BIOLOGICAL ASSESSMENT

(continued)

APPENDIX O.1

Compensatory Wetland Mitigation Plan

(continued)

Jordan Cove LNG	Eelgrass Site Geomorphic History and Analysis		moffatt & nichol
	Document Number: J1-740-TEC-TNT-DEA-00002-00		
	Rev.: A	September 20, 2018	

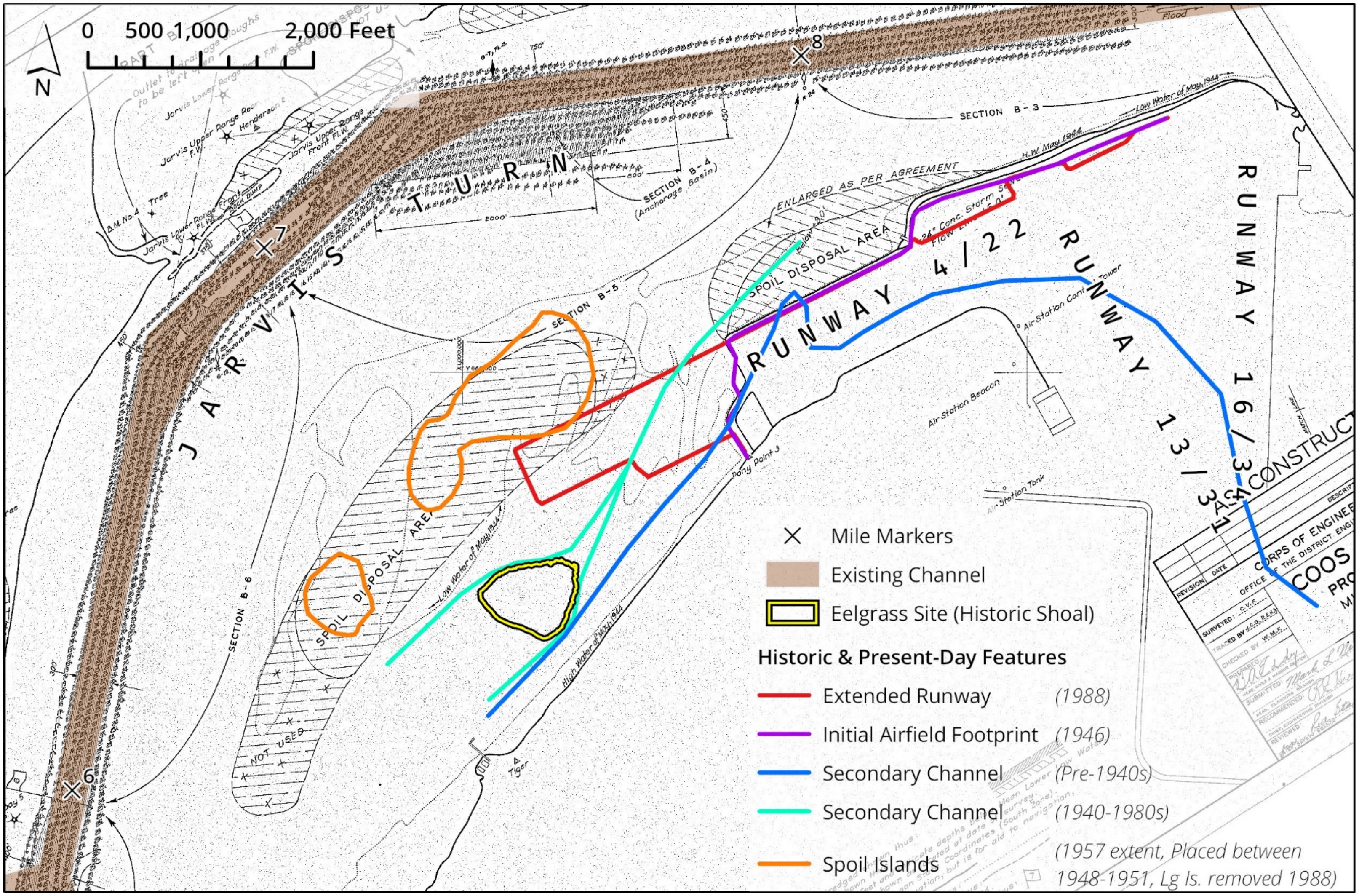

Figure 2-3. 1949 USACE Proposed Dredging and Disposal Plan (CB-1-385)

Jordan Cove LNG	Eelgrass Site Geomorphic History and Analysis		moffatt & nichol
	Document Number: J1-740-TEC-TNT-DEA-00002-00		
	Rev.: A	September 20, 2018	

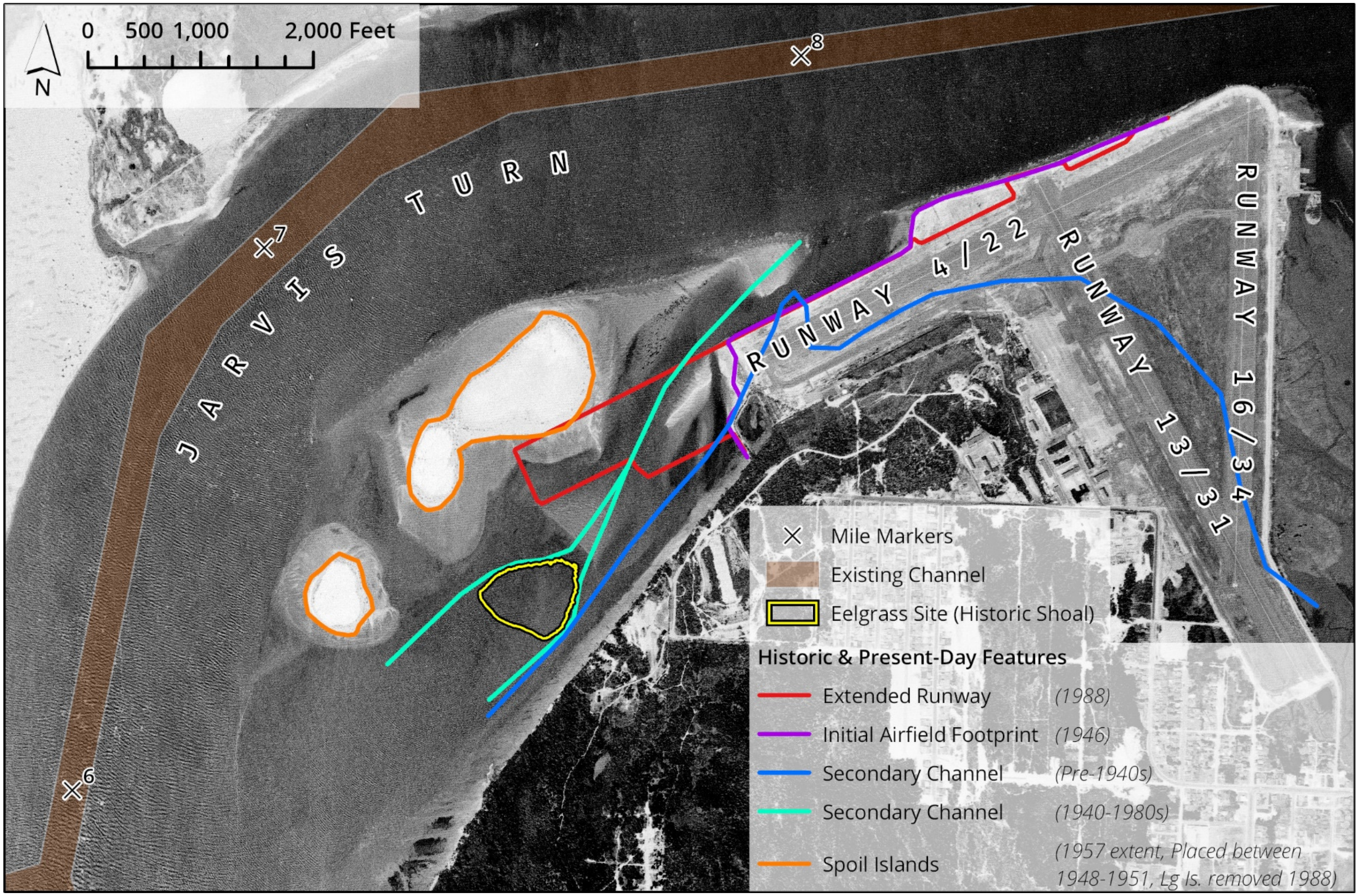

Figure 2-4. 1957 USGS Aerial

Jordan Cove LNG	Eelgrass Site Geomorphic History and Analysis		moffatt & nichol
	Document Number: J1-740-TEC-TNT-DEA-00002-00		
	Rev.: A	September 20, 2018	

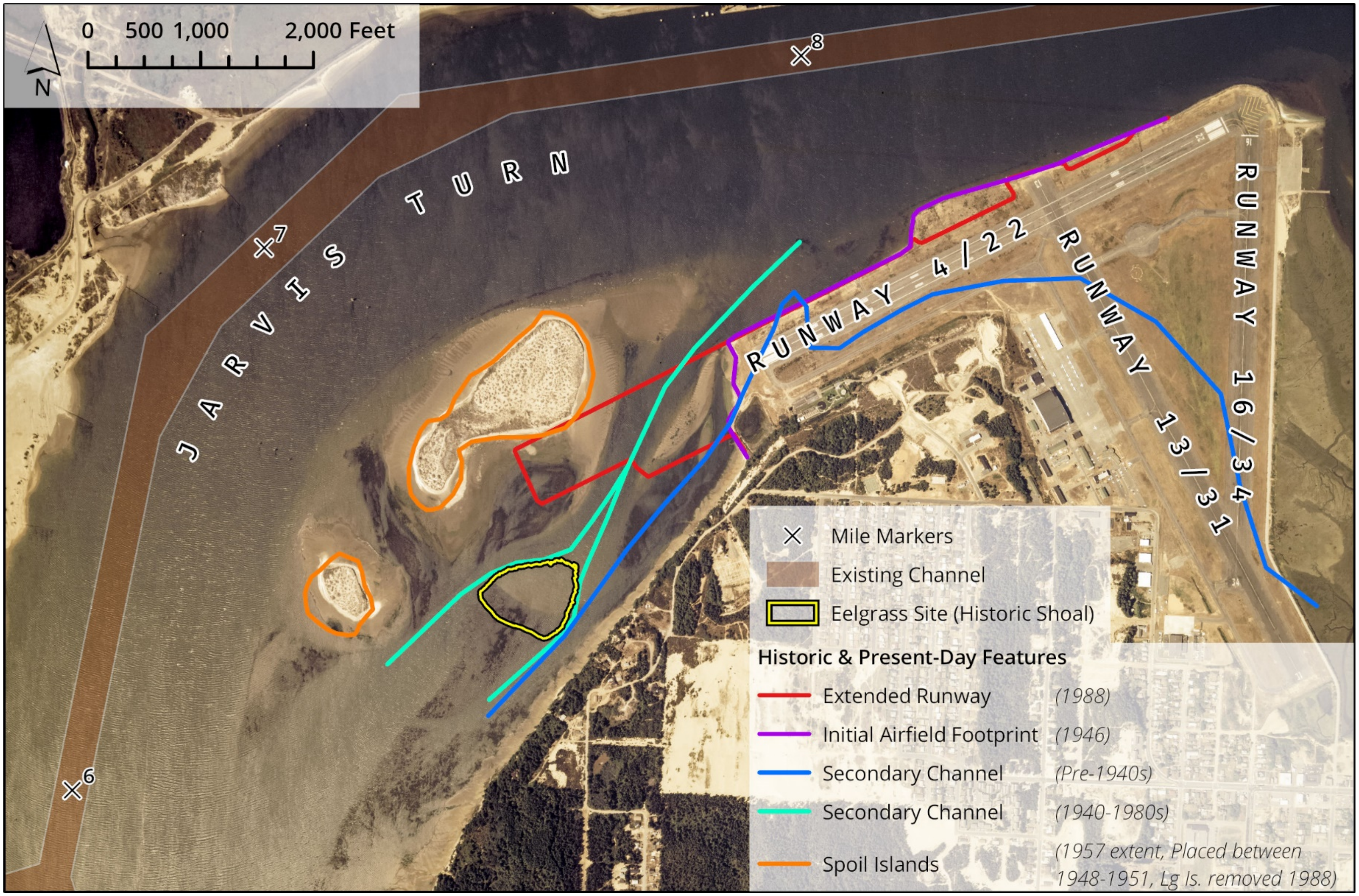

Figure 2-5. 1977 USGS Aerial

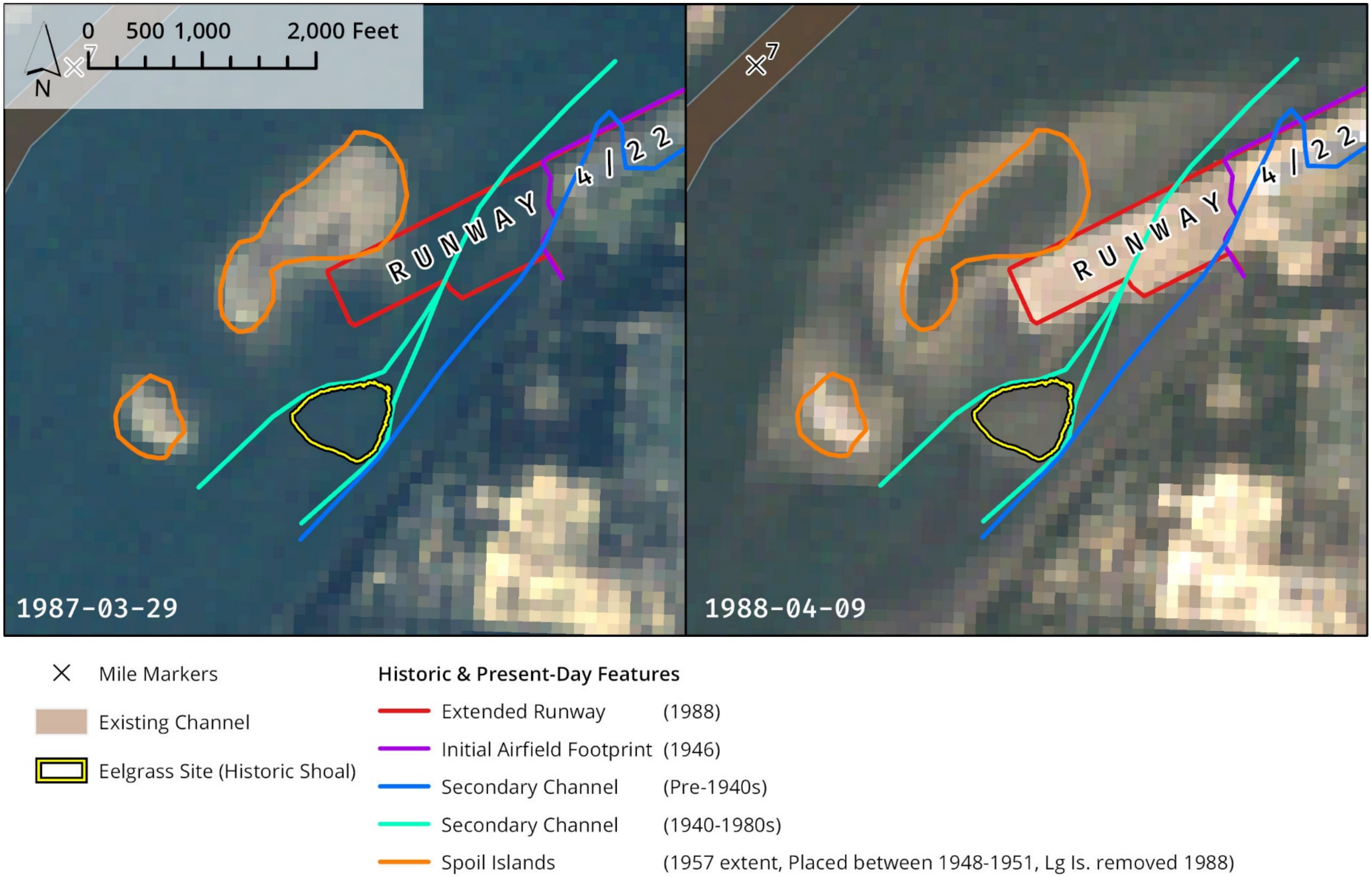

Figure 2-6. Satellite images showing the removal of the large dredge spoil island to construct the airport runway extension (1987-1988)

Figure 2-7. Partial removal of the spoil island, used as a source of fill for Runway 4/22 extension (1987), photo by Ward Robertson

Jordan Cove LNG	Eelgrass Site Geomorphic History and Analysis		moffatt & nichol
	Document Number: J1-740-TEC-TNT-DEA-00002-00		
	Rev.: A	September 20, 2018	

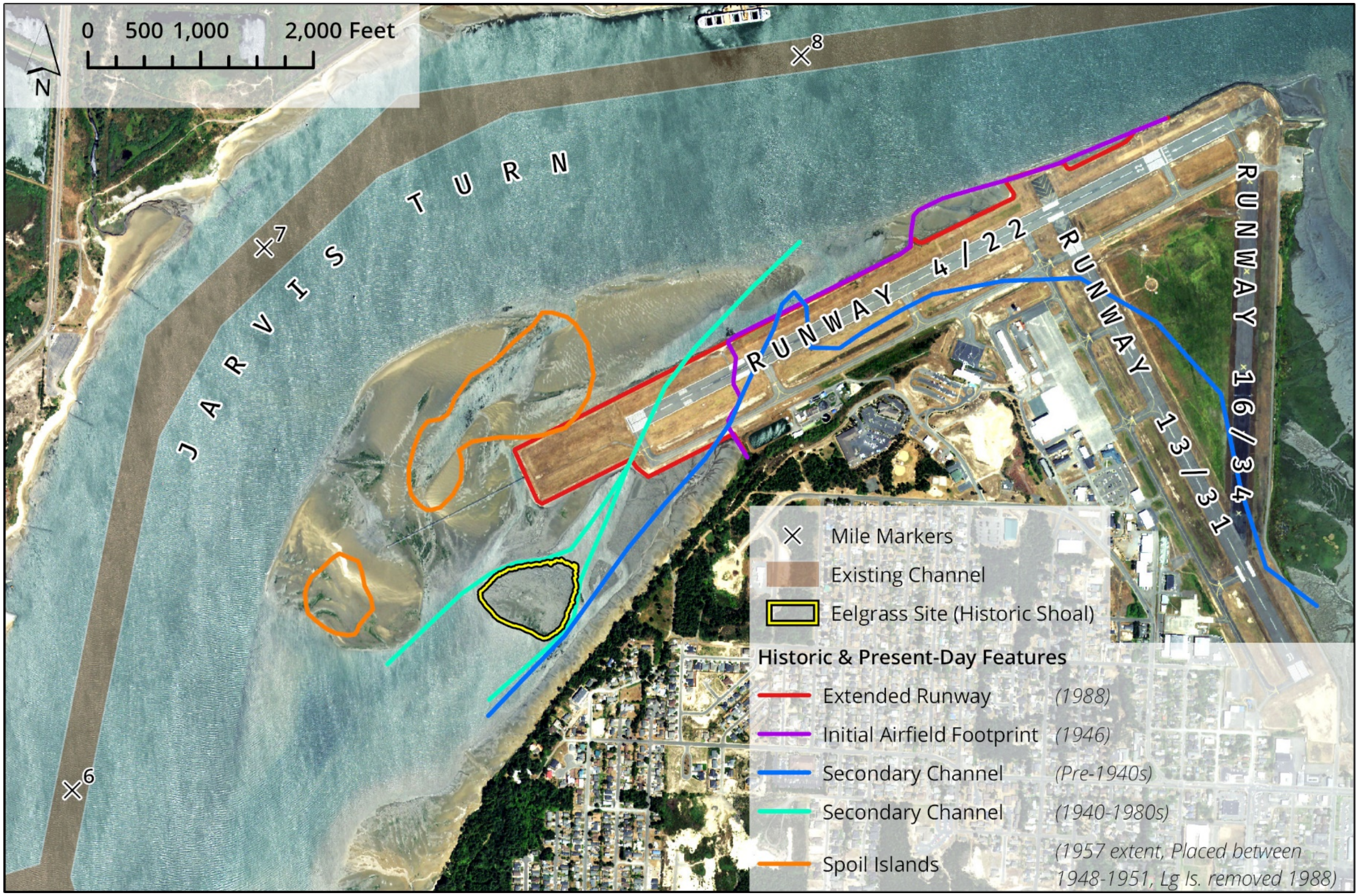

Figure 2-8. 2016 USDA Aerial

3. MODELING

In support of the permitting efforts for the JCEP, M&N has prepared two technical memoranda to summarize the hydrodynamics and sediment transport within the bay. Specifically, this memorandum should be used in parallel with the "Sediment Transport Analysis Technical Memorandum" and the "Hydrodynamic Analysis Technical Memorandum" (M&N 2018a, 2018b). The hydrodynamic and sediment transport studies used MIKE-21 to model "Without-Project" (existing conditions) and "With-Project" scenarios. The With-Project scenario included the proposed Eelgrass Mitigation Site. A comparison of the two scenarios provides an indication of anticipated changes to channel flow and sedimentation resulting from the proposed JCEP.

A typical 3-month winter tide cycle was used to model sediment transport. The With-Project and Without-Project scenarios used the same tide information and methodologies. Winter tidal conditions were used because these months tend to have the most extreme tidal currents and thus yield more conservative results. Winter months with larger tidal currents were applied in the model. The model configurations are discussed in detail in the hydrodynamic study and sediment transport study (M&N 2018a, M&N 2018b).

The sediment transport modeling result for the existing condition showed sand waves within the main channel and little sedimentation outside the main channel. A slight amount of deposition is shown just south of the proposed Eelgrass Mitigation Site (the existing delta-shaped shoal; (Figure 3-1). Other than the small depositional patch (less than 0.5ft deep and approximately 0.8 acres), the region south of Runway 4/22 is stable (OIPCB 2017).

A comparison of the With-Project and Without-Project modeling results show a large percentage reduction in currents (50%) at the Eelgrass Mitigation Site (Table 3-1). However, currents associated with the existing (i.e., Without-Project) and future With-Project conditions are quite small (0.2 knots) with a modeled net change of 0.1 knot. Given that the region south of Runway 4/22 is already static, the reduction in currents is unlikely to cause increased shoaling. A comparison of sediment transport modeling results supports this claim. Figure 3-2 shows no change in sedimentation near the Eelgrass Mitigation Site between the With and Without-Project conditions.

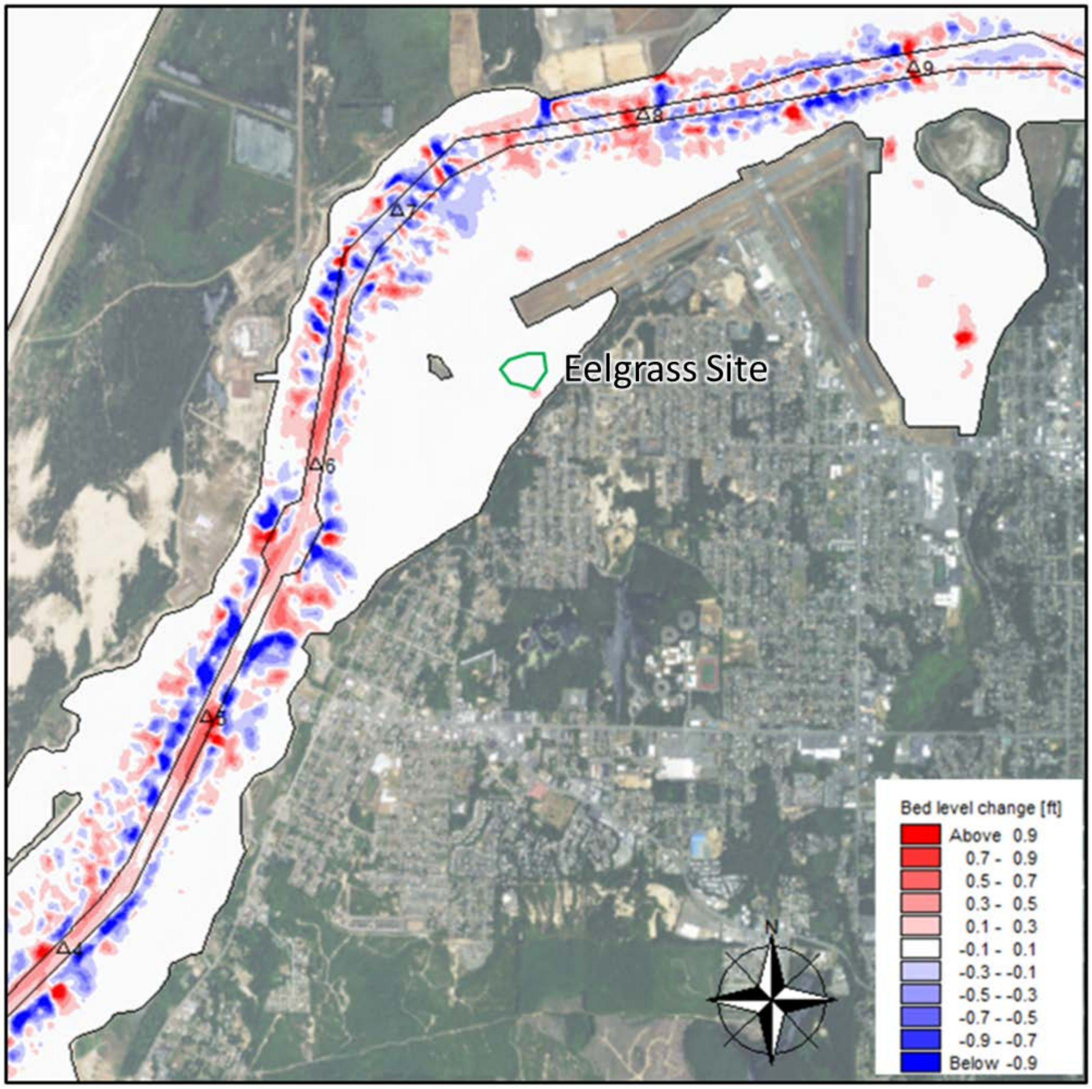

Figure 3-1. Model Result for the Existing Condition; Red – Shoaling, Blue - Erosion (OIPCB 2017)

Table 3-1. Modeled Current Change for the Eelgrass Mitigation Site (M&N 2018b)

	Mean Current Speed during Flood Tides (knots)	Mean Current Speed during Ebb Tides (knots)	99th Percentile Current Speed (knots)
Without-Project	0.2	0.1	0.4
With-Project	0.1	0.1	0.3
% Change	-50%	0%	-25%

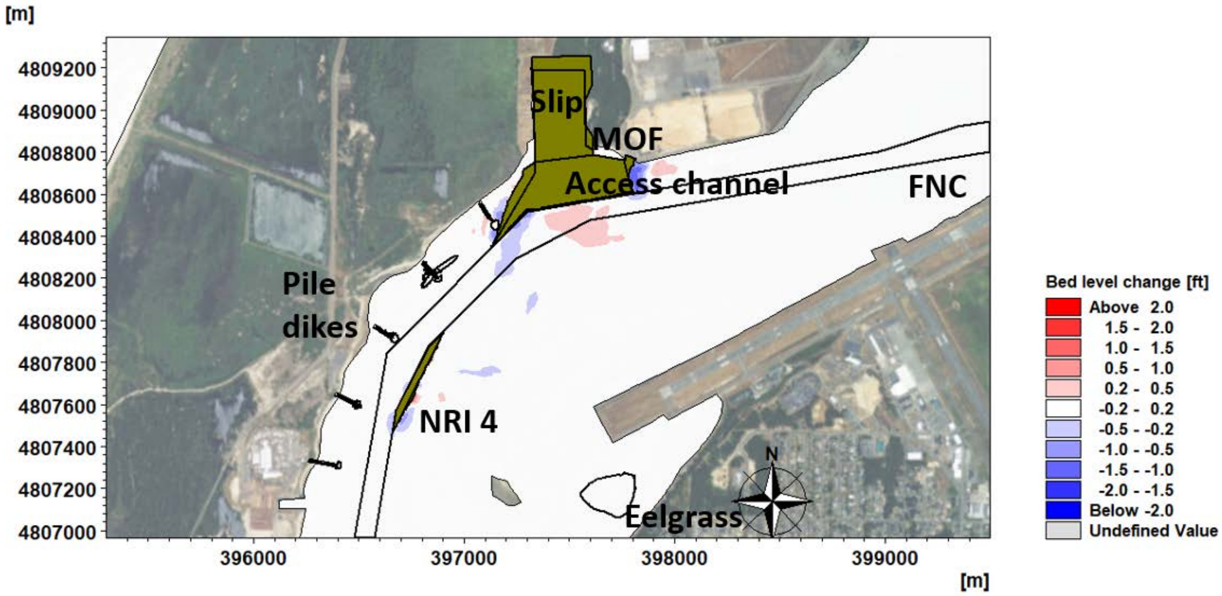

Figure 3-2. Difference of Bed Level Changes after One Year at the Jarvis Ranges, Without-Project vs. With-Project; Red – Shoaling, Blue – Erosion (M&N 2018a)

4. SUMMARY

This memorandum documents historic changes to the topography in the vicinity of the proposed Eelgrass Mitigation Site and determines how the constructed site will respond to hydrodynamic conditions within the estuary. Specifically, this memorandum determines whether the forces that created the existing shoal at the proposed site would cause the deepened mitigation site to fill with sediment. The site history and computer modeling of future conditions suggests that the proposed excavated Eelgrass Mitigation Site will remain stable.

The secondary channel that previously flowed over and delivered sediment to the proposed site is no longer active. Construction of the airport in 1946 and creation of dredge spoil islands in 1951 created conditions that led to the formation of the mound of sediment at the proposed Eelgrass Mitigation Site. In 1988, the airport was lengthened by approximately 2,000 feet to the west, effectively cutting off nearly all flow through the proposed site. Since this time, the proposed Eelgrass Mitigation Site has remained largely unchanged. Sediment transport modeling results support this, showing little-to-no change over the shallow region of the site. Models of the proposed JCEP (including the Eelgrass Mitigation Site) show no changes to the sedimentation patterns in the vicinity of the Eelgrass Mitigation Site. Therefore, after excavating, grading, and planting eelgrass at the proposed Eelgrass Mitigation Site, it is expected that the area will maintain its constructed depth and will not shoal back to its present-day elevation.

5. REFERENCES

CH2M Hill 1990. North Bend Runway Extension Status Report. Prepared for the City of North Bend, Oregon.

Gonor, J.J., Strehlow, D.R., Johnson, G.E., 1979. “Ecological Assessments at the North Bend Airport Extension Site: A Study of the Proposed North Bend, Oregon Airport Extension”.

Moffatt & Nichol (M&N), 2018a “Hydrodynamic Studies – Sediment Transport Analysis”. Prepared for JCLNG, May 2018. JCLNG Document No. J1-000-MAR-TNT-DEA-00003-00.

—, 2018b “Hydrodynamic Studies – Hydrodynamic Analysis Technical Memorandum”. Prepared for JCLNG, May 2018. JCLNG Document No. J1-000-MAR-TNT-DEA-00008-00.

—, 2017 “Navigation Reliability Improvement (NRI) Dredge Areas Evaluation Technical Memorandum”. Prepared for JCLNG, October 2017. JCLNG Document No. J1-000-MAR-TNT-DEA-00002-00

Oregon International Port of Coos Bay (OIPCB), 2017. “Coos Bay, Oregon, Section 204(f) Channel Modification Project: 60% Engineering Design Report”. October 31, 2017. JCLNG Document No. J1-000-MAR-RPT-PCB-00004-00.

APPENDIX E: LNG TERMINAL WETLAND FUNCTIONAL ASSESSMENT

(J1-000-TEC-TNT-DEA-00020-00 September 27, 2017)

Jordan Cove LNG	Jordan Cove Energy Project Wetland Functional Assessment		David Evans and Associates Inc.
	Document Number: J1-000-TEC-TNT-DEA-00020-00		
	Rev.: B	**Rev. Date: October 13, 2017**	

TECHNICAL MEMORANDUM

DATE:	September 27, 2017
ATTENTION:	Caroline Burda, Senior Environmental Specialist
COMPANY:	Jordan Cove LNG
ADDRESS:	5615 Kirby Drive, Suite 500
FROM:	Ethan Rosenthal
SUBJECT:	Jordan Cove Energy Project Wetland Functional Assessment
DEA PROJECT NAME:	Jordan Cove LNG
DEA PROJECT NO:	JLNG0000-0003
DOCUMENT #	J1-000-TEC-TNT-DEA-00020-00
COPIES TO:	DEA File

1. INTRODUCTION

This memorandum provides the results of wetland functional assessments conducted for the Jordan Cove Energy Project ("JCEP Project") permitting effort. Wetland functional assessments were conducted for wetlands, including estuarine resources, located within the JCEP Project study area that will experience permanent impacts. The areas of the JCEP Project that will experience permanent wetland or estuarine resource impacts include: Ingram Yard, slip and access channel, Material Offloading Facility, South Dunes site, and the Trans Pacific Parkway/U.S. Highway 101 Intersection Widening. Functions and values were also assessed at the Kentuck Project mitigation site and the Eelgrass Mitigation site, both for the existing pre-mitigation condition and the designed post-mitigation condition. This memorandum is intended to provide the wetland functional assessment results. A discussion of project impacts, including avoidance and minimization measures, is provided in the permit application submittals to the U.S. Army Corps of Engineers ("USACE") and the Oregon Department of State Lands ("DSL").

2. METHODS

Wetland functions and values were evaluated for impacted wetlands and the mitigation sites pre- and post-mitigation. Table 1 lists the assessment methods used for various aspects of the project.

Table 1. Functional Assessment Methods Used for JCEP Permanent Wetland and Estuarine Impacts

Project and Components	Method: Rationale
Freshwater wetland impacts	Oregon Rapid Wetland Assessment Protocol ("ORWAP"): This is the approved method for assessing functions and values in Oregon, particularly for projects that entail multiple wetland types.
Existing tidal habitats and Eelgrass Mitigation site (intertidal sand/mudflats, shallow subtidal, eelgrass, salt marsh, riprap embankment below highest measured tide)	Best Professional Judgement ("BPJ"): BPJ entails the review of functions and values based on the knowledge and experience of a trained professional, as opposed to a more formulaic/model driven approach such as ORWAP. The habitats assessed using BPJ occur at the proposed slip and access channel, the Trans Pacific Parkway/US Highway 101 intersection, along the west side of East Bay Drive at the Kentuck Project, and at the Eelgrass Mitigation site. ORWAP is not intended to assess these types of estuarine resources, with the exception of salt marsh. Because impacts to salt marsh habitats are extremely small (0.06 acre) and are adjacent to the other habitats noted above, they have been included in this method due to their *de minimis* function relative to the surrounding impacted habitats.
Kentuck Project, pre- and post-mitigation	ORWAP: This method is appropriate for evaluating all wetland types at the site in its existing condition. This method also covers the many wetland types that will exist post-mitigation. ORWAP does consider the presence of mudflats within the greater vegetated portion of a site. Therefore, mudflats that will form at the site have been included as a part of the overall site assessment. Post-mitigation conditions were assessed seperately for the two Kentuck Project areas: Tidal Reconnection Area and Freshwater Floodplain Reconnection Area. These areas were evaluated seperately since the sources of hydrology—tidal and non-tidal—are distinctly different. However, each assessment of post-mitigation condition assumed that the other mitigation site was in place and therefore adjacent conditions would improve functions within the assessed area.

2.1 OREGON RAPID WETLAND ASSESSMENT PROTOCOL METHOD AND SPECIAL CONSIDERATIONS

ORWAP is a standardized protocol for assessing the functions and values of wetlands in Oregon. DSL led its development with funding from the U.S. Environmental Protection Agency and oversight by an advisory committee of state and federal agencies and private consultants. ORWAP outputs, like those of other methods, are not necessarily more accurate than judgments of a subject expert, partly because ORWAP spreadsheet models lack the intuitiveness and integrative skills of an actual person knowledgeable of a particular function, and models cannot anticipate every possible condition that may occur in nature (Adamus et al. 2016a).

The procedure for using ORWAP involves several steps. After data from the three-part form are entered into an Excel spreadsheet, ORWAP automatically generates scores intended to reflect the ability of a wetland to support the following functions: Water Storage and Delay, Sediment Retention and Stabilization, Phosphorus Retention, Nitrate Removal and Retention; Anadromous Fish Habitat; Resident Fish Habitat; Amphibian and Reptile Habitat; Waterbird Nesting Habitat; Waterbird Feeding Habitat; Aquatic Invertebrate Habitat; Songbird, Raptor, and Mammal Habitat; Water Cooling; Native Plant Diversity; Pollinator Habitat; Organic Nutrient Export; and Carbon Sequestration (Adamus et al. 2016a). For all but two of these functions, scores are given for both components of an ecosystem service: function and value (the Function Rating and the Value Rating, respectively). The functions are also condensed into thematic groups, called “grouped services.” Grouped services ratings are what are required for regulatory use and include the following: Hydrologic Function, Water Quality Support, Fish Habitat, Aquatic Habitat, and Ecosystem Support. The individual functions are given a numeric score, while the grouped services are simply rated as “lower,” “moderate,” or “higher.” If the function is completely absent, then a “zero” score is assigned. A “zero” score also may be assigned if the score ranked among the lowest of all wetlands in Oregon. The grouped rating is based on the highest scoring individual function within the particular group. ORWAP version 3.1 calculator spreadsheets, databases, and forms (Adamus et. al. 2016b) were used to conduct the wetland functional assessment for the JCEP permitting effort.

2.1.1 Special Consideration: Anadromous Fish Function

During implementation of ORWAP on portions of the project wetlands, it was observed that the ORWAP model sometimes greatly overstated the benefits to anadromous fish. The model does not have a simple question such as, “Do anadromous fish have access to the wetland?” Instead, the model attempts to get at this question indirectly through a series of related questions that don’t take into account wetlands that might drain to anadromous fish-bearing waters via a non-fish-friendly tidegate or where a drainage connection might occur down a steep embankment that blocks fish passage. According to direction from DSL (Hicks pers. comm. 2017), when this issue arises it should be noted on the ORWAP cover sheet form and results can be manually adjusted. Because the ORWAP form is locked, it is not possible to adjust scores directly in the form, so these adjustments show up only in the attached summary table. The results section below notes any cases in which these adjustments apply in the assessment of project wetlands.

2.1.2 Special Consideration: Hydrologic and Water Quality Functions

ORWAP typically assigns Function Ratings for depressional wetlands lacking an outlet as “higher” for Hydrologic Function and Water Quality Support scores, regardless of any other characteristics of the wetland. The model essentially assumes that all water flowing in, including any pollutants, is trapped and therefore the wetland reduces downstream flooding, and pollutants cannot impact downstream waters. The scoring of these functions for project depressional wetlands followed this pattern. However, the value ratings of these functions for project wetlands generally rated “lower” or “moderate,” presumably because the wetlands are quite small and located in the low end of the watershed, which means the functions are of relatively little benefit in these instances. The wetland characterization and results section below notes cases in which this situation applies to project wetlands.

3. WETLAND CHARACTERIZATION AND RESULTS

Wetlands requiring functional assessments are described below. These descriptions are intended to provide a general picture of the assessed wetlands as context for the more detailed assessment questions required by ORWAP or to provide the discussion of functions for resources in which BPJ was used to assess functions. ORWAP functional scores are summarized in the attached summary table. ORWAP cover pages and detailed score sheets for each assessment are provided as an attachment after the summary table. Detailed assessment worksheet forms, roughly 30 pages per assessed wetland, are available upon request.

3.1 IMPACTED WETLANDS

3.1.1 Wetlands 2013-6 and 2012-2 (Assessed Using ORWAP)

Wetlands 2013-6 and 2012-2 are interdunal emergent wetlands situated at a transition zone between generally less developed dune lands to the west and more disturbed developed areas to the east. The nearest source of disturbance to the wetland is Jordan Cove Road, which runs nearly adjacent to the east side of the wetlands. The wetlands have no surface outlet and are primarily fed by groundwater. Much of the wetlands are ponded year-round, ranging from up to 3 feet deep in the deeper areas during winter to just a few inches deep during summer. Wetland vegetation primarily consists of native emergent species, with some willow shrubs around the edges of the wetlands. The wetlands are bordered by coastal dune forest; however, as previously noted, Jordan Cove Road is close to the eastern boundary of the wetlands. A large expanse of sand dune, coastal dune forest, and wetlands are located to the west of the wetlands.

Notable findings from ORWAP include:

- Group scores that rated as “higher” for both the Function Rating and the Value Rating include: Aquatic Habitat and Ecosystem Support. The “higher” rating for Aquatic Habitat and Ecosystem Support make intuitive sense, because these wetlands are fairly intact and are bordered by other intact habitats.
- As noted in the methods section, Hydrologic Function and Water Quality Support function scores rated as “higher” solely because these wetlands have no outlet. However, the Value Rating for both of these functions was “lower.”
- The wetlands are not accessible to fish and likely do not have resident fish. ORWAP rated the Fish Habitat function as “lower”; however, this score was manually adjusted to zero in the attached summary table.

3.1.2 Wetland C (Assessed Using ORWAP)

Wetland C is a relatively small depressional forested wetland dominated by native plant species typical of the Oregon coast. The wetland is close to the shoreline of the geographic feature known as Jordan Cove. The surrounding area consists of second growth forest, a grassed access road, Jordan Cove Road farther to the west, and cleared historic industrial land farther to the east. The wetland has no surface outlet and is primarily fed by groundwater. Minor ponding likely occurs in winter, and the wetland dries out in summer.

Notable findings from ORWAP include:

- Findings for Wetland C at the group level are essentially the same as those noted for Wetlands 2013-6 and 2012-2; see findings above.

3.1.3 Wetland E (Assessed Using ORWAP)

Wetland E is a deep depressional wetland dominated solely by yellow pond lily (*Nuphar luteum*). Ponding occurs throughout the year across the entirety of the wetland, with water surface elevations dropping roughly 2 to 3 feet from winter to summer. Yellow pond lily covers most of the water surface by summer; only a few small open water areas remain. The surrounding area consists of second growth forest, a grassed access road, Jordan Cove Road farther to the west, and cleared historical industrial land farther to the east. The wetland has no surface outlet and is primarily fed by groundwater.

Notable findings from ORWAP include:

- Findings for Wetland C at the group level are essentially the same as those noted for Wetlands 2013-6 and 2012-2; see findings above.
- One exception to the similarity in findings is that the Fish Habitat function was not manually decreased from “lower” to zero for Wetland E, because this wetland contains a persistent source of ponded water that is several feet deep. Although it is not known if resident fish are present, it appears more likely that they are present at Wetland E than at Wetlands 2013-6 and 2012-2.

3.1.4 Wetlands H, I, J, and N (Assessed Using ORWAP)

Wetlands H, I, J, and N are all located in highly disturbed areas of the former Weyerhaeuser Mill property, now referred to as the South Dunes site. These wetlands consist of constructed drainage ditches and some flat wetland areas drained by the ditches. Vegetation is primarily a mix of native emergent and non-native grasses; however, some fringing willows might also be present. Surrounding areas consist of old concrete fill pads, and grass and shrub uplands dominated by non-native species that are occasionally maintained. Although these wetlands might drain to the bay, particularly during wetter months or high precipitation events, there is no fish access either because of fish-impassable culverts (i.e., tide gates or culvert elevation) or because the ditch bottoms are well above the elevation of high tides and outlet drainage spills over a steep embankment.

Notable findings from ORWAP include:

- No group functions rated as “high” for these wetlands, because all of these wetlands are situated in highly disturbed areas associated with past industrial activities. Non-native vegetation dominates these wetlands as well as the surrounding buffer areas. Some group functions did rate as “moderate”; however, this rating is most likely a result of more natural conditions farther afield, including relative proximity to the Coos Bay estuary.
- These wetlands are not accessible to fish, nor would they provide habitat to fish if access were provided. ORWAP rated the Fish Habitat function as “lower”; however, this score was manually adjusted to zero in the attached summary table.

3.1.5 Estuarine Resources at Proposed Access Channel (Assessed Using BPJ)

Permanently impacted estuarine resources at the proposed access channel consist mostly of unvegetated intertidal sand/mudflat, unvegetated shallow subtidal habitat, narrow bands of eelgrass along the intertidal/subtidal boundary, and a very small patch (<0.1 acre) of salt marsh vegetation. The habitats provide similar functions to one another; however, the salt marsh and eelgrass habitats tend to provide these functions to a greater extent. Flats habitats support algae and a variety of benthic invertebrates. These habitats are generally sheltered from strong currents and wave action, and their gradual slopes tend to dissipate wave and tidal energies. Sediment deposition and tidal/wave action are important factors that help develop and shape flats habitat. Tidal flat sediments vary from fine mud to cobbles. Sediments at the access channel range from course sand to mud. Shallow water depths allow for maximum light and warm temperatures, which may result in extensive algae blooms in the spring and summer. Diatoms are a very common type of algae that are distributed throughout the lower bay and contribute significantly to estuarine primary production. Mudflats and sand flats provide habitat to various shellfish species and ghost shrimp. Bottom-feeding fishes graze over flats during high tide. Flats habitats are important to juvenile salmonids, because they provide suitable substrate conditions to support primary productivity (benthic algae) and prey species (benthic macroinvertebrates). Eelgrass beds further support primary productivity, act as substrate and structure for epiphytic (attached) algae and other aquatic organisms, and provide important cover for juvenile fish. Herring and other aquatic organisms attach their eggs to eelgrass. Intertidal flats also provide feeding areas for waterfowl, shorebirds, and raptor species such as osprey. The habitats at the proposed access channel could provide all of these functions; however, likely not at a level as high as some of the more diverse and ecologically complex locations found elsewhere in the bay (e.g., Clam Island area).

3.2 MITIGATION SITES

3.2.1 Kentuck Project Wetlands – Existing Conditions (Assessed Using ORWAP)

Wetlands at the Kentuck Project site primarily consist of wet pasture that now occupies the former Kentuck Golf Course. Vegetation primarily consists of non-native grasses, with scattered native and ornamental trees. Hydrology is primarily driven by a high seasonal groundwater table along with direct precipitation. Some ponding occurs during the winter months, with excessive ponding occurring after heavy and/or persistent periods of rain. Ponding is generally absent in the summer, except for a few small excavated ponds/former golf course water hazards. Several small drainages enter the site from adjacent hillsides and flow to Kentuck Inlet (i.e., Coos Bay) via a tidegated culvert into a sump on the east side of East Bay Road and then to a non-tidegated culvert under East Bay Road. The site is hydrologically isolated from Kentuck Slough (inclusive of Kentuck Creek) by a levee. Currently, the site is inaccessible to fish from the bay and Kentuck Slough. Forested wetland, dominated by typical native coastal plant species, occurs on the south side of Golf Course Lane, and is also part of the overall site. These wetland areas are fed by subsurface flow and runoff from the adjacent hillside. There is also a small dam and irrigation pond that drains to the former golf course area. Drainage is via a standpipe. The irrigation pond contains perennial open water, areas of yellow pond lily, and emergent wetland dominated by native species. Forest lands border the east side of the site, and there is a combination of timber harvest and residential dwellings further upslope.

Notable findings from ORWAP include:

- No group scores rated as "higher" for both the Function Rating and Value Rating.
- Aquatic Habitat and Ecosystem Support functions ratings were manually adjusted from "higher" to "moderate." ORWAP likely scored these as "higher" because some minor portions of the Kentuck Project site have intact habitats; however, these portions provide a poor point of comparison, because the majority of the site lacks intact native habitats and has been highly altered by past land use practices. A "moderate" rating is more appropriate for this site, because it is a former golf course that is slowly reverting back to more natural conditions but still experiences grazing and lacks overall diversity.
- ORWAP rated the Fish Habitat function as "moderate," but this score was manually adjusted to "lower" in the attached summary table. The site wetlands and associated creeks are not accessible to anadromous fish but could have resident fish. ORWAP rated the individual "Resident Fish" function as "lower."

3.2.2 Kentuck Project Wetlands – Post-mitigation, Tidal Reconnection Area (i.e., JCEP Mitigation) (Assessed Using ORWAP)

The Kentuck Site post-mitigation will contain two primary areas: one connected to tidal influence and the other not connected to tidal influence but connected to Kentuck Creek. This description covers the portion that will be connected to tidal influence and is intended to provide mitigation for the JCEP Project impacts.

After mitigation this area will consist of a combination of mudflats, salt marsh, tide channels, and fringing freshwater wetlands that will form a complex estuarine ecosystem providing a full connection and fish accessibility to and from Coos Bay. Willows are highly supportive of rearing salmonids and they will be an important component of the fringing wetland plant communities. The site will also be connected to Kentuck Slough via a muted tidal regulator (i.e., a fish-friendly tidegate structure). Hydrology will be provided primarily by tidal inundation, along with freshwater inputs from hillside seepage and incoming drainages.

Notable findings from ORWAP include:

- Group scores that rated as "higher" for both the Function Rating and Value Rating include: Water Quality Support, Fish Habitat Support, Aquatic Habitat Support, and Ecosystem Support. These high ratings make intuitive sense, because the area will be restored to a complex and diverse array of native habitat types that were historically present but have been lost in the estuary.
- The Hydrologic Function rated as "lower" for the Function Rating, likely only because the area will be a tidal wetland and therefore will not support flood control.

3.2.3 Kentuck Project Wetlands – Post-mitigation, Freshwater Floodplain Reconnection Area (i.e., PCGP Mitigation) (Assessed Using ORWAP)

The northeast end of the Kentuck Project site will be reconnected to Kentuck Creek, outside of the previously described Tidal Reconnection Area, and therefore will provide restored freshwater wetland floodplain habitat. This area will be focused on mitigation for the impacts of the Pacific Connector Gas Pipeline project ("PCGP Project"), which consist of conversion of palustrine forested and scrub-shrub wetlands to emergent wetlands. Therefore, forested and scrub-shrub wetlands are the dominant habitat types proposed for this area; however, a minor component of emergent wetland will also be provided. The existing levee that segregates Kentuck Creek from the Kentuck Project site will be removed in this area, allowing flood flows to enter the wetlands. Minor grading within the freshwater floodplain reconnection area will occur in order to provide microtopographic relief, which should allow for establishment of diverse plant communities and provide fish refugia habitat during periods of high water. Similar to the tidal portion of the Kentuck Project described above, because willows are highly supportive of rearing salmonids, they will be an important component of the plant communities.

Notable findings from ORWAP include:

- Group scores that rated as "higher" for both the Function Rating and Value Rating include: Water Quality Support, Fish Habitat Support, Aquatic Habitat Support, and Ecosystem Support. These high ratings make intuitive sense, because the area will be restored to a complex and diverse array of native habitat types along the Kentuck Creek floodplain that were historically present but have been lost.
- The Function Rating for Water Quality Support was manually increased from "moderate" to "higher," because it is assumed that the benefits of increased shade/lower water temperature and the trapping of sediments during high flows are likely underestimated by ORWAP, and will certainly be greater than the "moderate" rating ORWAP also calculated for the existing condition.
- The Value Ratings for Aquatic Habitat and Ecosystem Support functions were manually increased to "higher," because these functions are clearly valued in the watershed and because the assessment of the pre-mitigation condition rated them as "higher" value. Clearly, the improvement in site conditions should not reduce their value.

3.2.4 Eelgrass Mitigation Site – Existing Conditions (Assessed Using BPJ)

The proposed Eelgrass Mitigation site currently consists of a sand flat island situated several feet above mean lower low tide elevation. The island is exposed during lower low tides. Deeper areas surrounding the island contain eelgrass beds. Functions that are provided by sand flats and mudflats are described above in the discussion of "Estuarine Resources at Proposed Access Channel." Generally speaking, the functions provided occur at a lower level for bare sand flats than for areas with eelgrass beds. In addition, primary production and associated food chain support are lower in the bare sand flat areas than in the areas with eelgrass. The bare sand flat also lacks the substrate and structure to support epiphytic algae and other organisms that would increase primary and secondary productivity. Cover for juvenile fish is not provided.

3.2.5 Eelgrass Mitigation Site – Post-mitigation (Assessed Using BPJ)

The same functions provided pre-mitigation would be provided post-mitigation; however, these functions would be provided at a higher level. The presence of eelgrass would elevate levels of primary production and associated food chain support functions considerably. The eelgrass would also provide substrate and structure to support epiphytic algae and other organisms that would increase primary and secondary productivity. Cover for juvenile fish would be provided along with attachment sites for egg laying by herring and other aquatic organisms.

4. SUMMARY FINDINGS

Based on ORWAP, freshwater wetland group functions likely to be most affected by the JCEP Project and that received "higher" Function and Value Ratings are the Aquatic Habitat and Ecosystem Support functions. Under existing conditions, no functions at the proposed Kentuck Project mitigation site rated as "higher." On the other hand, post-mitigation Function Ratings for both the Kentuck Project Tidal Reconnection Area and the Kentuck Project Freshwater Floodplain Reconnection Area rated as "higher" for Water Quality Support, Fish Habitat, Aquatic Habitat, and Ecosystem Support, all of which received "higher" Value Ratings as well. These assessment results suggest two conclusions: first, proposed mitigation at both Kentuck Project areas results in a functional uplift of important wetland values, and second, the uplift at the Kentuck Project will occur, at a minimum, to the same "higher" Function Rating and Value Rating group functions that will be lost at the freshwater impact sites.

Estuarine habitat functions will be lost at the proposed slip location. As previously described, functions such as shellfish habitat, waterbird habitat, primary production, cover for juvenile fish, and egg laying attachment areas for herring and other aquatic organisms may be provided at this impact site; however, due to current site conditions, the impact site likely does not provide these functions at as high a level as some of the more diverse and ecologically complex locations found elsewhere in the bay. Lost estuarine functions will be offset at the Kentuck Project site and the Eelgrass Mitigation site, both of which are currently situated in and/or post-mitigation will result in a considerably more complex and diverse array of habitats than at the slip impact site, thus resulting in an overall uplift in functions.

As previously noted, this memorandum is only intended to provide the wetland functional assessment results. A discussion of project impacts, including avoidance and minimization measures, is provided in the Joint Permit Application submittal to the USACE and DSL.

5. REFERENCES

Adamus, P., J. Morlan, K. Verble. and A. Buckley. 2016b. Oregon Rapid Wetland Assessment Protocol (ORWAP, revised). Version 3.1 calculator spreadsheet, databases, and data forms. Oregon Department of State Lands, Salem, OR.

Adamus, P., K. Verble, and M. Rudenko. 2016a. Manual for the Oregon Rapid Wetland Assessment Protocol (ORWAP, revised). Version 3.1. Oregon Dept. of State Lands, Salem, OR.

Dana Hicks, DSL, personal communication, August 18, 2017.

ATTACHMENTS

- Attachment 1: ORWAP Summary Table
- Attachment 2: ORWAP Cover Pages and Summary Scores

Attachment 1: ORWAP Summary Table

ORWAP Functional Assessment Summary Results for JCEP Project

Note: Group functions where both the Function Rating and Values Rating were "higher" have been shaded in green. These Group Functions will be emphasized in the comparison of impacts to mitigation.

Impacted Wetlands

	Wetland C				Wetland E				Wetlands H, Wetland I, Wetland J, and Wetland N				Wetland 2013-6 and 2012-2			
GROUPS	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Higher	--	Lower	--	Higher	--	Lower	--	Moderate	--	Lower	--	Higher	--	Lower	--
Water Quality Support (SR, PR, or NR)	Higher	--	Moderate	--	Higher	--	Lower	--	Lower	--	Moderate	LM	Higher	--	Lower	--
Fish Habitat (FA or FR)	0 (2)	--	0 (2)	--	Lower	--	Lower	--	0 (2)	--	0 (2)	--	0 (2)	--	0 (2)	--
Aquatic Habitat (AM, WBF, or WBN)	Higher	--	Higher	--	Higher	MH	Higher	--	Moderate	--	Higher	--	Higher	MH	Higher	--
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Higher	MH	Higher	--	Higher	MH	Higher	--	Moderate	MH	Higher	--	Higher	MH	Higher	--

Kentuck Project Site, Pre- and Post-Mitigation

	Pre-Mitigation (i.e. Existing Conditions)				Post-Mitigation Tidal Reconnection Area				Post-Mitigation Freshwater Floodplain Reconnection Area			
GROUPS	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Lower	--	Lower	--	Lower	--	Lower	--	Moderate		Lower	
Water Quality Support (SR, PR, or NR)	Moderate	--	Higher	--	Higher	--	Higher	--	Higher (5)		Higher	
Fish Habitat (FA or FR)	Lower (1)	--	Higher	--	Higher	--	Higher	--	Higher		Higher	
Aquatic Habitat (AM, WBF, or WBN)	Moderate (6)	--	Higher	--	Higher	--	Higher	--	Higher	MH	Higher (4)	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Moderate (6)	MH	0 (3)	0 (3)	Higher	--	Higher	--	Higher		Higher (4)	

Notes regarding ratings, including manual adjustments to ORWAP ratings.

(1) Rating manually adjusted to "Lower" because ORWAP currently not able to account for tidegates that prevent fish passage. Note score on individual worksheet is as calculated by ORWAP (i.e. moderate).

(2) A "0" rating was manually entered because ORWAP had rated the function as "lower" when in fact no function is provided due to a total lack of access by anadromous and resident fish.

(3) A "0" rating was asigned by ORWAP because the associated highest function within the Ecosystem Support group was "Organic Nutrient Export." ORWAP does not assess the value of Organic Nutrient Export.

(4) Values scores were manually increased to "higher" since the functions are clearly valued in the watershed and because the assessment of the pre-mitigation rated them to be of high value.

(5) Function Rating manually increased from "moderate" to "higher" since it is believed that shade/temperature benefits and trapping of sediments during high flows are likely underestimated by ORWAP and will certainly be greater than the "moderate" rating ORWAP also calculated for the existing condition.

(6) Manually adjusted from "higher" to "moderate". ORWAP likely scored as "higher" because some minor portions of the Kentuck Project have intact habitats; however, this provides a poor comparison when reviewing the majority of the site that lacks intact native habitats and that have been highly altered by past land use practices.

Attachment 2: ORWAP Cover Pages and Summary Scores

ORWAP Version 3.1. Cover Page: Basic Description of Assessment	
Site Name:	Wetland C
Investigator Name:	Phil Rickus
Date of Field Assessment:	various during different times of year
County:	Coos County
Nearest Town:	North Bend
Latitude (decimal degrees):	
Longitude (decimal degrees):	43.4339, -124.2492
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	0.29 ac
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	100%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PEMW, PFOC
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	Depressional
Soil Unit Mapped in Most of the AA:	Waldport-Heceta, fine sands, 0 to 30% slopes
If tidal, the tidal phase during most of visit:	not tidal
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	no
How many wetlands have you assessed previously using ORWAP (approximate)?	> 30
.	Relatively small depressional forested wetland dominated by natives. The surrounding area consists of second growth forest, a grassed access road, Jordan Cove Road further to the west and cleared historic industrial land further to the east. The wetland has no surface outlet and is primarily fed by groundwater. Minor ponding likely occurs in winter with the wetland drying out in summer.

Site Name:	**Wetland C**
Investigator Name:	**Phil Rickus**
Date of Field Assessment:	**various during different times of year**
Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.	

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	10.00	Higher		0.00	Lower	
Sediment Retention & Stabilization (SR)	10.00	Higher		4.85	Moderate	
Phosphorus Retention (PR)	10.00	Higher		2.27	Lower	
Nitrate Removal & Retention (NR)	10.00	Higher		1.80	Lower	
Anadromous Fish Habitat (FA)	0.00	Lower		0.00	Lower	
Resident Fish Habitat (FR)	0.00	Lower		0.00	Lower	
Amphibian & Reptile Habitat (AM)	7.40	Higher		3.47	Lower	
Waterbird Nesting Habitat (WBN)	6.64	Moderate	MH	10.00	Higher	
Waterbird Feeding Habitat (WBF)	9.03	Higher		10.00	Higher	
Aquatic Invertebrate Habitat (INV)	5.69	Moderate		2.47	Lower	
Songbird, Raptor, Mammal Habitat (SBM)	3.04	Lower		5.00	Moderate	
Water Cooling (WC)	9.41	Higher		0.00	Lower	
Native Plant Diversity (PD)	6.94	Higher	MH	10.00	Higher	
Pollinator Habitat (POL)	7.09	Higher	MH	5.77	Higher	MH
Organic Nutrient Export (OE)	0.00	Lower				
Carbon Sequestration (CS)	7.51	Higher				
Public Use & Recognition (PU)				3.16	Lower	

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	3.71	Moderate	
Wetland Ecological Condition (EC)	1.92	Lower	
Wetland Stressors (STR)	2.86	Lower	

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Higher		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Higher		Moderate	
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Lower		Lower	
Aquatic Habitat (AM, WBF, or WBN)	Waterbird Feeding Habitat (WBF)	Higher		Higher	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Native Plant Diversity (PD)	Higher	MH	Higher	

ORWAP Version 3.1. Cover Page: Basic Description of Assessment

Site Name:	Wetland E
Investigator Name:	Ethan Rosenthal
Date of Field Assessment:	various during different times of year
County:	Coos County
Nearest Town:	North Bend
Latitude (decimal degrees):	43.4345
Longitude (decimal degrees):	-124.2482
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	0.5 ac
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	15%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PAB
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	Depressional
Soil Unit Mapped in Most of the AA:	Waldport-Heceta, fine sands, 0 to 30% slopes
If tidal, the tidal phase during most of visit:	not tidal
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes
How many wetlands have you assessed previously using ORWAP (approximate)?	> 30
.	Ponded wetland dominated by yellow pond lilly. Hydrologic and WQ support function scores rated as "higher" solely due to wetland having no outlet. Otherwise, both would have rated as "lower." Values scores for both of these functions rated as "lower."

Site Name:	**Wetland E**
Investigator Name:	**Ethan Rosenthal**
Date of Field Assessment:	**various during different times of year**
Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.	

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	10.00	Higher		0.00	Lower	
Sediment Retention & Stabilization (SR)	10.00	Higher		1.95	Lower	
Phosphorus Retention (PR)	10.00	Higher		2.03	Lower	
Nitrate Removal & Retention (NR)	10.00	Higher		1.61	Lower	
Anadromous Fish Habitat (FA)	0.00	Lower		0.00	Lower	
Resident Fish Habitat (FR)	0.00	Lower		0.00	Lower	
Amphibian & Reptile Habitat (AM)	7.08	Higher	MH	3.53	Lower	
Waterbird Nesting Habitat (WBN)	7.30	Higher	MH	10.00	Higher	
Waterbird Feeding Habitat (WBF)	9.50	Higher		10.00	Higher	
Aquatic Invertebrate Habitat (INV)	4.98	Moderate	LM	2.46	Lower	
Songbird, Raptor, Mammal Habitat (SBM)	2.50	Lower		5.00	Moderate	
Water Cooling (WC)	8.43	Higher		0.00	Lower	
Native Plant Diversity (PD)	6.63	Higher	MH	10.00	Higher	
Pollinator Habitat (POL)	0.00	Lower		0.00	Lower	
Organic Nutrient Export (OE)	0.00	Lower				
Carbon Sequestration (CS)	3.50	Lower	LM			
Public Use & Recognition (PU)				3.19	Lower	

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	3.29	Moderate	
Wetland Ecological Condition (EC)	1.67	Lower	
Wetland Stressors (STR)	3.43	Lower	LM

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Higher		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Higher		Lower	
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Lower		Lower	
Aquatic Habitat (AM, WBF, or WBN)	Waterbird Nesting Habitat (WBN)	Higher	MH	Higher	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Native Plant Diversity (PD)	Higher	MH	Higher	

ORWAP Version 3.1. Cover Page: Basic Description of Assessment	
Site Name:	Wetland H (East), Wetland I (North and South), Wetland J, and Wetland N
Investigator Name:	Ethan Rosenthal
Date of Field Assessment:	various during different times of year
County:	Coos County
Nearest Town:	North Bend
Latitude (decimal degrees):	43.436061
Longitude (decimal degrees):	-124.2429
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	1.44
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	100%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PEM
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	Depressional
Soil Unit Mapped in Most of the AA:	Waldport-Heceta, fine sands, 0 to 30% slopes
If tidal, the tidal phase during most of visit:	not tidal
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes
How many wetlands have you assessed previously using ORWAP (approximate)?	> 30
Comments about the site or this ORWAP assessment (attach extra page if desired):	These wetlands are all of similar character and consist of highly disturbed ditch/drainage features and/or maintained areas within industrial grounds associated with the former Weyerhauser Mill site (now referred to as the South Dunes Site). Vegetation is mostly non-native and buffer areas are highly disturbed.

Site Name:	**Wetland H (East), Wetland I (North and South), Wetland J, and Wetland N**
Investigator Name:	**Ethan Rosenthal**
Date of Field Assessment:	**various during different times of year**

Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	6.08	Moderate		0.00	Lower	
Sediment Retention & Stabilization (SR)	2.52	Lower		3.35	Moderate	LM
Phosphorus Retention (PR)	0.00	Lower		0.00	Lower	
Nitrate Removal & Retention (NR)	3.70	Lower	LM	3.79	Moderate	LM
Anadromous Fish Habitat (FA)	0.00	Lower		0.00	Lower	
Resident Fish Habitat (FR)	0.00	Lower		0.00	Lower	
Amphibian & Reptile Habitat (AM)	5.54	Moderate		3.07	Lower	
Waterbird Nesting Habitat (WBN)	6.18	Moderate		10.00	Higher	
Waterbird Feeding Habitat (WBF)	6.13	Moderate	MH	10.00	Higher	
Aquatic Invertebrate Habitat (INV)	1.84	Lower		2.24	Lower	
Songbird, Raptor, Mammal Habitat (SBM)	2.75	Lower		5.00	Moderate	
Water Cooling (WC)	1.00	Lower		0.00	Lower	
Native Plant Diversity (PD)	0.00	Lower		0.00	Lower	
Pollinator Habitat (POL)	3.05	Moderate		7.63	Higher	
Organic Nutrient Export (OE)	6.22	Moderate				
Carbon Sequestration (CS)	1.21	Lower				
Public Use & Recognition (PU)				3.31	Lower	

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	2.63	Moderate	LM
Wetland Ecological Condition (EC)	3.35	Moderate	LM
Wetland Stressors (STR)	5.90	Moderate	

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Moderate		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Lower		Moderate	LM
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Lower		Lower	
Aquatic Habitat (AM, WBF, or WBN)	Waterbird Nesting Habitat (WBN)	Moderate		Higher	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Pollinator Habitat (POL)	Moderate		Higher	

ORWAP Version 3.1. Cover Page: Basic Description of Assessment

Site Name:	Wetland 2013-6 and 2012-2
Investigator Name:	Phil Rickus
Date of Field Assessment:	various during different times of year
County:	Coos County
Nearest Town:	North Bend
Latitude (decimal degrees):	
Longitude (decimal degrees):	
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	0.8 ac
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	15%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PAB
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	Depressional
Soil Unit Mapped in Most of the AA:	Waldport-Heceta, fine sands, 0 to 30% slopes
If tidal, the tidal phase during most of visit:	not tidal
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes
How many wetlands have you assessed previously using ORWAP (approximate)?	> 30
.	Ponded wetland dominated by yellow pond lilly. Hydrologic and WQ support function scores rated as "higher" solely due to wetland having no outlet. Otherwise, both would have rated as "lower." Values scores for both of these functions rated as "lower." Fish Habitat should be rated as zero, since there is no fish access and resident fish are likely not present.

Site Name:	**Wetland 2013-6 and 2012-2**
Investigator Name:	**Phil Rickus**
Date of Field Assessment:	**various during different times of year**
Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.	

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	10.00	Higher		0.00	Lower	
Sediment Retention & Stabilization (SR)	10.00	Higher		1.95	Lower	
Phosphorus Retention (PR)	10.00	Higher		2.03	Lower	
Nitrate Removal & Retention (NR)	10.00	Higher		1.61	Lower	
Anadromous Fish Habitat (FA)	0.00	Lower		0.00	Lower	
Resident Fish Habitat (FR)	0.00	Lower		0.00	Lower	
Amphibian & Reptile Habitat (AM)	7.08	Higher	MH	3.55	Lower	
Waterbird Nesting Habitat (WBN)	7.45	Higher	MH	10.00	Higher	
Waterbird Feeding Habitat (WBF)	9.60	Higher		10.00	Higher	
Aquatic Invertebrate Habitat (INV)	4.98	Moderate	LM	2.46	Lower	
Songbird, Raptor, Mammal Habitat (SBM)	2.50	Lower		5.00	Moderate	
Water Cooling (WC)	8.43	Higher		0.00	Lower	
Native Plant Diversity (PD)	6.63	Higher	MH	10.00	Higher	
Pollinator Habitat (POL)	0.00	Lower		0.00	Lower	
Organic Nutrient Export (OE)	0.00	Lower				
Carbon Sequestration (CS)	3.63	Lower	LM			
Public Use & Recognition (PU)				3.19	Lower	

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	3.29	Moderate	
Wetland Ecological Condition (EC)	1.67	Lower	
Wetland Stressors (STR)	3.43	Lower	LM

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Higher		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Higher		Lower	
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Lower		Lower	
Aquatic Habitat (AM, WBF, or WBN)	Waterbird Nesting Habitat (WBN)	Higher	MH	Higher	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Native Plant Diversity (PD)	Higher	MH	Higher	

ORWAP Version 3.1. Cover Page: Basic Description of Assessment	
Site Name:	Kentuck Site (Pre-Mitigation)
Investigator Name:	Ethan Rosenthal
Date of Field Assessment:	various during different times of year
County:	Coos
Nearest Town:	Coos Bay, North Bend
Latitude (decimal degrees):	43.4266
Longitude (decimal degrees):	-124.1797
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	100 acres
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	100%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PEM, PFO, PAB
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	Slope/Flats
Soil Unit Mapped in Most of the AA:	Coquille silt loam
If tidal, the tidal phase during most of visit:	not tidal
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes
How many wetlands have you assessed previously using ORWAP (approximate)?	>30
Comments about the site or this ORWAP assessment (attach extra page if desired):	Fish function score manually adjusted to low, since site is diked off from Coosy Bay and Kentuck Slough. Tidegated culvert prevents fish access. ORWAP currently does not account for blockage by tide gates.

Site Name:	**Kentuck Site (Pre-Mitigation)**
Investigator Name:	**Ethan Rosenthal**
Date of Field Assessment:	**various during different times of year**

Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	2.85	Lower		0.00	Lower	
Sediment Retention & Stabilization (SR)	5.02	Moderate		7.05	Higher	
Phosphorus Retention (PR)	2.71	Lower	LM	5.20	Moderate	
Nitrate Removal & Retention (NR)	4.48	Moderate	LM	10.00	Higher	
Anadromous Fish Habitat (FA)	7.36	Moderate	MH	10.00	Higher	
Resident Fish Habitat (FR)	0.00	Lower		0.00	Lower	
Amphibian & Reptile Habitat (AM)	6.95	Higher	MH	2.34	Lower	
Waterbird Nesting Habitat (WBN)	6.93	Moderate	MH	10.00	Higher	
Waterbird Feeding Habitat (WBF)	8.90	Higher		10.00	Higher	
Aquatic Invertebrate Habitat (INV)	3.26	Lower		1.04	Lower	
Songbird, Raptor, Mammal Habitat (SBM)	3.47	Lower	LM	10.00	Higher	
Water Cooling (WC)	4.84	Moderate	MH	4.09	Moderate	
Native Plant Diversity (PD)	0.00	Lower		0.00	Lower	
Pollinator Habitat (POL)	5.20	Moderate		4.43	Moderate	
Organic Nutrient Export (OE)	7.30	Higher	MH			
Carbon Sequestration (CS)	5.16	Moderate				
Public Use & Recognition (PU)				2.06	Lower	

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	2.75	Moderate	LM
Wetland Ecological Condition (EC)	2.75	Lower	LM
Wetland Stressors (STR)	5.83	Moderate	

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Lower		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Moderate		Higher	
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Moderate	MH	Higher	
Aquatic Habitat (AM, WBF, or WBN)	Waterbird Feeding Habitat (WBF)	Higher		Higher	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Organic Nutrient Export (OE)	Higher	MH	0.00	0.00

ORWAP Version 3.1. Cover Page: Basic Description of Assessment	
Site Name:	Kentuck Site-Tidal (Post-Mitigation)
Investigator Name:	Ethan Rosenthal
Date of Field Assessment:	various during different times of year
County:	Coos
Nearest Town:	Coos Bay, North Bend
Latitude (decimal degrees):	43.4197
Longitude (decimal degrees):	-124.1923
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	90 acres
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	100%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	EEM, ESS, EFO, EUS
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	E
Soil Unit Mapped in Most of the AA:	N/A
If tidal, the tidal phase during most of visit:	N/A
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes
How many wetlands have you assessed previously using ORWAP (approximate)?	>30
Comments about the site or this ORWAP assessment (attach extra page if desired):	Assessment is based on the mitigation site design. 100 percent of the site has been visited; however, this site is currently diked of from tidal influence. Post-mitigation, the site will have tidal influence. Some freshwater wetlands have been included in the design, but will likely still have a degree of tidal influence via a fluctuating ground water surface.

Site Name:	**Kentuck Site-Tidal (Post-Mitigation)**
Investigator Name:	**Ethan Rosenthal**
Date of Field Assessment:	**various during different times of year**

Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	0.00	Lower		0.00	Lower	
Sediment Retention & Stabilization (SR)	7.39	Higher		8.75	Higher	
Phosphorus Retention (PR)	5.02	Moderate		3.18	Lower	LM
Nitrate Removal & Retention (NR)	5.87	Moderate		10.00	Higher	
Anadromous Fish Habitat (FA)	9.23	Higher		10.00	Higher	
Resident Fish Habitat (FR)	9.43	Higher		10.00	Higher	
Amphibian & Reptile Habitat (AM)	0.00	Lower		0.00	Lower	
Waterbird Nesting Habitat (WBN)	0.00	Lower		0.00	Lower	
Waterbird Feeding Habitat (WBF)	9.67	Higher		10.00	Higher	
Aquatic Invertebrate Habitat (INV)	8.86	Higher		8.61	Higher	
Songbird, Raptor, Mammal Habitat (SBM)	10.00	Higher		10.00	Higher	
Water Cooling (WC)	0.00	Lower		0.00	Lower	
Native Plant Diversity (PD)	9.96	Higher		10.00	Higher	
Pollinator Habitat (POL)	7.57	Higher		2.58	Moderate	LM
Organic Nutrient Export (OE)	8.53	Higher				
Carbon Sequestration (CS)	8.90	Higher				
Public Use & Recognition (PU)				6.36	Moderate	MH

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	4.61	Higher	MH
Wetland Ecological Condition (EC)	10.00	Higher	
Wetland Stressors (STR)	5.00	Moderate	

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Lower		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Higher		Higher	
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Higher		Higher	
Aquatic Habitat (AM, WBF, or WBN)	Waterbird Feeding Habitat (WBF)	Higher		Higher	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Aquatic Invertebrate Habitat (INV)	Higher		Higher	

ORWAP Version 3.1. Cover Page: Basic Description of Assessment	
Site Name:	Kentuck--Fresh (Post-Mitigation)
Investigator Name:	Ethan Rosenthal
Date of Field Assessment:	various during different times of year
County:	Coos
Nearest Town:	Coos Bay, North Bend
Latitude (decimal degrees):	43.4266
Longitude (decimal degrees):	-124.1797
TRS, quarter/quarter section and tax lot(s):	
Approximate size of the Assessment Area (AA, in acres):	9 acres
AA as percent of entire wetland (approx.). Attach sketch map if AA is smaller than the entire contiguous wetland.	100%
If delineated, DSL file number (WD #) if known:	
Cowardin Systems & Classes (indicate all present, based on field visit and/or aerial imagery): Systems: Palustrine =P, Riverine =R, Lacustrine =L, Estuarine =E Classes: Emergent =EM, Scrub-Shrub =SS, Forested =FO, Aquatic Bed (incl. SAV) =AB, Open Water =OW, Unconsolidated Bottom =UB, Unconsolidated Shore =US	PFO, PSS, PEM
Predominant HGM Class: Estuarine=E, Lacustrine=L, Riverine=R, S= Slope, F= Flats, D= Depressional	Riverine
Soil Unit Mapped in Most of the AA:	Coquille silt loam
If tidal, the tidal phase during most of visit:	not tidal
What percent (approximate) of the **wetland** were you able to visit?	100
What percent (approximate) of the **AA** were you able to visit?	100
Have you attended an ORWAP training session? If so, indicate approximate month & year.	yes
How many wetlands have you assessed previously using ORWAP (approximate)?	>30
Comments about the site or this ORWAP assessment (attach extra page if desired):	Assessment is based on the mitigation site design. 100 percent of the site has been visited; however, this site is currently diked of from Kentuck Creek. Post-mitigation, the site will be open to overbank flows during high water.

Site Name:	**Kentuck--Fresh (Post-Mitigation)**
Investigator Name:	**Ethan Rosenthal**
Date of Field Assessment:	**various during different times of year**

Scores will appear below after data are entered in worksheets OF, F, T, and S. See Manual for definitions and descriptions of how scores were computed and ratings assigned.

Normalized Scores & Ratings for this Assessment Area (AA):

Specific Functions or Values:	Function Score	Function Rating	Rating Break Proximity	Values Score	Values Rating	Rating Break Proximity
Water Storage & Delay (WS)	5.92	Moderate		0.00	Lower	
Sediment Retention & Stabilization (SR)	5.00	Moderate		6.89	Higher	
Phosphorus Retention (PR)	2.99	Lower	LM	4.32	Moderate	
Nitrate Removal & Retention (NR)	5.29	Moderate		10.00	Higher	
Anadromous Fish Habitat (FA)	8.82	Higher		10.00	Higher	
Resident Fish Habitat (FR)	6.45	Higher	MH	10.00	Higher	
Amphibian & Reptile Habitat (AM)	6.98	Higher	MH	1.70	Lower	
Waterbird Nesting Habitat (WBN)	5.73	Moderate		10.00	Higher	
Waterbird Feeding Habitat (WBF)	4.26	Moderate		10.00	Higher	
Aquatic Invertebrate Habitat (INV)	7.82	Higher		1.14	Lower	
Songbird, Raptor, Mammal Habitat (SBM)	3.78	Moderate	LM	10.00	Higher	
Water Cooling (WC)	7.50	Higher		3.64	Moderate	
Native Plant Diversity (PD)	7.56	Higher		6.67	Moderate	MH
Pollinator Habitat (POL)	7.54	Higher		4.43	Moderate	
Organic Nutrient Export (OE)	7.68	Higher				
Carbon Sequestration (CS)	1.65	Lower				
Public Use & Recognition (PU)				3.92	Lower	LM

Other Attributes:	Score	Rating	Rating Break Proximity
Wetland Sensitivity (SEN)	2.08	Lower	LM
Wetland Ecological Condition (EC)	5.90	Higher	
Wetland Stressors (STR)	3.13	Lower	LM

GROUPS	Selected Function	Function Rating	Rating Break Proximity	Values Rating	Rating Break Proximity
Hydrologic Function (WS)	Water Storage & Delay (WS)	Moderate		Lower	
Water Quality Support (SR, PR, or NR)	Sediment Retention & Stabilization (SR)	Moderate		Higher	
Fish Habitat (FA or FR)	Anadromous Fish Habitat (FA)	Higher		Higher	
Aquatic Habitat (AM, WBF, or WBN)	Amphibian & Reptile Habitat (AM)	Higher	MH	Lower	
Ecosystem Support (WC, INV, PD, POL, SBM, or OE)	Water Cooling (WC)	Higher		Moderate	

APPENDIX F: PIPELINE WETLAND FUNCTIONAL ASSESSMENT

ecology and environment, inc.

Jordan Cove LNG

Memorandum
High Value Wetlands

September 1, 2017

Wetland Functions and Values

Wetlands contribute to the ecological framework of Oregon's aquatic resources, which provide different environmental services. The U.S. Army Corps of Engineers and the Oregon Department of State Lands have outlined these environmental services in terms of functions and values. Wetland functions are their physical, chemical, and biological processes. Wetland values express the significance of functions to the needs of society (Adamus and Verble 2016).

Functional assessments of wetlands are often needed to broadly determine habitat losses and/or gains. Functional losses could arise when one wetland type is changed to another (i.e., wetland conversion), while gains could occur during wetland mitigation activities. Since some permanent wetland conversion will occur as a result of the project, the functions of wetlands that are directly impacted by project-related activities (e.g., clearing, grading, etc.) will be assessed using the Oregon Rapid Wetland Assessment Protocol (ORWAP). ORWAP is a system that rates wetland functions and values using a 0–10 scoring range. It rates wetlands according to 16 different functions (e.g. water storage, sediment retention, thermoregulation, habitat for different species, etc.) (Adamus and Verble 2016). These functions and values can be aggregated into Group Levels to serve as a helpful summary for the purposes of reporting ORWAP scores for regulatory programs. Primary groups include hydrologic function, water quality support, fish habitat, aquatic habitat, and ecosystem support (DSL 2016). When an ORWAP analysis is conducted, a wetland receives a rating for each group and function identified in Table 1.

Table 1 Oregon Rapid Wetland Assessment Protocol Wetland Groups and Functions

Primary Groups	Functions within Each Group
Hydrologic Function	• Water storage and delay
Water Quality Support	• Sediment retention and stabilization • Phosphorus retention • Nitrate removal and retention
Fish Habitat	• Anadromous fish habitat • Resident fish habitat
Aquatic Habitat	• Amphibian and reptile habitat • Water bird nesting habitat • Water bird feeding habitat
Ecosystem Support	• Water cooling • Aquatic invertebrate habitat • Native plant diversity • Pollinator habitat • Songbird, raptor and mammal habitat • Organic nutrient export

In 2009, a function assessment was completed by ICF Jones & Stokes using best professional judgment (BPJ) and the Judgmental Method. BPJ was used due to the large spatial scale of the project area and the overall similarity of most of the features encountered. The wetland acreage within the project area was totaled at the fifth-field HUC level, and the wetland functions and values were then cumulatively assessed for:

- Water quality and quantity functions;
- Fish and wildlife habitat functions;
- Native plant communities and species diversity functions; and
- Recreational and educational values.

Wetlands were classified using hydrogeomorphic (HGM) classes and/or subclasses according to their hydrologic source and landscape position. Each wetland was also classified according to the Cowardin (1979) system. Based on observable field indicators of the conditions and process, location of the wetlands within the watershed and proximity to other wetlands, and HGM and Cowardin classifications, the project delineated wetlands aggregated at the fifth-field HUC level were scored high, moderate, or low. Since access has not been granted to all parcels to prepare an updated HGM Report, the 2009 report was updated with current wetland data and acreages to reflect the pipeline corridor as of July 2017.

Aside from specific functions and values, three other, broader attributes to wetland health are determined when using ORWAP: ecological condition, stressors, and sensitivity. Ecological condition can be measured in general terms by vegetation composition and its comparable characteristics to reference wetland data. Stressors can be described by observing the degree to which the wetland has been subjected to negative human-influenced factors. Sensitivity of a wetland can be viewed as the wetland's "intrinsic resistance and resilience" to stressors, with a higher score denoting a more sensitive ecosystem.

Project Converted Wetlands

Removal of trees and other woody vegetation for the project would result in altering existing wetland community types. This would primarily entail conversion of scrub-shrub wetlands and forested wetlands to emergent wetlands. The project would permanently impact 0.83 acres of wetlands due to conversion. While current ORWAP field work has yet to be conducted, desktop analysis using wetland datasheets and previous ORWAP scores can give a generalized summary of the functions and values of permanently impacted wetlands along the project corridor.

Scrub-shrub wetlands, classified as PSS (palustrine scrub-shrub) by the National Wetland Inventory (NWI), are wetlands that are dominated by saplings and shrubs that are less than 20 feet tall (Cowardin et. al. 1979). Tree sapling and shrub species typical of the PSS wetlands subject to conversion along the project route include willows species (*Salix spp.*), Oregon ash (*Fraxinus latifolia*), Douglas spirea (*Spiraea douglasii*), and sweet briar (*Rosa eglanteria*). In some areas, PSS wetlands are co-dominant with emergent wetlands (palustrine emergent or PEM). While not applicable to every PSS wetland undergoing conversion, previous ORWAP data shows PSS wetlands exhibiting high function and value scores in the following aggregated groups: water quality, aquatic support, and terrestrial support (DEA 2013).

Forested wetlands, classified as PFO (palustrine forested) by the NWI, are dominated by trees and shrubs that are 20 feet or taller. Forested wetlands contain mature tree canopies and, depending on species, can have substantial shrub and ground cover layers. Tree species typical of the PFO wetlands subject to conversion along the project right-of-way include red alder (*Alnus rubra*), Oregon ash (*Fraxinus latifolia*), and various willow species (*Salix spp.*). While not applicable to every PFO wetland undergoing conversion, previous ORWAP data shows PFO wetlands exhibiting high function and value scores in water quality, aquatic support, and terrestrial support groups (DEA 2013). In instances where streams or other waterbodies are adjacent to a PFO, high function and value scores are expected within the fish support group, as trees and shrubs can shade waterbodies and provide temperature regulation among other services (ODFW 2017). Conversion of PSS and PFO wetland types to PEM types will result in changes to current wetland function and values. Since trees and shrubs typically provide more cover and habitat opportunities, it can be assumed that terrestrial support functions and values will be lower. If shade trees and shrubs are removed adjacent to fish-bearing waterbodies, it can be assumed that functions and values associated with the fish support group will be lower. However, exact changes in function and value scores are not known at this time. Field assessments will be carried out to apply the ORWAP to wetlands subject to conversion along the project corridor.

References

Adamus, P. and K. Verble. 2016. Manual for the Oregon Rapid Assessment Protocol (ORWAP), Version 3.1. Oregon Department of State Lands, Aquatic Resource Management Program. http://www.oregon.gov/dsl/WW/Documents/ORWAP_3_1_Manual_Nov_2016.pdf

David Evans and Associates (DEA). 2013. Pacific Connector Gas Pipeline Compensatory Wetland Mitigation Plan.

Department of State Lands (DSL). 2016. Guidance for Using the Oregon Rapid Wetland Assessment Protocol (ORWAP) in the State and Federal Permit Programs. http://www.oregon.gov/dsl/WW/Documents/Guidance_for_Regulatory_Use_of_ORWAP_v3_1.pdf

Oregon Department of Fish and Wildlife (ODFW). 2017. The Oregon Conservation Strategy, Conserve Wetlands. http://oregonconservationstrategy.org/strategy-habitat/wetlands/

APPENDIX G: DRAFT EELGRASS MITIGATION SITE EASEMENT/PROTECTION MECHANISM

After recording, return to:
JORDAN COVE ENERGY PROJECT L.P. AND PACIFIC CONNECTOR GAS PIPELINE, LP
5615 KIRBY DRIVE, SUITE 500
HOUSTON, TX 77005

DEED OF CONSERVATION AND RESTORATION EASEMENT
FOR THE
Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP
Eelgrass Mitigation Site*, Corps permit # NWP-2017-41, DSL permit # 60697-RF*

THIS DEED OF CONSERVATION EASEMENT AND RESTORATION EASEMENT is made this ______ day of ______, 20__, by and between the State of Oregon Department of State Lands ("Department"), with an address of 775 Summer St NE # 100, Salem, OR 97301, in favor of [insert easement holder information] ("Grantee"). Jordan Cove Energy Project L.P., a Delaware limited partnership, acting through its general partner, Jordan Cove Energy Project, LLC, a Delaware limited liability company, and Pacific Connector Gas Pipeline, LP, a Delaware limited partnership, acting through its general partner, Pacific Connector Gas Pipeline, LLC, a Delaware limited liability company, 5615 Kirby Drive, Suite 500, Houston, TX 77005 is the applicant ("Applicant") for Removal-Fill Permit No. 60697 (the "DSL Permit"). The Department, Grantee, and Applicant together are referred to herein as the "Parties."

RECITALS

1. The Department is the owner of the real property described in Exhibit "A," attached hereto and by this reference incorporated herein (the "Property"). Applicant has designated the Property as a compensatory mitigation site in accordance with the DSL Permit approved by the Department, and the Department of the Army Permit No. NWP-2017-41 ("Corps Permit") approved by the US Army Corps of Engineers ("Corps").

2. The Department and Applicant desire and intend to provide for the perpetual protection and conservation of the wetland and waterway functions and values of the Property and for the management of the Property and improvements thereon, and to this end desire to

subject the Property to the covenants, restrictions, easements and other encumbrances hereinafter set forth, each and all of which is and are for the benefit of the Property;

3. The Department has accepted Applicant's mitigation plan for the Property under ORS 196.800 et seq, and the Corps has likewise accepted the mitigation plan under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act.

DEFINITIONS

1.1 "Department" shall mean and refer to the Department, the owner of the Property and the Grantor herein, and the owner's heirs, successors, and assigns.

1.2 "DSL Permit" shall mean the final document approved by the Department that includes the mitigation plan and which formally establishes the mitigation site and stipulates the terms and conditions of its construction, operation and long-term management. A copy of the DSL Permit may be obtained at the Department of State Lands, 775 Summer St. NE, Salem, OR 97301; phone 503-986-5200.

1.3 "Corps Permit" shall mean the final document approved and issued by the Corps which includes the mitigation plan describing where and how the compensatory mitigation will be completed, monitored, managed, and maintained. A copy of the Corps Permit associated with this easement may be obtained at the office of the US Army Corps of Engineers, Regulatory Branch, 333 SW First Ave., Portland, OR 97208; Phone 503-808-4373.

1.4 "Property" shall mean and refer to all real property subject to this easement, as more particularly set forth in Exhibit "A."

TERMS AND CONDITIONS

NOW, THEREFORE, in consideration of the mutual covenants contained herein, and for other good and valuable consideration, the Department hereby conveys to Grantee, its successors and assigns, a perpetual conservation easement consisting of the rights and restrictions enumerated herein, over and across the Property (the "Easement").

2.1 **Purposes.** It is the purpose of the Easement to preserve, to protect in perpetuity, to enhance upon mutual agreement, and in the event of their degradation or destruction, to restore the wetland and waterway functions and values of the Property. It is further the purpose of this Easement to implement the mitigation plan, which has been approved by the Department and the Corps. To carry out this purpose, the following rights are conveyed to Grantee by this Easement:

A. To enter upon the Property at reasonable times with any necessary equipment or vehicles to inspect, determine compliance with the covenants and prohibitions contained in this Easement, and to enforce the rights herein granted in a manner that will not unreasonably interfere with the use and quiet enjoyment of the Property by the Department; and

B. To proceed at law or in equity to enforce the provision of this Easement and the covenants set forth herein, to prevent the occurrence of any of the prohibited uses set forth herein, and to require the restoration of such areas or features of the Property that may be damaged by any use that is inconsistent with this Easement.

2.2 **Department Representations.** The Department represents and warrants that after reasonable investigation, and to the best of its knowledge, that no hazardous materials or contaminants are present that conflict with the conservation purposes intended; that the Property is in compliance with all federal state, and local laws, regulations, and permits; that there is no pending litigation affecting, involving, or relating to the Property that would conflict with the intended conservation use; and that the Property is free and clear of any and all liens, claims, restrictions, easements and encumbrances that would interfere with the ability to protect and conserve the Property.

2.3 **Applicant Funding.** The Parties agree that Applicant has provided sufficient financial resources to Grantee to carry out the purposes of this Easement.

2.4 **Prohibited Uses.** Except as necessary to conduct, remediate or maintain the Property consistent with the DSL Permit and the Corps Permit and the mitigation plan, the actions prohibited by this Easement include:

A. There shall be no removal, destruction, cutting, trimming, mowing, alteration or spraying with biocides of any native vegetation in the Property, nor any disturbance or change in the natural habitat of the Property unless it promotes the mitigation goals and objectives established for the Property. Hazard trees that pose a specific threat to existing structures including fences or pedestrian trails may be felled and left on site. Dry grass only may be mowed after July 1 to abate fire hazard.

B. There shall be no agricultural, commercial, or industrial activity undertaken or allowed in the Property; nor shall any right of passage across or upon the Property be allowed or granted if that right of passage is used in conjunction with agricultural, commercial or industrial activity.

C. No domestic animals shall be allowed to graze or dwell on the Property.

D. There shall be no filling, excavating, dredging, mining or drilling; no removal of topsoil, sand, gravel, rock minerals or other materials, nor any storage nor dumping of ashes, trash, garbage, or of any other material, and no changing of the topography of the land of the Property in any manner once the wetlands are constructed unless approved in writing by the Department and by the Corps.

E. There shall be no construction or placing of buildings, mobile homes, advertising signs, billboards or other advertising material, vehicles or other structures on the Property.

F. There shall be no legal or de facto division, subdivision or partitioning of the protected Property.

G. Use of motorized off-road vehicles is prohibited except on existing roadways.

2.5 **Reserved Rights.** The Department reserves all other rights accruing from the Department's ownership of the Property including but not limited to the exclusive possession of the Property, the right to transfer or assign the Department's interest in the same; the right to take action necessary to prevent erosion on the Property, to protect the Property from losing its wetland or waterway functions and values, or to protect public health or safety; and the right to use the Property in any manner not prohibited by this Easement and which would not defeat or diminish the conservation purpose of this Easement. The Department specifically reserves the right to use the Property for the purposes of mitigation activities as described in Corps Permit No. NWP-2017-41 and DSL Permit No. 60697-RF, which reserved rights are deemed to be consistent with the purposes enumerated in the permit.

2.6 **Assignment.** Grantee may assign this Easement with the Department's consent, which shall not be unreasonably withheld, provided that Grantee requires, as a condition of such assignment, that the conservation purposes of the Easement continue to be carried out.

2.7 **General Provisions.**

A. **Notice**. The Department and the Corps shall be provided with a 60-day advance written notice of any legal action concerning this Easement, or of any action to extinguish, void or modify this Easement, in whole or in part. This Easement, and the covenants, restrictions, and other encumbrances contained herein, are intended to survive foreclosure, tax sales, bankruptcy proceedings, zoning changes, adverse possession, abandonment, condemnation and similar doctrines or judgments affecting the Property. A copy of this recorded Easement shall accompany said notice.

B. **Validity**. If any provision of this Easement, or the application thereof to any person or circumstance, is found to be invalid, the remainder of the provisions of this

Easement, or the application of such provisions to persons or circumstances other than those as to which it is found to be invalid, as the case may be, shall not be affected thereby.

[Signatures Follow]

IN WITNESS WHEREOF, the undersigned have executed

this instrument this ___________ day of ______________________, 20_____.

GRANTOR:

By:_______________________________
Title:_____________________________
Date:_____________________________

APPLICANT Jordan Cove Energy Project L.P., by and through its general partner, Jordan Cove Energy Project, LLC:

By:_______________________________
Title:_____________________________
Date:_____________________________

APPLICANT Pacific Connector Gas Pipeline, LP, by and through its general partner, Pacific Connector Gas Pipeline, LLC:

By:_______________________________
Title:_____________________________
Date:_____________________________

GRANTEE:

By:_______________________________
Title:_____________________________
Date:_____________________________

Attachment:
Exhibit A, legal description and labeled map of the Property

ACKNOWLEDGMENT

STATE OF OREGON)
)ss.
COUNTY OF ___________________________)

On this ____ day of ______________, 20___, personally appeared _____________________________, proven to me to be the ________________________ of the State of Oregon Department of State Lands, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Oregon
My Commission Expires: __________________

ACKNOWLEDGMENT

STATE OF TEXAS)
)ss.
COUNTY OF ___________________________)

On this ____ day of ______________, 20___, personally appeared _____________________________, proven to me to be the _____________________ of Jordan Cove Energy Project, LP, acting through its general partner, Jordan Cove Energy Project, LLC, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Texas
My Commission Expires: __________________

ACKNOWLEDGMENT

STATE OF TEXAS)
)ss.
COUNTY OF ____________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the ______________________ of Pacific Connector Gas Pipeline, LP, acting through its general partner, Pacific Connector Gas Pipeline, LLC, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Texas
My Commission Expires: ___________________

ACKNOWLEDGMENT

STATE OF OREGON)
)ss.
COUNTY OF ____________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the _________________________ of ______________________________________, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Oregon
My Commission Expires: ___________________

APPENDIX H: DRAFT KENTUCK PROJECT SITE EASEMENT/PROTECTION MECHANISM

After recording, return to:
JORDAN COVE ENERGY PROJECT L.P. AND PACIFIC CONNECTOR GAS PIPELINE, LP
5615 KIRBY DRIVE, SUITE 500
HOUSTON, TX 77005

DEED OF CONSERVATION, RESTORATION, AND ACCESS EASEMENT FOR THE
Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP
Kentuck Mitigation Site*, Corps permit # NWP-2017-41, DSL permit # 60697-RF*

THIS DEED OF CONSERVATION, RESTORATION, AND ACCESS EASEMENT is made this ______ day of ______, 20__, by and between the State of Oregon Department of State Lands ("Department"), with an address of 775 Summer St NE # 100, Salem, OR 97301, in favor of [insert easement holder information] ("Grantee"). Jordan Cove Energy Project L.P., a Delaware limited partnership, acting through its general partner, Jordan Cove Energy Project, LLC, a Delaware limited liability company, and Pacific Connector Gas Pipeline, LP, a Delaware limited partnership, acting through its general partner, Pacific Connector Gas Pipeline, LLC, a Delaware limited liability company, 5615 Kirby Drive, Suite 500, Houston, TX 77005 is the applicant ("Applicant") for Removal-Fill Permit No. 60697 (the "DSL Permit"). The Department, Grantee, and Applicant together are referred to herein as the "Parties."

RECITALS

1. The Department is the owner of the real property described in Exhibit "A," attached hereto and by this reference incorporated herein (the "Department Property"). Applicant is the owner of the real property described in Exhibit "B," attached hereto and by this reference incorporated herein (the "Applicant Property"). The Department Property and the Applicant Property together are referred to herein as the "Property."

2. Applicant has designated the Property as a compensatory mitigation site in accordance with the DSL Permit approved by the Department, and the Department of the Army

Permit No. NWP-2017-41 ("Corps Permit") approved by the US Army Corps of Engineers ("Corps").

3. The Department and Applicant desire and intend to provide for the perpetual protection and conservation of the wetland and waterway functions and values of the Property and for the management of the Property and improvements thereon, and to this end desire to subject the Property to the covenants, restrictions, easements and other encumbrances hereinafter set forth, each and all of which is and are for the benefit of the Property;

4. The Department has accepted Applicant's mitigation plan for the Property under ORS 196.800 et seq, and the Corps has likewise accepted the mitigation plan under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act.

DEFINITIONS

1.1 "Department" shall mean and refer to the Department, the owner of the Property and the Grantor herein, and the owner's heirs, successors, and assigns.

1.2 "DSL Permit" shall mean the final document approved by the Department that includes the mitigation plan and which formally establishes the mitigation site and stipulates the terms and conditions of its construction, operation and long-term management. A copy of the DSL Permit may be obtained at the Department of State Lands, 775 Summer St. NE, Salem, OR 97301; phone 503-986-5200.

1.3 "Corps Permit" shall mean the final document approved and issued by the Corps which includes the mitigation plan describing where and how the compensatory mitigation will be completed, monitored, managed, and maintained. A copy of the Corps Permit associated with this easement may be obtained at the office of the US Army Corps of Engineers, Regulatory Branch, 333 SW First Ave., Portland, OR 97208; Phone 503-808-4373.

1.4 "Property" shall mean and refer to all real property subject to this easement, as more particularly set forth in Exhibits "A" and "B."

TERMS AND CONDITIONS

NOW, THEREFORE, in consideration of the mutual covenants contained herein, and for other good and valuable consideration, the Department and Applicant hereby convey to Grantee, its successors and assigns, a perpetual conservation easement consisting of the rights and restrictions enumerated herein, over and across the Property (the "Easement").

2.1 **Purposes.** It is the purpose of the Easement to preserve, to protect in perpetuity, to enhance upon mutual agreement, and in the event of their degradation or destruction, to restore the wetland and waterway functions and values of the Property. It is further the purpose of this Easement to implement the mitigation plan, which has been approved by the Department and the Corps. To carry out this purpose, the following rights are conveyed to Grantee by this Easement:

A. To enter upon the Property at reasonable times with any necessary equipment or vehicles to inspect, determine compliance with the covenants and prohibitions contained in this Easement, and to enforce the rights herein granted in a manner that will not unreasonably interfere with the use and quiet enjoyment of the Property by the Department and the Applicant; and

B. To proceed at law or in equity to enforce the provision of this Easement and the covenants set forth herein, to prevent the occurrence of any of the prohibited uses set forth herein, and to require the restoration of such areas or features of the Property that may be damaged by any use that is inconsistent with this Easement.

2.2 **Department Representations.** The Department represents and warrants that after reasonable investigation, and to the best of its knowledge, that no hazardous materials or contaminants are present that conflict with the conservation purposes intended; that the Property is in compliance with all federal state, and local laws, regulations, and permits; that there is no pending litigation affecting, involving, or relating to the Property that would conflict with the intended conservation use; and that the Property is free and clear of any and all liens, claims, restrictions, easements and encumbrances that would interfere with the ability to protect and conserve the Property.

2.3 **Applicant Funding.** The Parties agree that Applicant has provided sufficient financial resources to Grantee to carry out the purposes of this Easement.

2.4 **Prohibited Uses.** Except as necessary to conduct, remediate or maintain the Property consistent with the DSL Permit and the Corps Permit and the mitigation plan, the actions prohibited by this Easement include:

A. There shall be no removal, destruction, cutting, trimming, mowing, alteration or spraying with biocides of any native vegetation in the Property, nor any disturbance or change in the natural habitat of the Property unless it promotes the mitigation goals and objectives established for the Property. Hazard trees that pose a specific threat to existing structures including fences or pedestrian trails may be felled and left on site. Dry grass only may be mowed after July 1 to abate fire hazard.

B. There shall be no agricultural, commercial, or industrial activity undertaken or allowed in the Property; nor shall any right of passage across or upon the Property be allowed or granted if that right of passage is used in conjunction with agricultural, commercial or industrial activity.

C. No domestic animals shall be allowed to graze or dwell on the Property.

D. There shall be no filling, excavating, dredging, mining or drilling; no removal of topsoil, sand, gravel, rock minerals or other materials, nor any storage nor dumping of ashes, trash, garbage, or of any other material, and no changing of the topography of the land of the Property in any manner once the wetlands are constructed unless approved in writing by the Department and by the Corps.

E. There shall be no construction or placing of buildings, mobile homes, advertising signs, billboards or other advertising material, vehicles or other structures on the Property.

F. There shall be no legal or de facto division, subdivision or partitioning of the protected Property.

G. Use of motorized off-road vehicles is prohibited except on existing roadways.

2.5 **Reserved Rights.** The Department reserves all other rights accruing from the Department's ownership of the Department Property, including but not limited to the exclusive possession of the Department Property, the right to transfer or assign the Department's interest in the same; the right to take action necessary to prevent erosion on the Department Property, to protect the Department Property from losing its wetland or waterway functions and values, or to protect public health or safety; and the right to use the Department Property in any manner not prohibited by this Easement and which would not defeat or diminish the conservation purpose of this Easement. The Applicant reserves all other rights accruing from the Applicant's ownership of the Applicant Property, including but not limited to the exclusive possession of the Applicant Property, the right to transfer or assign the Applicant's interest in the same; the right to take action necessary to prevent erosion on the Applicant Property, to protect the Applicant Property from losing its wetland or waterway functions and values, or to protect public health or safety; and the right to use the Applicant Property in any manner not prohibited by this Easement and which would not defeat or diminish the conservation purpose of this Easement. The Department specifically reserves the right to use the Department Property for the purposes of mitigation activities as described in Corps Permit No. NWP-2017-41 and DSL Permit No. 60697-RF, which reserved rights are deemed to be consistent with the purposes enumerated in the permit. The Applicant specifically reserves the right to use the Applicant Property for the purposes of mitigation activities as described in Corps Permit No. NWP-2017-41 and DSL Permit No. 60697-RF, which reserved rights are deemed to be consistent with the purposes enumerated in the permit.

2.6 **Access Easement.** Applicant hereby grants to the Department an easement and right of entry on the Applicant Property for the purpose of physically accessing the Applicant Property at all reasonable times to inspect the Applicant Property in order to monitor and to ascertain whether there has been compliance with this Easement and the DSL Permit. In the event that the Applicant Property lacks access via a public road or other common area, Applicant grants to the Department an easement over and across any other property of Applicant, the use of which is necessary to access the Applicant Property. The Applicant hereby grants to the Corps a right of entry to ascertain compliance with the Corps Permit and this Easement.

2.7 **Assignment.** Grantee may assign this Easement with the Department's consent, which shall not be unreasonably withheld, provided that Grantee requires, as a condition of such assignment, that the conservation purposes of the Easement continue to be carried out.

2.8 **General Provisions.**

A. **Notice**. The Department and the Corps shall be provided with a 60-day advance written notice of any legal action concerning this Easement, or of any action to extinguish, void or modify this Easement, in whole or in part. This Easement, and the covenants, restrictions, and other encumbrances contained herein, are intended to survive foreclosure, tax sales, bankruptcy proceedings, zoning changes, adverse possession, abandonment, condemnation and similar doctrines or judgments affecting the Property. A copy of this recorded Easement shall accompany said notice.

B. **Validity**. If any provision of this Easement, or the application thereof to any person or circumstance, is found to be invalid, the remainder of the provisions of this Easement, or the application of such provisions to persons or circumstances other than those as to which it is found to be invalid, as the case may be, shall not be affected thereby.

[Signatures Follow]

IN WITNESS WHEREOF, the undersigned have executed

this instrument this ___________ day of ______________________, 20_____.

GRANTOR:

By:_________________________________
Title:_______________________________
Date:_______________________________

APPLICANT Jordan Cove Energy Project L.P., by and through its general partner, Jordan Cove Energy Project, LLC:

By:_ ________________________________
Title:_______________________________
Date:_______________________________

APPLICANT Pacific Connector Gas Pipeline, LP, by and through its general partner, Pacific Connector Gas Pipeline, LLC:

By:_________________________________
Title:_______________________________
Date:_______________________________

GRANTEE:

By:_________________________________
Title:_______________________________
Date:_______________________________

Attachment:
Exhibit A, legal description and labeled map of the Property

ACKNOWLEDGMENT

STATE OF OREGON)
)ss.
COUNTY OF ___________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the ________________________ of the State of Oregon Department of State Lands, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Oregon
My Commission Expires: __________________

ACKNOWLEDGMENT

STATE OF TEXAS)
)ss.
COUNTY OF ___________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the _____________________ of Jordan Cove Energy Project, L.P., acting through its general partner, Jordan Cove Energy Project, LLC, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Texas
My Commission Expires: __________________

ACKNOWLEDGMENT

STATE OF TEXAS)
)ss.
COUNTY OF ____________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the ______________________ of Pacific Connector Gas Pipeline, LP, acting through its general partner, Pacific Connector Gas Pipeline, LLC, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Texas
My Commission Expires: ___________________

ACKNOWLEDGMENT

STATE OF OREGON)
)ss.
COUNTY OF ____________________________)

On this ____ day of ______________, 20___, personally appeared ______________________________, proven to me to be the _________________________ of ______________________________________, and acknowledged that she/he signed the forgoing instrument on behalf of and by authority of said entity and that the instrument is said entity's voluntary act and deed for the uses and purposes mentioned therein.

Before me:

____

Notary Public in and for the State of Oregon
My Commission Expires: ___________________

APPENDIX I: SEDIMENT TRANSPORT ANALYSIS TECH MEMO

(J1-000-MAR-TNT-DEA-00003-00 September 19, 2018)

Jordan Cove LNG	Hydrodynamic Studies – Sediment Transport Analysis		moffatt & nichol
	Document Number: J1-000-MAR-TNT-DEA-00003-00		
	Rev.: 0	Rev. Date: September 19, 2018	

TECHNICAL MEMORANDUM

DATE:	September 19, 2018
ATTENTION:	Drew Jackson, P.E.
COMPANY:	Jordan Cove LNG, LLC (JCLNG)
ADDRESS:	5615 Kirby Drive, Suite 500, Houston, TX 77005
FROM:	Cheng-Feng Tsai, P.E., William Gerken, P.E. – Moffatt & Nichol
SUBJECT:	Sediment Transport Analysis
DEA PROJECT NAME:	Ad Hoc Permitting Support
DEA PROJECT NO:	JLNG0000-0003
M&N PROJECT NO:	9929-03, Task Order MN-1130-002
DOCUMENT #	J1-000-MAR-TNT-DEA-00003-00
COPIES TO:	DEA (Sean Sullivan, Loren Stucker)

1. INTRODUCTION

Jordan Cove Energy Project, LP (“JCEP”) is seeking authorization from the Federal Energy Regulatory Commission (“FERC”) under Section 3 of the Natural Gas Act (“NGA”) to site, construct, and operate a natural gas liquefaction and liquefied natural gas (“LNG”) export facility (“LNG Terminal”), located on the bay side of the North Spit of Coos Bay, Oregon. The LNG Terminal, related facilities, temporary construction sites, and other sites/actions associated with LNG Terminal construction are collectively referred to as the “JCEP Project Area” as shown on Figure 1-1.

The JCEP Project Area is made up of the following selected components, among others not listed here because they are not relevant to the scope of this memorandum:

- Slip – a permanent facility between Ingram Yard and the Access Channel. LNG carriers will enter the Slip via the Access Channel, get loaded with LNG, and leave for export. The Slip will include an LNG carrier loading berth and LNG loading facilities, a tug berth, and an emergency lay berth to safely moor a temporarily disabled LNG carrier.
- Access channel – the Access Channel will be dredged north of the Federal Navigation Channel (“FNC”) to provide LNG carriers with access from the FNC to the Slip.
- Material Offloading Facility (“MOF”) – a permanent facility east of the Slip where fill will be placed to construct a barge berth. Dredging will occur to access the MOF.
- Navigation Reliability Improvements (“NRI”) – four permanent dredge areas adjacent to the FNC that will allow for navigation efficiency and reliability for vessel transit under a broader weather window.

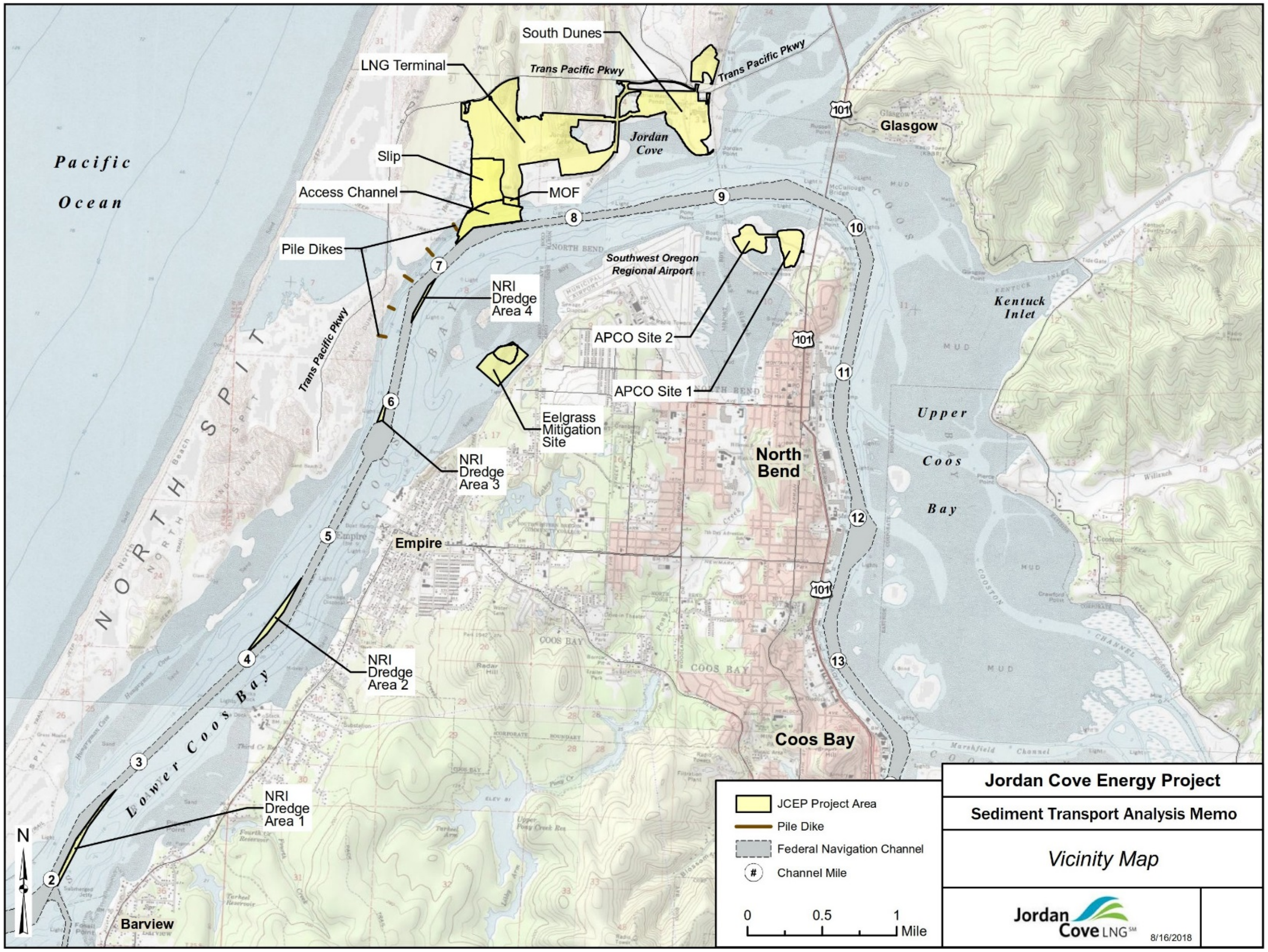

Figure 1-1. JCEP Project Area

In support of the permitting efforts for the JCEP, Moffatt & Nichol ("M&N") has prepared this technical memorandum to summarize the sediment transport analyses performed. The purposes of this study are to assess changes to existing sediment transport patterns due to the project, including the NRI, the Slip and Access Channel, the MOF, and the Eelgrass Mitigation site; to estimate shoaling and/or scour over the project areas and FNC; to assess any potential changes to the existing FNC; and to provide a basis for evaluating potential changes to the pile dikes.

The sediment transport analysis is part of the hydrodynamic studies package, and it is necessary to review this study along with other technical memorandums prepared for the project. Specifically, this study should be considered in parallel with the "Hydrodynamic Analysis Technical Memorandum" (M&N 2018).

Table 1-1 summarizes the two modeling scenarios evaluated, "Without-Project" and "With-Project", and the corresponding design features. The Without-Project scenario is based on the existing FNC with a channel depth of -38' MLLW (-37' navigation depth + 1' advance maintenance dredging). In areas which have historically maintained a depth below -38' MLLW, the existing bathymetry used in the Oregon International Port of Coos Bay's (OIPCB) Section 204(f) Channel Modification Project (OIPCB Project) modeling efforts (OIPCB 2017) was used. The With-Project scenario adopts the same FNC depths used in the Without-Project scenario, and adds the four NRI areas, the Slip and Access Channel, the MOF, and the Eelgrass Mitigation site. This approach allows the changes due to the JCEP to be evaluated.

All elevations in this document are referenced to MLLW tidal datum, unless otherwise noted. Additional details related to hydrodynamic modeling development, such as bathymetric sources and modeling grids, are provided in the "Hydrodynamic Analysis Technical Memorandum" (M&N 2018).

Table 1-1. Summary of Modeling Scenarios

Location	Without-Project	With-Project
Federal Navigation Channel Maintained Depth (ft, MLLW)	≤ -38.0	≤ -38.0*
NRI Dredged Depth (ft, MLLW)	Existing	-39.0
Access Channel Dredged Depth (ft, MLLW)	Existing	-46.7
Slip Dredged Depth (ft, MLLW)	N/A	-45.5
Side Slope for Sand Bottom (OIPCB 2017)	Existing	3H:1V (NRI 1-3) 4H:1V (NRI 4) 3H:1V (Slip & Access Channel)
Side Slope for Rock Bottom (OIPCB 2017)	Existing	1H:1V

* In this study, the water depth of 38 ft is a minimum depth in the FNC. The actual bathymetry used at the entrance and elsewhere is naturally deeper.

Construction side slopes for the Access Channel and NRI areas are used in the With-Project modeling scenario. These construction side slopes are stable against mass failure (sloughing) during and after construction. Stable construction side slopes are based on the analysis completed for the OIPCB Project (OIPCB 2017). Estimations of long-term equilibrated side slopes in non-rock (sand) material will vary. The majority of material to be removed for construction of the Access Channel, NRI 3 and NRI 4 is sand, portions of NRI 1 and NRI 2 are also composed of sandy material overlying rock. In these areas sand side slopes will equilibrate over time to a slope flatter than the initial construction slope. Estimations of long-term equilibrated side slopes in non-rock material can vary significantly. Based on analysis methodology followed on the OIPCB Project (OIPCB 2017b) the conservative long term equilibrated slopes may vary between approximately 5H:1V and 20H:1V

Estimated long-term equilibrated side slopes were not used in the With-Project scenario modeling. After the completion of initial construction dredging, side slopes will continue to evolve over a period of time (estimated 5 to 10 years depending on depth of dredge cut, slope material properties, hydraulic forces acting on slope, and other factors) until they reach a stable slope angle, after which sedimentation patterns may reach a quasi-equilibrium state. There is an inherent level of uncertainty in estimating the long-term equilibrium side slope configuration and the amount of time until long term equilibrium is reached. Construction side slopes were used in the sediment transport analysis to better show the potential changes in sedimentation patterns associated with the JCEP.

The material to be removed for construction of NRI 1 and NRI 2 is primarily rock; rock side slopes will not change from the 1H:1V initial construction slope, and no long-term adjustments for the equilibration process are warranted in these locations.

This revised technical memorandum includes results and analysis based on additional supplemental modeling completed to address issues and questions brought resulting from the U.S. Army Corps of Engineers (USACE), Northwest Division, Portland District (NWP) review of the 408 60% Design Package (Rev. A; JCLNG Document No. J1-000-MAR-TNT-DEA-00003-00). Modifications to the numeric model included matching the With-Project model generated bathymetric grid to the Without-Project model gridded bathymetry outside of the project areas. These corrections provide for a more representative/accurate comparison of results for sediment transport, particularly in the North Jetty Root/Log Spiral Bay and south of Pile Dike 7.3 areas.

2. SEDIMENT TRANSPORT MODELING

2.1 MODEL OVERVIEW

Sediment transport and deposition was modeled using the two-dimensional MIKE-21 Flexible Mesh (FM) model, with coupled hydrodynamic and sediment transport modules (DHI 2014). The sediment transport module considers the erosion, transport, and deposition of sediment due to currents and/or waves.

By coupling the hydrodynamic and sediment transport processes, the model calculates the depth-averaged flow velocity and the corresponding bed shear stress at every time step. The resultant bed shear stress is then internally compared with the critical shear stress, which is a function of the bottom material size. If the calculated bed shear stress exceeds the critical shear stress, the bottom material will be mobilized by the model, resulting in erosion.

Figure 2-1 shows the modeling domain used in both the hydrodynamic analysis and the sediment transport analysis. The model domain included the entire estuary and was not limited to the JCEP areas. A complete discussion of the model domain, modeling grid, and bathymetric sources is provided in the "Hydrodynamic Analysis Technical Memorandum" (M&N 2018).

Strongest ebb currents in the Coos Bay estuary typically occur in winter (Dec to April) because of strong freshwater inflows. Daily freshwater discharge for Coos River for water years (WYs) 2007 to 2012 is shown in Figure 2-2. This figure shows that largest variations (spikes) of freshwater inflow occur in winter as well. To capture the strongest currents and largest variations in freshwater inflow, the modeling period for production runs was selected to be a typical three-month winter tide cycle (January 1, 2011 through March 31, 2011). The year 2011 was selected for production runs because it represented a typical water year, as shown in Figure 2-2. This same period was evaluated by the OIPCB Project (OIPCB 2017) for calibrating their sediment transport model.

The sediment transport model includes a morphological speed-up/repetition factor of 4 for 1-year analysis or 12 for 3-year analysis so that this three-month representative tidal cycle can be repeated to provide a full year or three years of sedimentation, respectively.

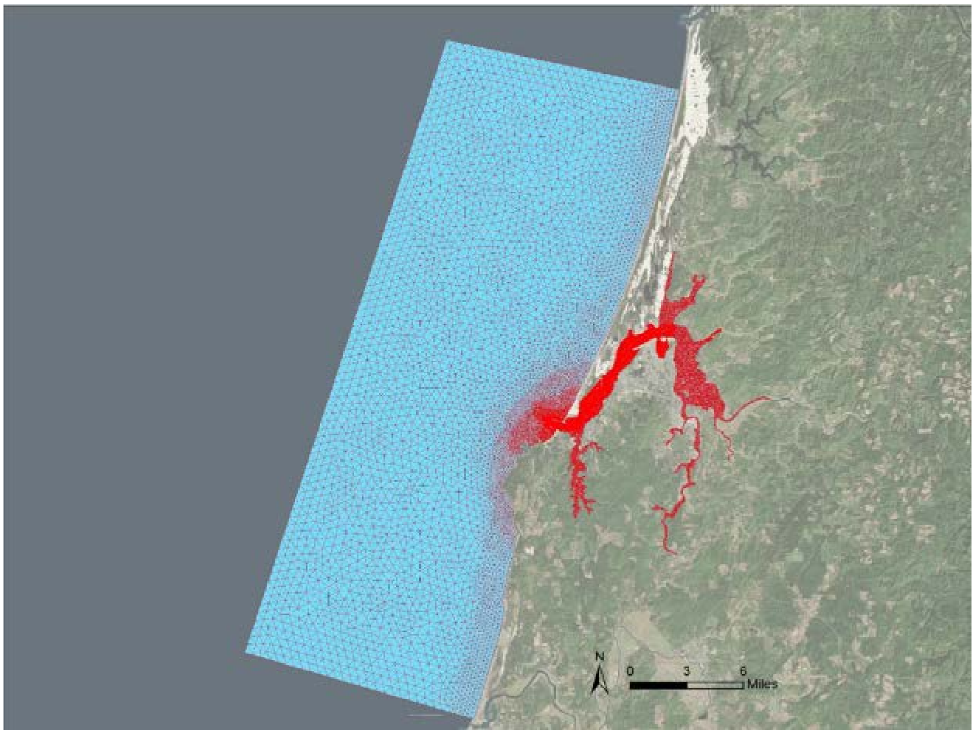

Figure 2-1. Modeling Domain and Elements with Varying Resolution

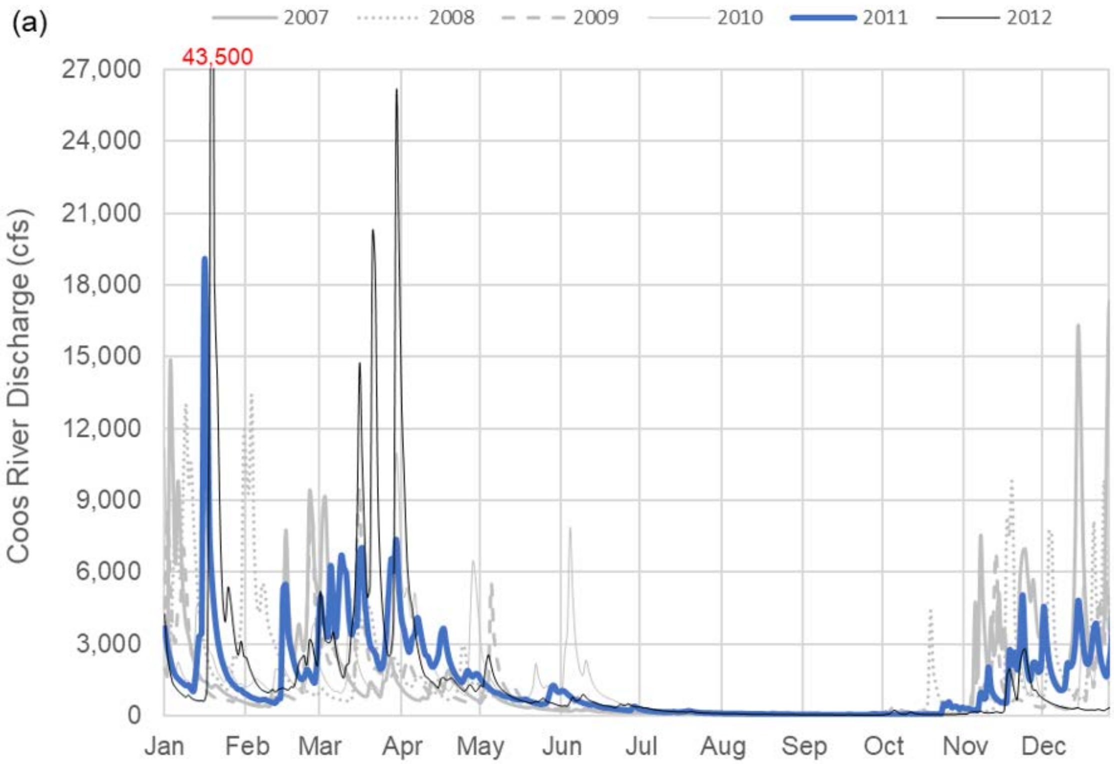

Figure 2-2. Coos River Discharge for Water Years (WYs) 2007 to 2012. WY 2011 is Highlighted.

2.2 MODEL SETUP

2.2.1 MAINTENANCE DREDGING SINCE 1998

Sediment dredged from the FNC, in the area below river mile ("RM") 12, is typically classified by grain size as either silt or sand. Finer sediments originating from the Coos River and other tributaries typically settle out above RM 12 (USACE/USEPA 1986). Therefore, sediment loading from freshwater runoff is not included.

Table 2-1 provides the maintenance dredging quantities of sediment for the federally maintained channel between RM 2.5 and RM 12 from 1998 to 2014 (OIPCB 2017). This table displays the full period since the most recent channel deepening project, which occurred in fiscal year 1996. Figure 2-3 shows the location of each channel range.

Table 2-1. Coos Bay Channel Quantity Dredged in Cubic Yards between RM 2.5 and RM 12

Year	Coos Bay & Empire Ranges RM 2.5 to 6.0	Jarvis Ranges RM 6.0 to 9.0	North Bend Ranges RM 9.0 to 12.0
1998[1]	0	48,911	0
1999	36,138	79,819	95,566
2000	61,923	83,335	31,093
2001	0	128,662	19,141
2002	0	52,764	1,017
2003	28,954	44,075	0
2004	5,718	46,184	44,350
2005	0	23,181	30,435
2006	33,790	34,706	3,953
2007	35,162	81,063	49,655
2008	5,082	59,686	54,584
2009	62,507	44,681	15,226
2010	16,126	69,217	4,080
2011[2]		223,148	
2012		105,495	
2013		269,078	
2014		37,907	
Average[3]	22,000	61,000	29,000

Notes:
1. Data compiled from dredging records provided by the USACE, Portland District.
2. Data provided by the USACE, Portland District, Field Office, not including a breakdown by range. The total quantity includes the amount dredged in the Charleston Channel.
3. Averages above the Entrance Range are based on 1998 to 2010 with minor modifications to match the overall average for the period 1998 to 2014. Values are rounded to the nearest thousands.

2.2.2 GRAIN SIZE MEASUREMENTS

Information regarding sediment grain size within the Coos Bay estuary is available from three sources: USACE 2005 (USACE 2005), SHN Consulting Engineers & Geologists 2007 (SHN 2007), and Geotechnical Resources, Inc. 2011 (GRI 2011). Figure 2-4 shows that the measurements exhibit a mixture of larger grain sizes in the channel, and smaller grain sizes that may be in the channel or in shallow water areas. The larger grain sizes, assumed to reflect channel bottom conditions, vary between 0.30 and 0.44 mm from the entrance to RM 9, and decrease to around 0.2 – 0.25 mm between RM 10 and RM 11. The southern part of the Upper Bay, above RM 12, is characterized by much finer sediments with a typical grain size of 0.04 mm. Near the airport runway, sand samples show a grain size between 0.25 and 0.28 mm. The measurements show variation throughout the channel, including in the FNC. Based on the above information, Figure 2-5 shows the grain size map used for sediment transport modeling. Consistent with the data, the map assumes a grain size of 0.33 mm in a majority of the channel area from the entrance to RM 9. Along the sides in the Coos Bay and Empire Ranges, the same trend observed near the airport runway was extrapolated to reduce grain size to between 0.25 and 0.28 mm. A linear interpolation was used between grain size 0.25 mm near RM 10 to 0.18 mm above RM 12.

2.2.3 GEOPHYSICAL INVESTIGATIONS

Shallow rock underlies much of the FNC, from the entrance to approximately RM 6. When this underlying rock is close to the surface, it limits the potential for erosion. These geophysical investigations were primarily based on the depth to the rock layer compiled by DEA in 2017 (OIPCB 2017) within and close to the FNC. Outside the FNC, areas of shallow rock were estimated based on bathymetric features. Shallow rock was also included – that is, the sand layer was assumed to be thin – along hardened reaches of the shoreline at Roseburg Forest Products, part of the airport runway, and the shoreline close to the FNC in the North Bend Ranges.

In addition, the remaining visible piles within the pile dike structures were modeled as individual piles to capture the changes in flow resistance in the water column imposed by the pile dikes as the flow changes. The remaining identifiable rock features in the area of the pile dikes are designated as nonerodable surfaces in the model. Figure 2-3 indicates the location of pile dike structures and rock aprons.

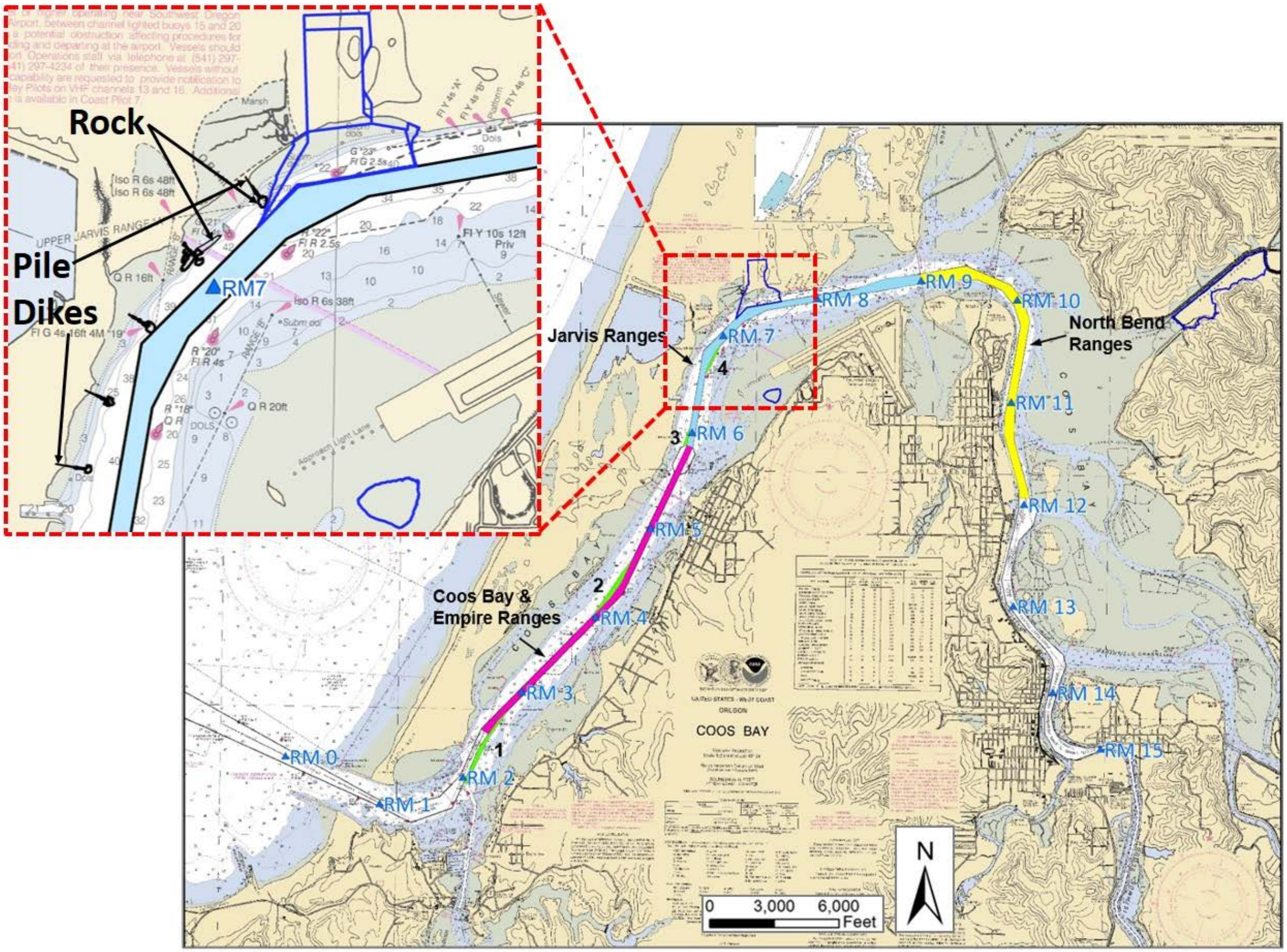

Image source: NOAA Nautical Chart, 18587 Coos Bay

Figure 2-3. Base Map Showing Channel Ranges Used in Shoaling Volume Calibration

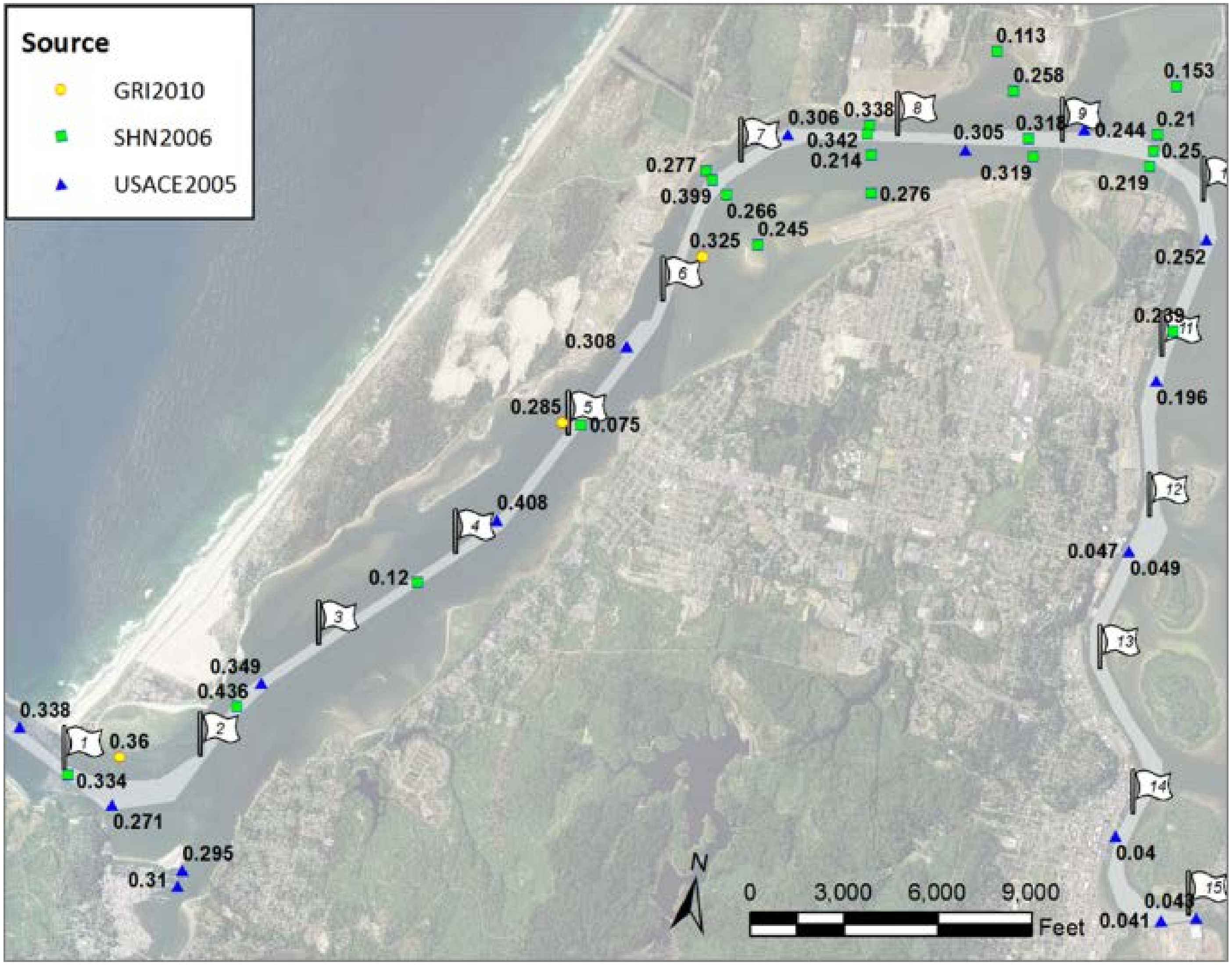

Figure 2-4. Measured Grain Size Map in millimeters

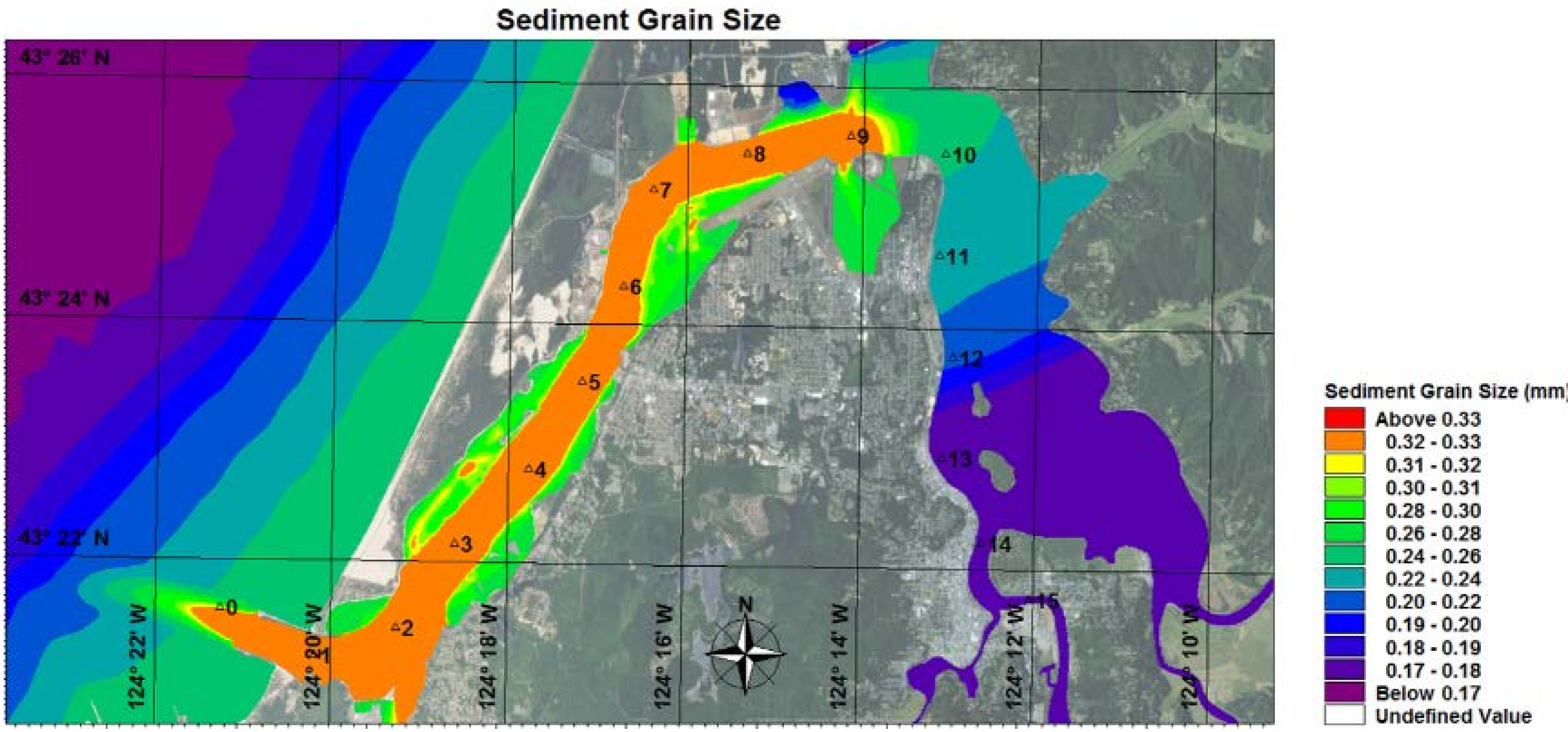

Figure 2-5. Simulated Grain Size Map in millimeters

2.2.4 INPUT PARAMETERS

Table 2-2 lists the primary input parameters used in the sediment transport module. These input parameters were adjusted during model refinement and calibration (described in Section 2.3).

Table 2-2. Input Parameters for Sediment Transport Module

Parameter	Value	Comments
Bedload Formula Suspended Load Formula	Van Rijn	Selected from four formulae available: Engelund & Fredsøe Engelund & Hansen Van Rijn Meyer-Peter and Müller
Bedload to Suspended Load Ratio	1 : 1.7	Relatively large suspended load fraction. Any ratio from entirely bedload to entirely suspended load is possible.
Model description	Non-Equilibrium	Uses advection-dispersion module to track suspended load
Porosity	0.4	Default value
Relative Sediment Density	2.65	Default value
Scaling Factor for Eddy Viscosity	1.0	Default value: dispersion follows hydrodynamic model
Bed Resistance	Manning's n = 0.025	Selected from four bed resistance available: Chezy number Manning's n Alluvial resistance Resistance from Hydrodynamic simulation

2.3 MODEL REFINEMENT AND CALIBRATION

The calibration for sediment transport modeling was based on the existing condition bathymetry (OIPCB 2017) and the annual average quantity of maintenance dredging since 1998 (Table 2-1).

Over an extended period of time, dredging records corroborate the average annual sedimentation rate reasonably well. Although the magnitude and frequency of dredging is dependent on budget and equipment capability on an annual basis, the amount of material removed depends on the sedimentation amounts and is limited by the authorized depths. The cumulative volume removed by dredging activities was deposited over the time between consecutive dredging events, and a deposition rate can be derived from this information. The uncertainty in this method is the exact surface area being dredged, however, the surface area is limited by the authorized dimensions. Therefore, over multiple dredging cycles, all deposited material within critical areas of the channel would be removed.

The approach of using average sedimentation rates over larger areas was selected to calibrate the model because numerical sediment transport models may have difficulty capturing bed level changes accurately in specific areas, such as channel turns and scour areas.

The four sediment theories presently available in the MIKE-21 sediment transport model are listed in Table 2-2. During model calibration, three out of the four were tested. Both the “Engelund & Fredsoe” and the “Engelund & Hansen” theory predict a higher shoaling rate in the Coos & Empire Ranges than the Jarvis Ranges, which is the reverse from the trend observed in the dredging records. Only the “Van Rijn” theory predicts the same trend, leading to the decision to base the analysis on the results predicted by the “Van Rijn” theory.

Using the “Van Rijn” theory, a series of bed load and suspended load combinations was tested during model calibration. The larger the bed load or suspended load, the greater the shoaling rate. The present load combination of 0.1/0.17 was found to best match the dredging records, and this specified load combination was based on model calibration.

Nominal porosity and relative sand density were considered. In this model, sand transport is primarily advective, while diffusive processes (usually not resolved in the model) are of less importance. It was noted that the model has a higher numerical diffusion compared to other similar models, which makes adjustments in diffusivity parameters less impactful.

In the coupled model setup, the hydrodynamic model and sediment transport models use different roughness parameters due to the nature of the numerical solutions. In the hydrodynamic model the roughness represents “apparent” roughness (which represent sediment characteristics, bedforms, and bed content). In the sediment transport model, roughness is used to compute bed shear stresses on the sediment particles only. Therefore, a single roughness value cannot satisfy both hydrodynamic and sediment transport solutions. The applied bed resistance of Manning’s n equal to 0.025 was refined during the model calibration.

Table 2-3 and Figure 2-6 show that the model satisfactorily predicts the annual dredging volumes between RM 2.5 and RM 12.

Table 2-3. Calibration of Annual Shoaling Volume

Location	Average Dredge Volume, CY/year	Simulated Volume, CY/year	Ratio simulated / actual volume
Coos Bay & Empire Ranges	22,000	18,000	0.8
Jarvis Ranges	61,000	61,000	1.0
North Bend Ranges	29,000	30,000	1.0
Total	**112,000**	**109,000**	**1.0**

The modeling result for the existing condition shows sand waves between RM 6 and RM 10, and not much sedimentation beyond RM 11 (Figure 2-7). This is consistent with general USACE observations of sand waves between RM 6 and 7 and not much sedimentation beyond RM 11.

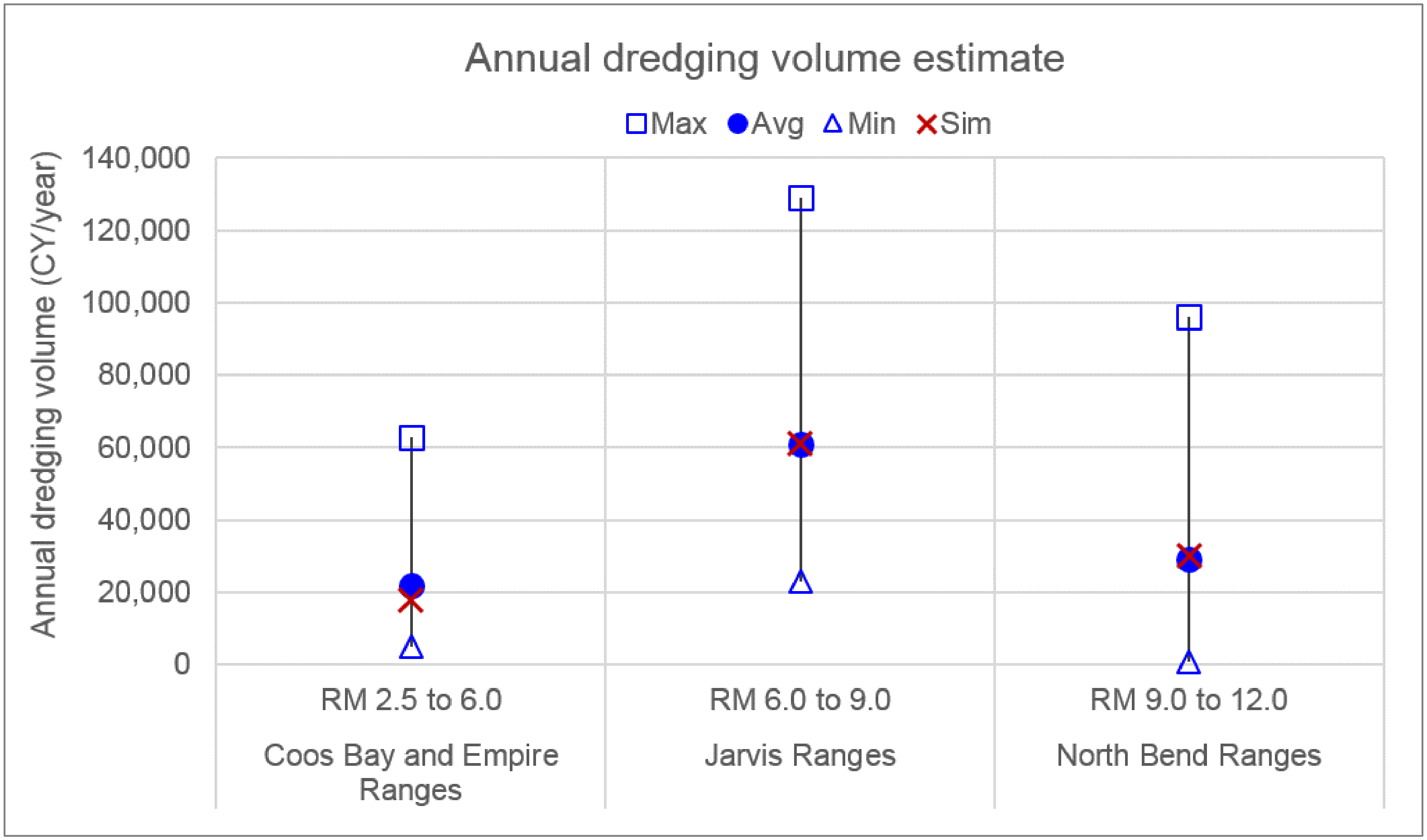

Figure 2-6. Calibration of Annual Shoaling Volume (Dredging Records vs. Simulation)

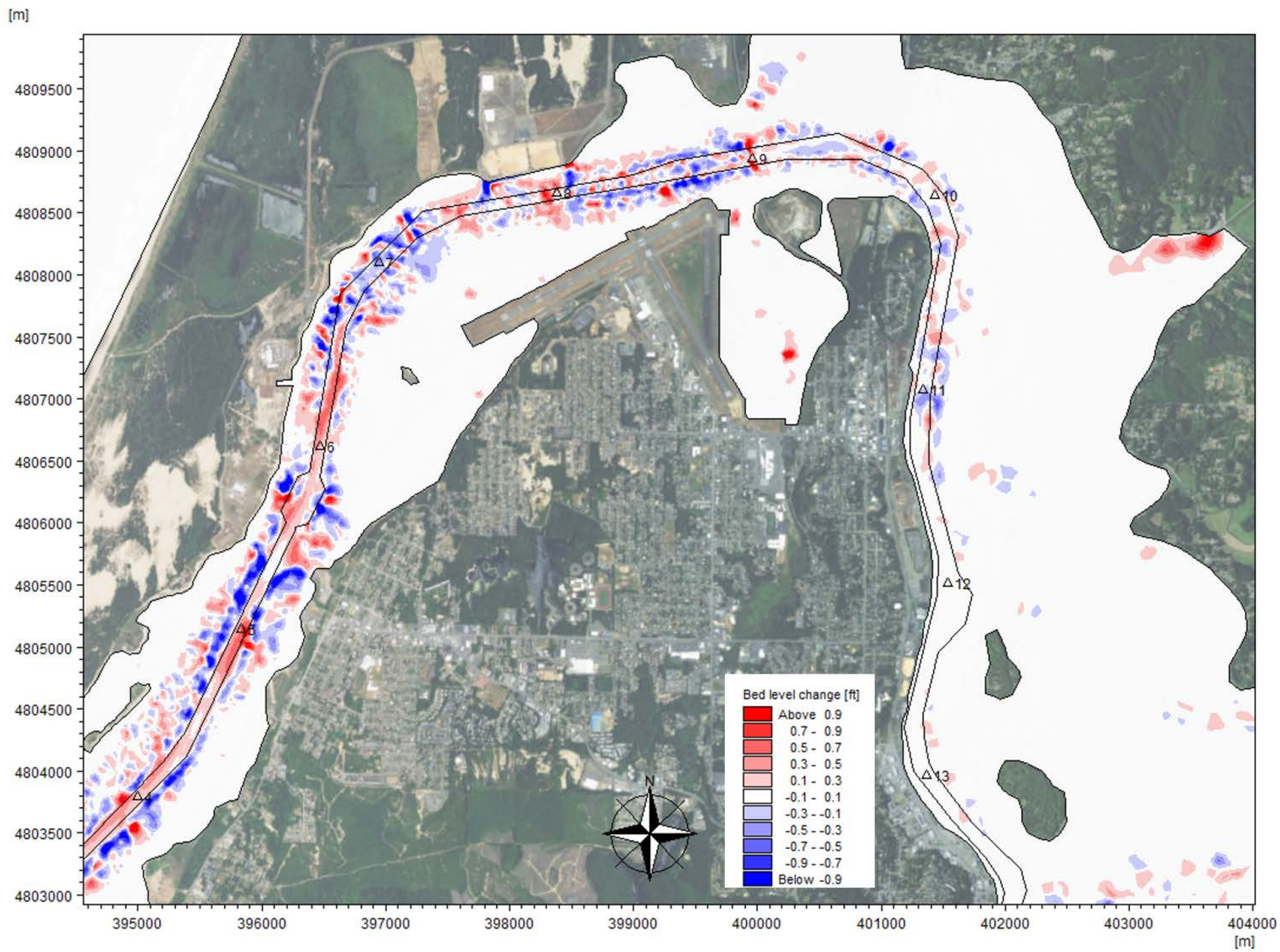

Figure 2-7. Model Result for the Existing Condition; Red – Shoaling, Blue - Erosion (OIPCB 2017)

2.4 MODELING RESULTS

Model results in terms of shoaling rates for "Without-Project" and "With-Project" scenarios were obtained. Comparison of the two scenarios provides an indication of the potential for changes in sedimentation rates resulting from the proposed JCEP Project.

2.4.1 CHANGES TO FEDERAL NAVIGATION CHANNEL

Table 2-4 compares the average shoaling rates at the same three channel ranges inside the FNC (see Figure 2-3) for a one-year and a three-year simulation of sediment transport for With Project and Without Project Conditions. Model results indicate that the average shoaling inside the FNC is not expected to change as a result of the proposed modifications.

Table 2-4. Comparison of Shoaling Rates Inside the Federal Navigation Channel

Location	Average Shoaling After One Year (ft)		Average Shoaling After Three Years (ft)	
	Without-Project	With-Project	Without-Project	With-Project
Coos Bay & Empire Ranges	0.1	0.1	0.2	0.2
Jarvis Ranges	0.3	0.3	0.7	0.7
North Bend Ranges	0.2	0.2	0.4	0.4

Figure 2-8 and Figure 2-12 presents the difference of bed level changes after one year and three years, respectively, between Without-Project and With-Project scenarios. Figure 2-9 through Figure 2-11, and Figure 2-13 through Figure 2-15 provide greater detail of the differences in bed level changes in the Lower Estuary, the Coos and Empire Ranges, and the Jarvis Ranges. Since the JCEP Project areas are dredged in the With-Project scenario, the areas beyond the FNC are removed by shading to avoid distraction from the assessment of changes inside the FNC.

From the results of the one-year run, most of the non-project area shows bed level changes less than 0.2 feet due to the JCEP Project. Some more noticeable changes of up to 1.2 ft in erosion were predicted locally near the intersection of the FNC with the Access Channel, near Pile Dike 7.3, and at the southern end of NRI 3 and NRI 4. Localized shoaling up to 0.4 ft in the FNC adjacent to the Access Channel are in a naturally deep section of the channel. It is noted that the study focuses on the differential sediment transport trend(s) observed in the modeling results, rather than the absolute values predicted by the model. Similar but somewhat greater changes in value and/or extents can be seen in the results of the three-year simulation comparison.

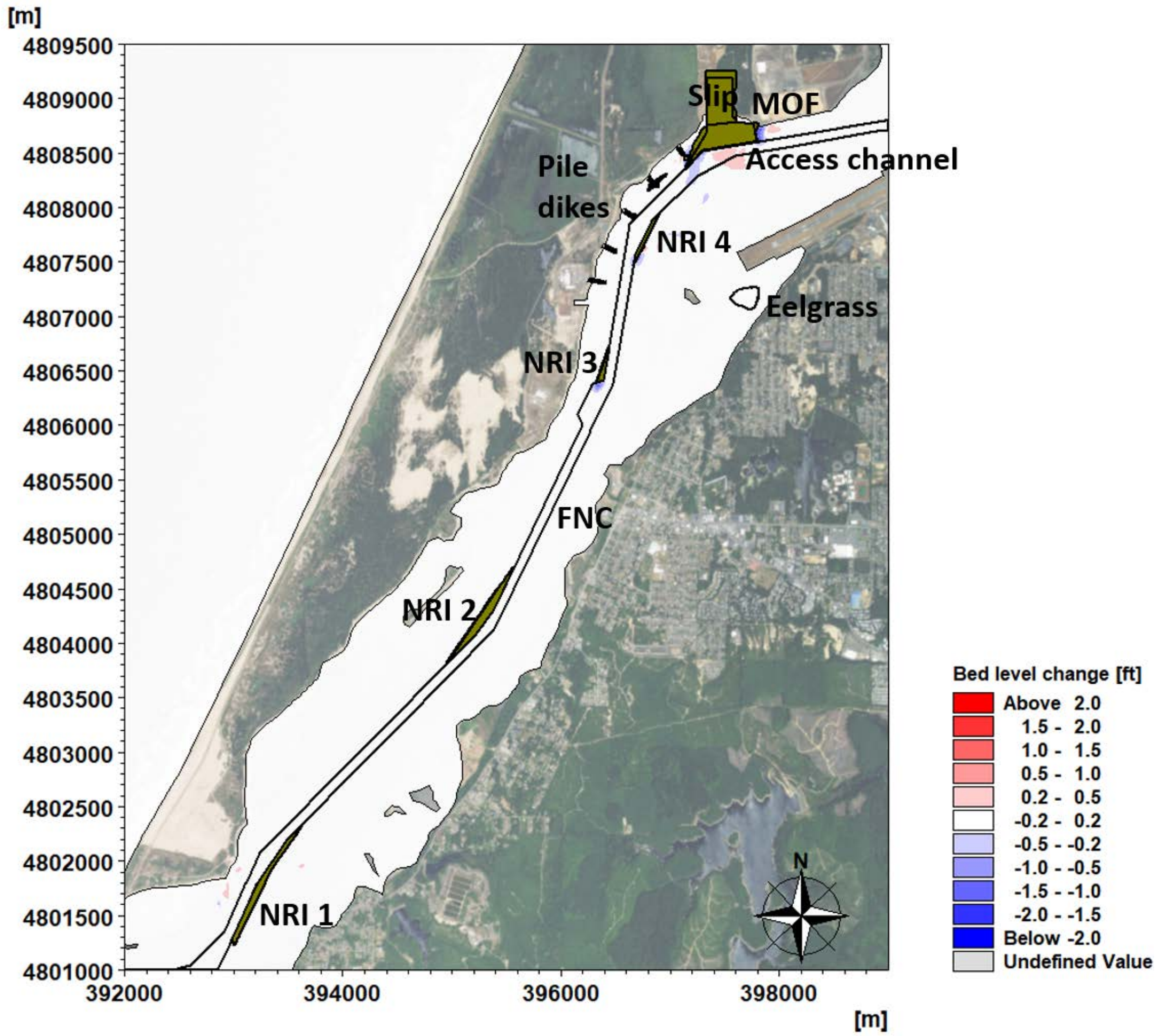

Figure 2-8. Difference of Bed Level Changes after One Year, Without-Project vs. With-Project Scenario; Red – Shoaling, Blue - Erosion

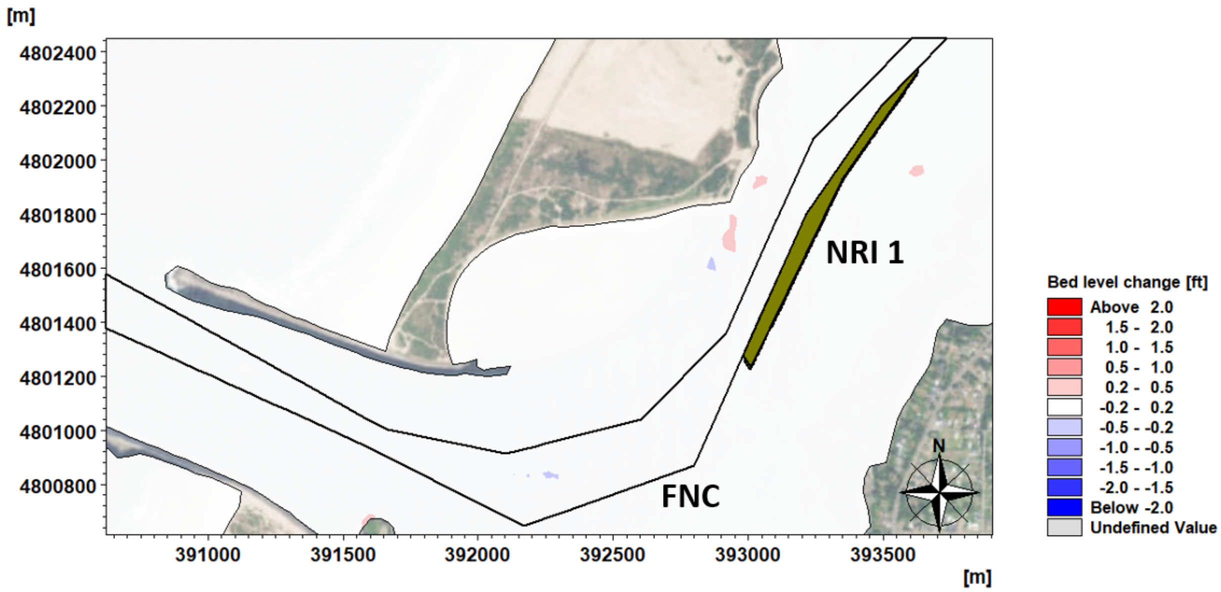

Figure 2-9. Difference of Bed Level Changes after One Year at the Lower Coos Bay Estuary, Without-Project vs. With-Project; Red – Shoaling, Blue - Erosion

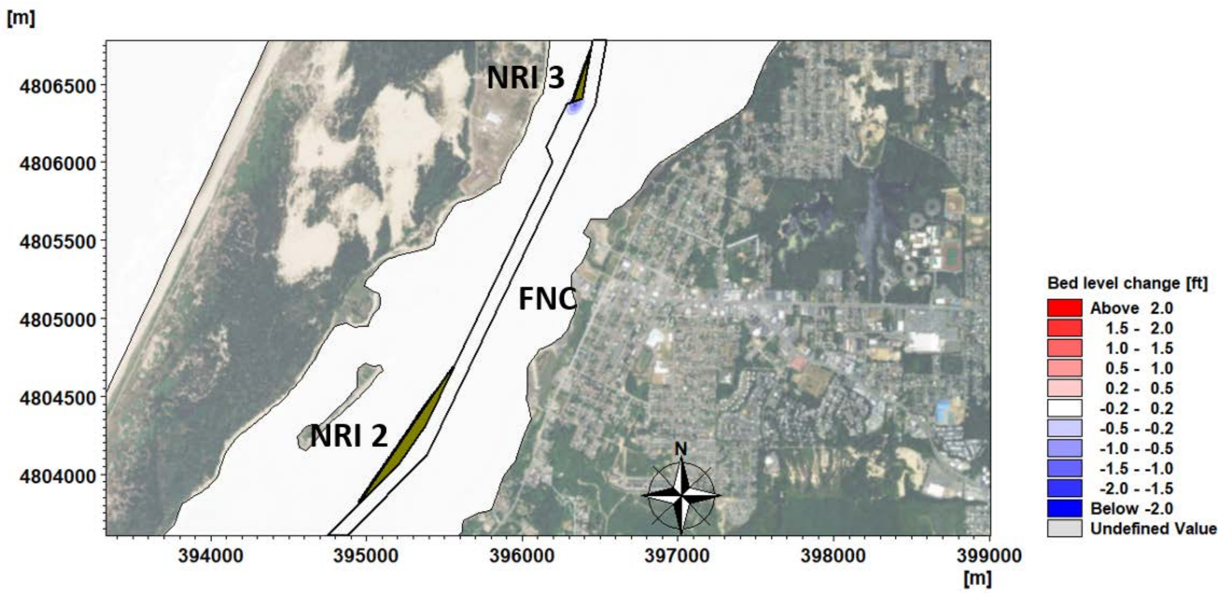

Figure 2-10. Difference of Bed Level Changes after One Year at the Coos & Empire Ranges, Without-Project vs. With-Project; Red – Shoaling, Blue - Erosion

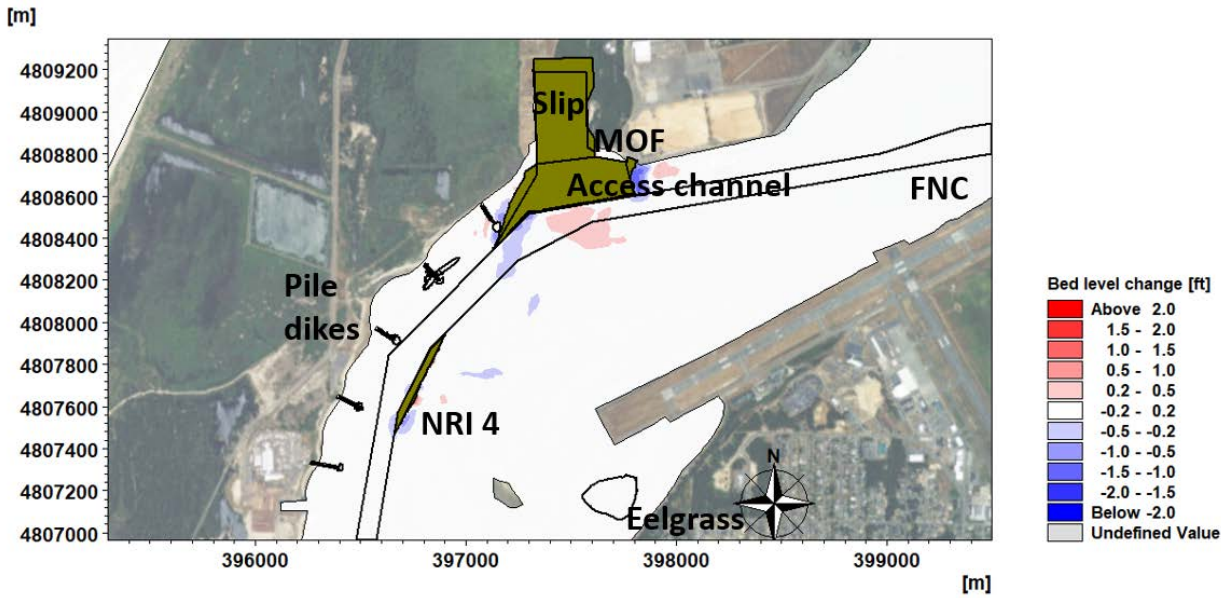

Figure 2-11. Difference of Bed Level Changes after One Year at the Jarvis Ranges, Without-Project vs. With-Project; Red – Shoaling, Blue - Erosion

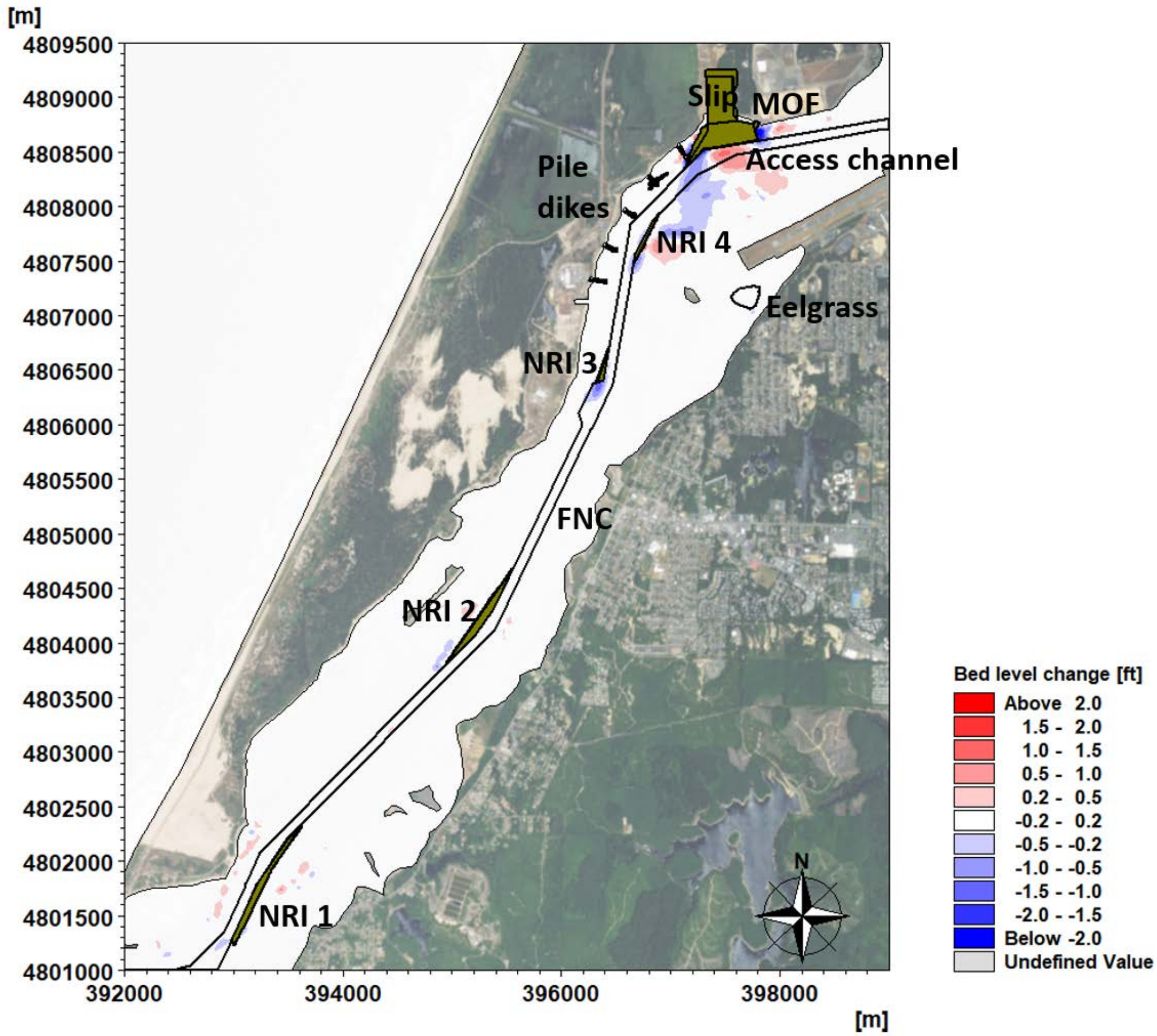

Figure 2-12. Difference of Bed Level Changes after Three Years, Without-Project vs. With-Project Scenario; Red – Shoaling, Blue - Erosion

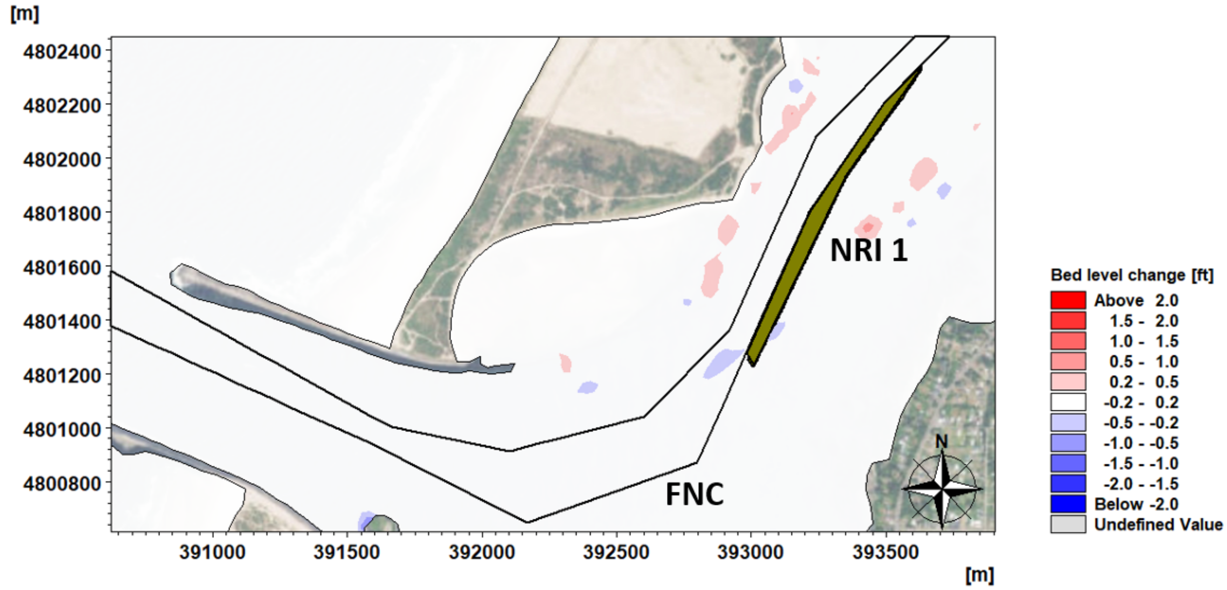

Figure 2-13. Difference of Bed Level Changes after Three Years at the Lower Coos Bay Estuary, Without-Project vs. With-Project; Red – Shoaling, Blue - Erosion

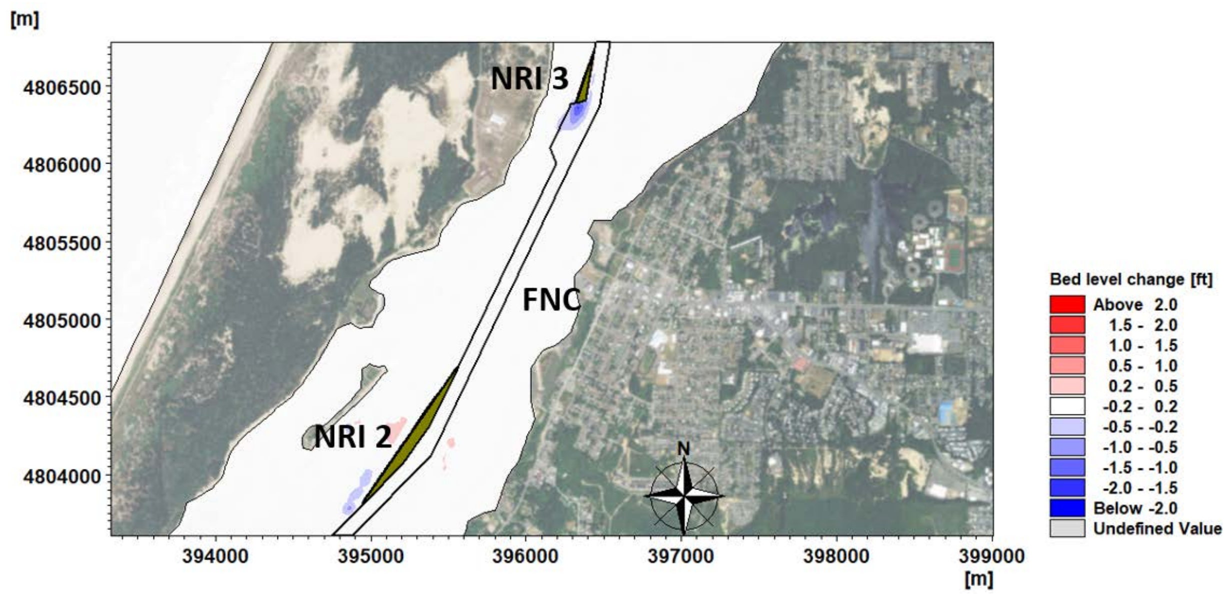

Figure 2-14. Difference of Bed Level Changes after Three Years at the Coos & Empire Ranges, Without-Project vs. With-Project; Red – Shoaling, Blue - Erosion

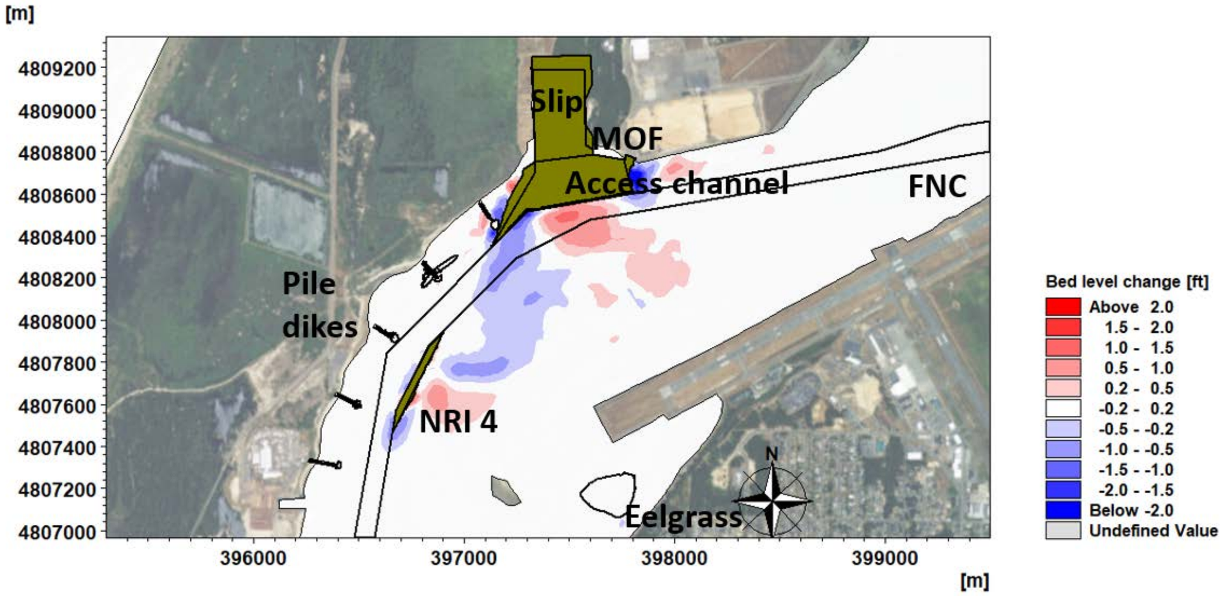

Figure 2-15. Difference of Bed Level Changes after Three Years at the Jarvis Ranges, Without-Project vs. With-Project; Red – Shoaling, Blue - Erosion

Figure 2-15 shows that the model predicts localized comparative erosion of 1.8 feet near the side slope of the Access Channel after three years. This is due to the construction of the Access Channel resulting in larger re-directed currents flowing through this area and re-joining the FNC at the southwest corner of the Access Channel and flow over and/or along the Access Channel dredge slope. The model indicates up to 2 feet of comparative erosion near the offshore end of Pile Dike 7.3. This area will be further analyzed to determine potential effects to Pile Dike 7.3 with results presented in a separate technical memorandum.

The model also predicts some localized shoaling of up to 1.1 feet in the FNC directly adjacent to the Access Channel after 3 years. This potential shoaling is in a historically naturally deep section of the channel where water depths generally range from approximately -39 to -41 feet MLLW and maintenance dredging has not typically been required. Actual sedimentation in this historically naturally deep area will be monitored by hydrographic survey in conjunction with monitoring surveys of the Slip, Access Channel, and NRI areas by the JCEP. Should sedimentation in this area over time result in conditions requiring maintenance dredging, maintenance dredging would be executed by the JCEP in conjunction with maintenance dredging of the NRI areas and access channel.

Figure 2-11 shows the model predicts the same general areas/patterns of erosion and deposition but to a lesser extent after 1 year.

2.4.2 SHOALING ESTIMATES AT THE PROJECT AREAS

Table 2-5 provides the average and maximum shoaling rates after one year and three years for the JCEP Project areas. Figure 2-14 through Figure 2-18 illustrate the results for each project area after one year. Figure 2-19 through Figure 2-23 illustrate the results for each project area after three years. All project areas, except NRI 4, experience a general trend of shoaling. The averaged shoaling of the three-year runs are not a multiple of the shoaling of the one-year runs because the hydraulic gradients, which drive sediment movements, change over time until a dynamic equilibrium state is reached.

Table 2-5. Shoaling Rates for the JCEP Project Areas

Location	RM	Shoaling After One Year (ft)		Shoaling After Three Years (ft)	
		Avg.	Max.	Avg.	Max.
NRI 1	2.0 - 2.5	< 0.1	0.1	0.2	0.4
NRI 2	4.0 - 4.5	0.2	0.6	0.7	1.6
NRI 3	6.0	0.6	1.1	1.5	2.5
NRI 4	6.5	0.2	1.2	0.4	1.3
Access Channel & MOF	7.5	0.1	1.2	0.3	1.5
JCEP Slip	7.5	< 0.1	0.6	< 0.1	0.8

A previous sedimentation analysis completed by Coast & Harbor Engineering (CHE 2011) indicated an annual sedimentation rate of approximately 0.2 ft. in the Slip, and 0.6 ft. in the Access Channel. These sedimentation values are of the same order of magnitude as those predicted by this analysis.

Figure 2-20 and Figure 2-25 indicate localized deposition in front of the MOF, localized erosion at the eastern side of the Slip, erosion of the design slope east of the MOF, and some localized erosion along the southwest side of the Access Channel.

The simulation results also show there are no noticeable sedimentation changes anticipated at the Eelgrass Mitigation site as a result of the proposed improvements.

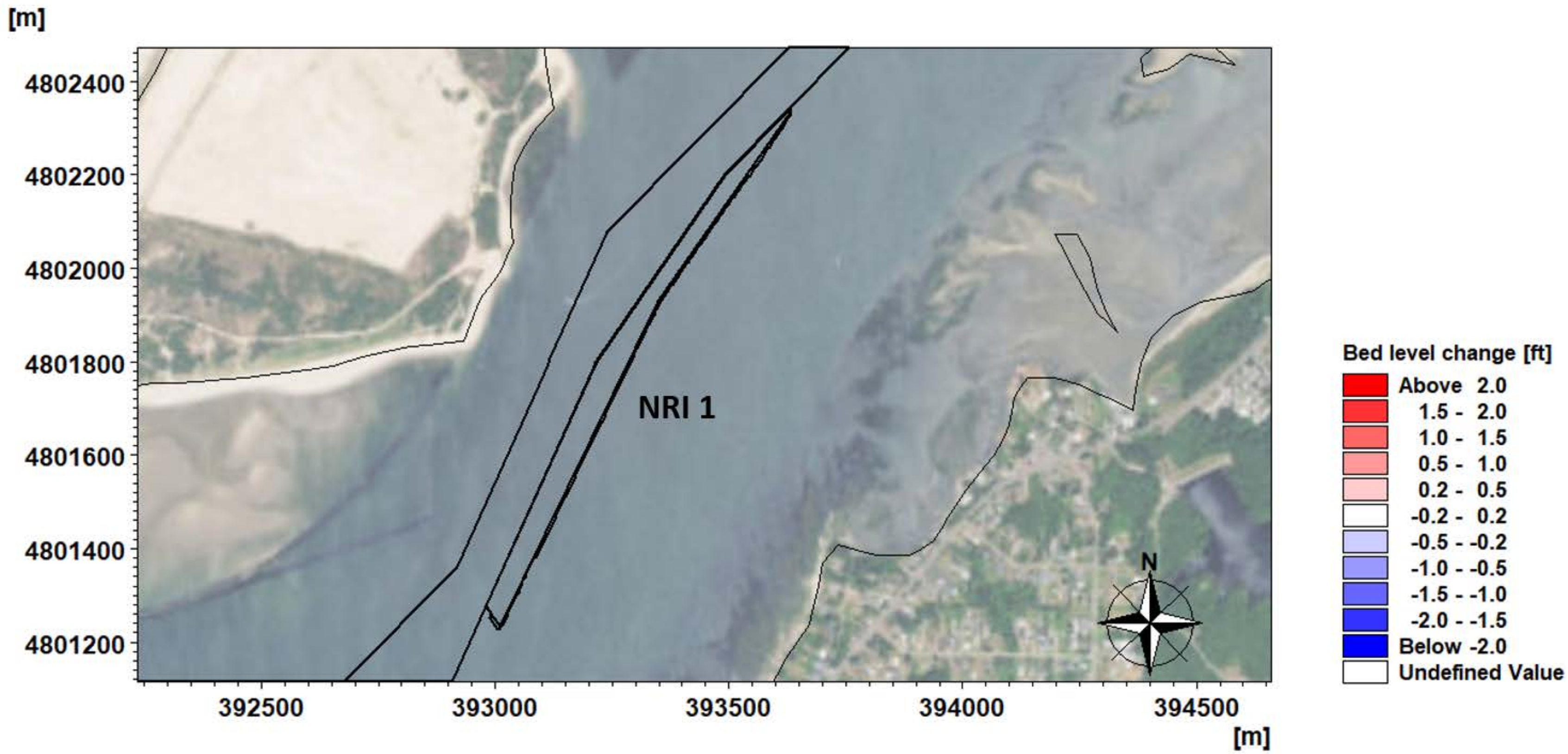

Figure 2-16. Bed Level Changes at NRI 1 after One Year for With-Project; Red – Shoaling, Blue - Erosion

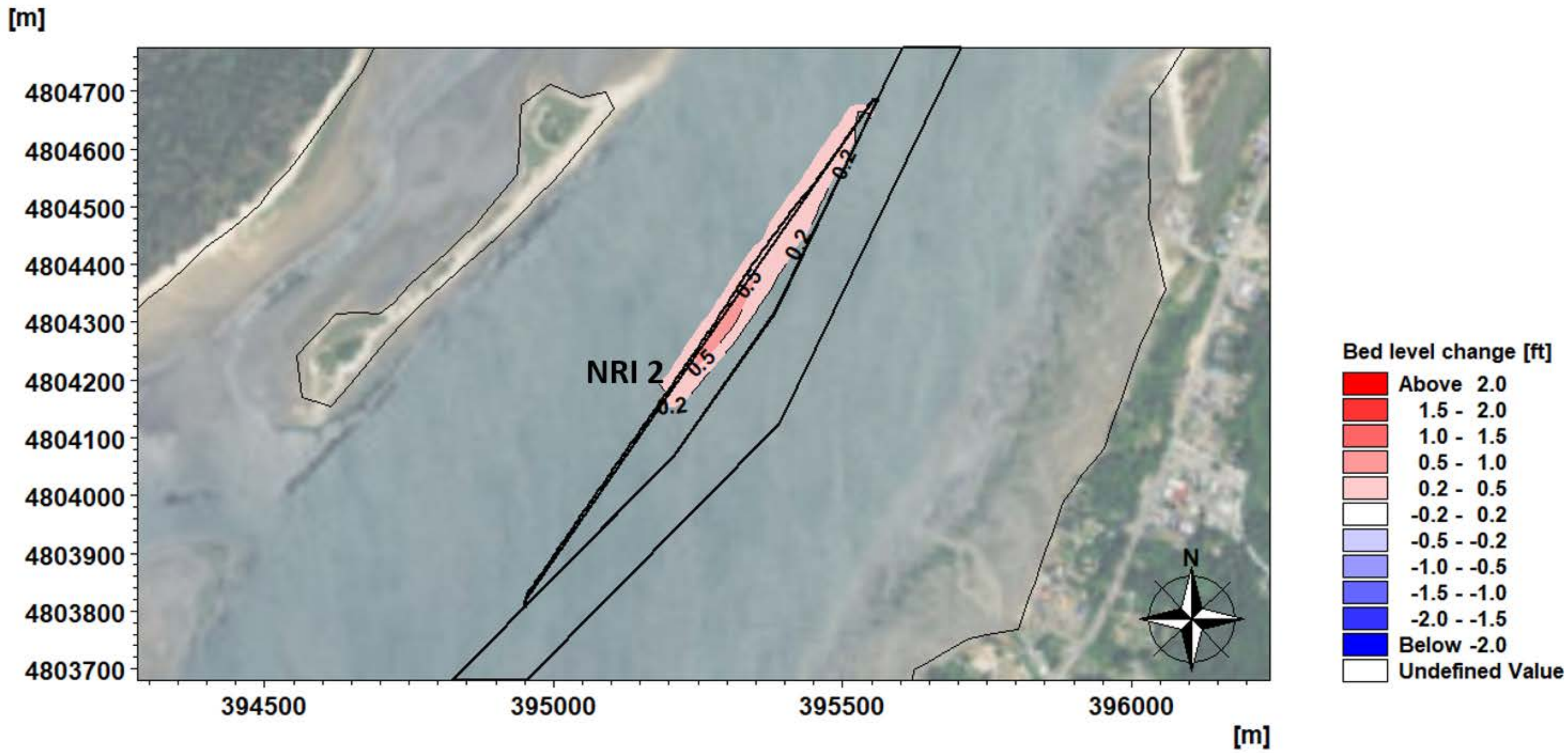

Figure 2-17. Bed Level Changes at NRI 2 after One Year for With-Project; Red – Shoaling, Blue - Erosion

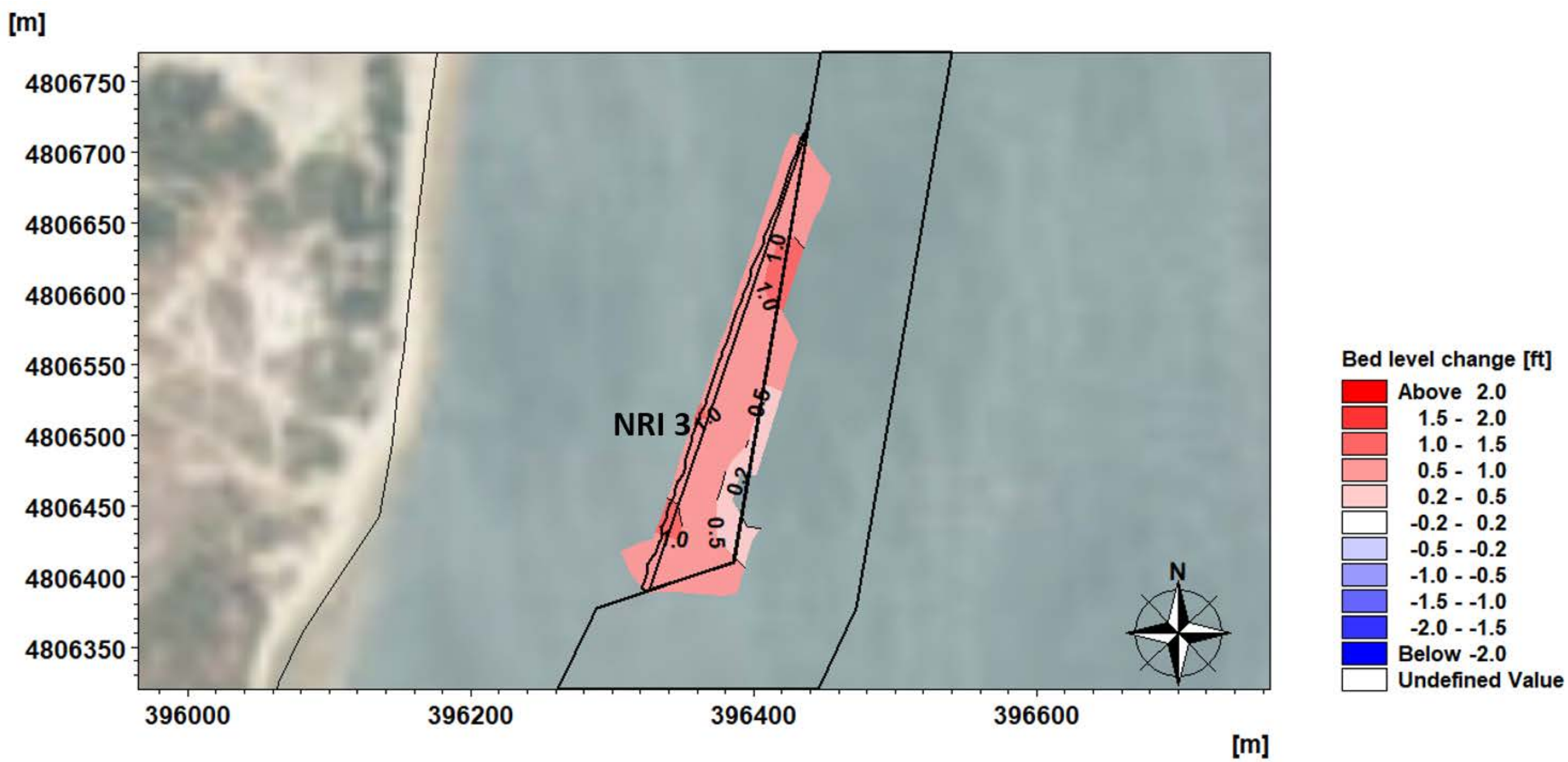

Figure 2-18. Bed Level Changes at NRI 3 after One Year for With-Project; Red – Shoaling, Blue - Erosion

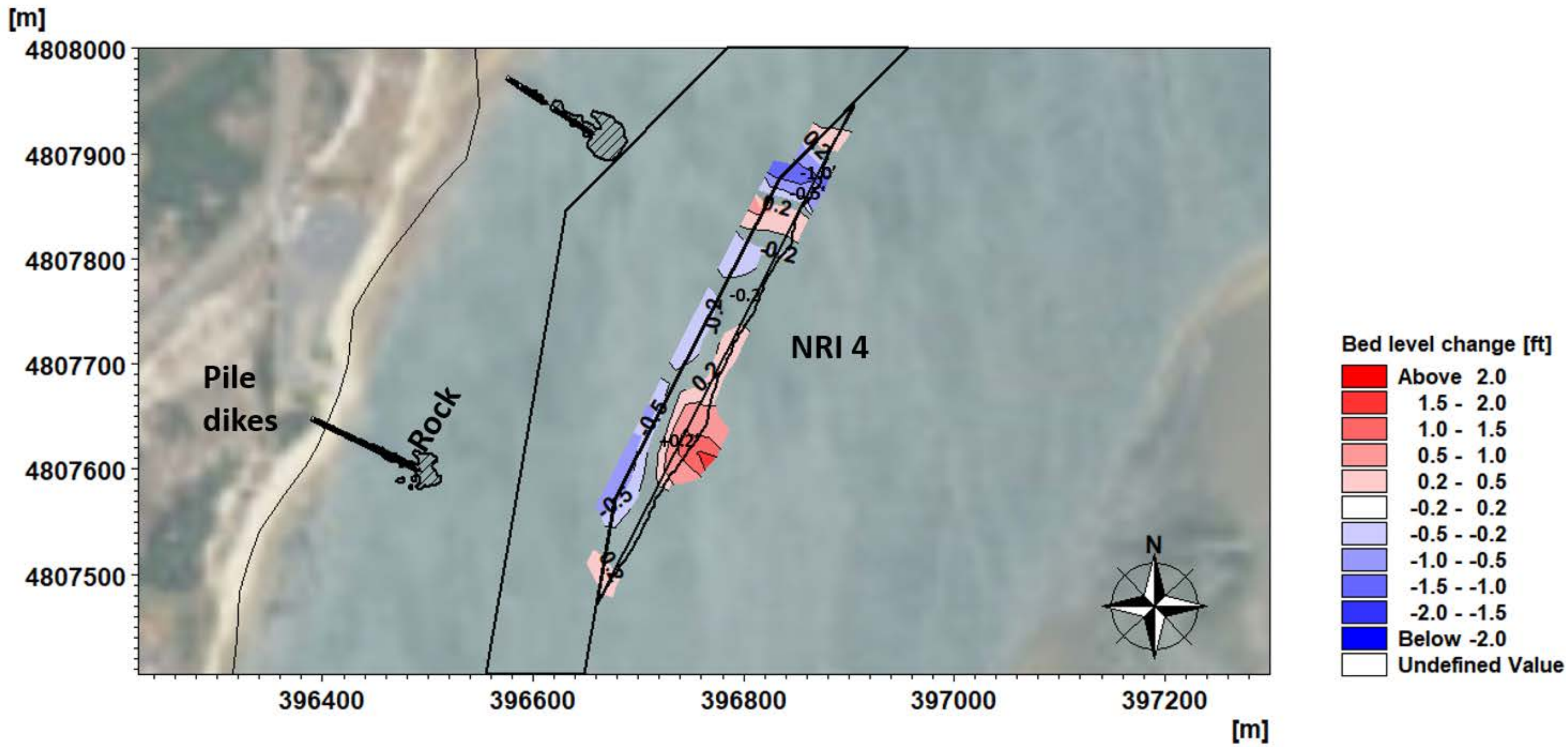

Figure 2-19. Bed Level Changes at NRI 4 after One Year for With-Project; Red – Shoaling, Blue - Erosion

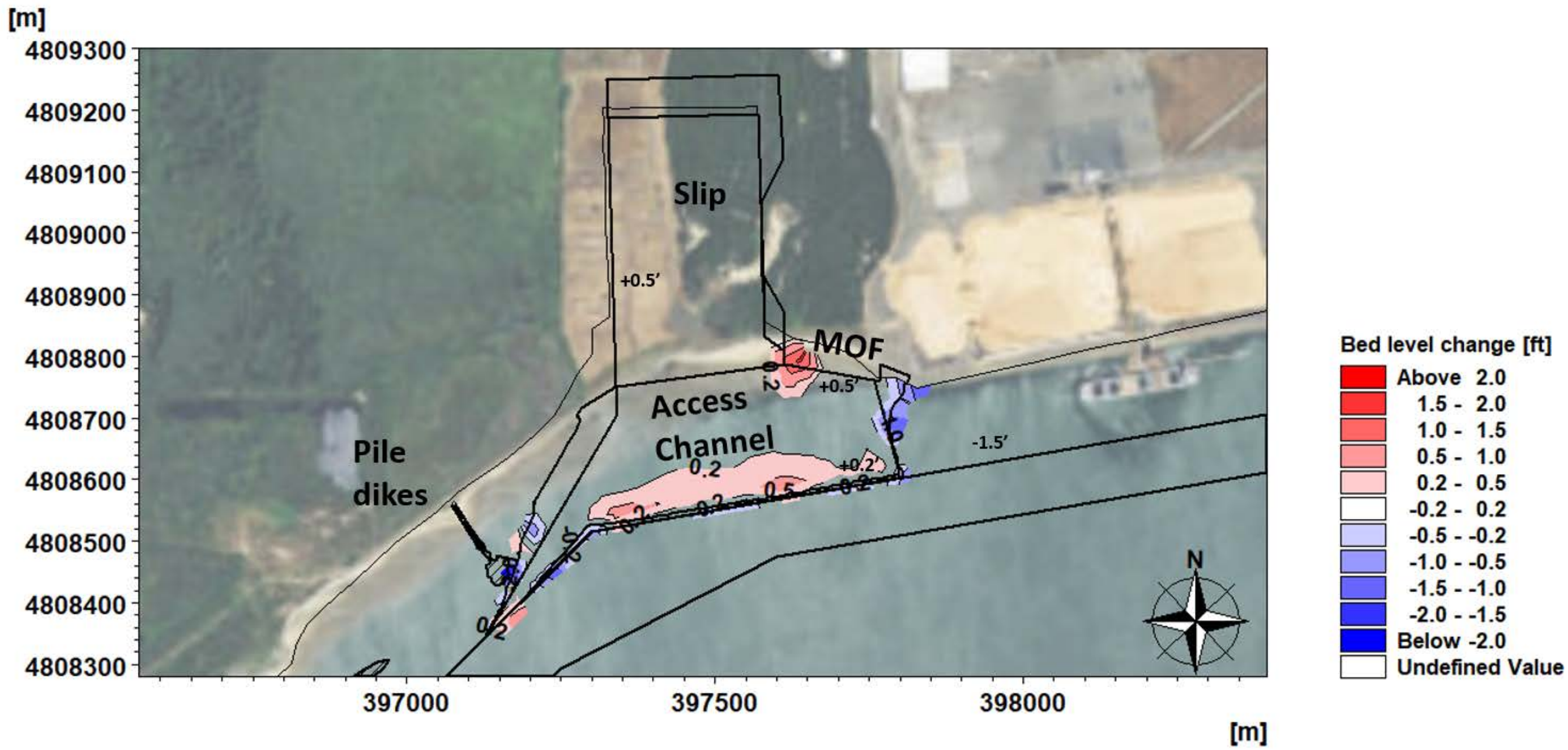

Figure 2-20. Bed Level Changes at the Slip, the Access Channel and the MOF after One Year for With-Project; Red – Shoaling, Blue - Erosion

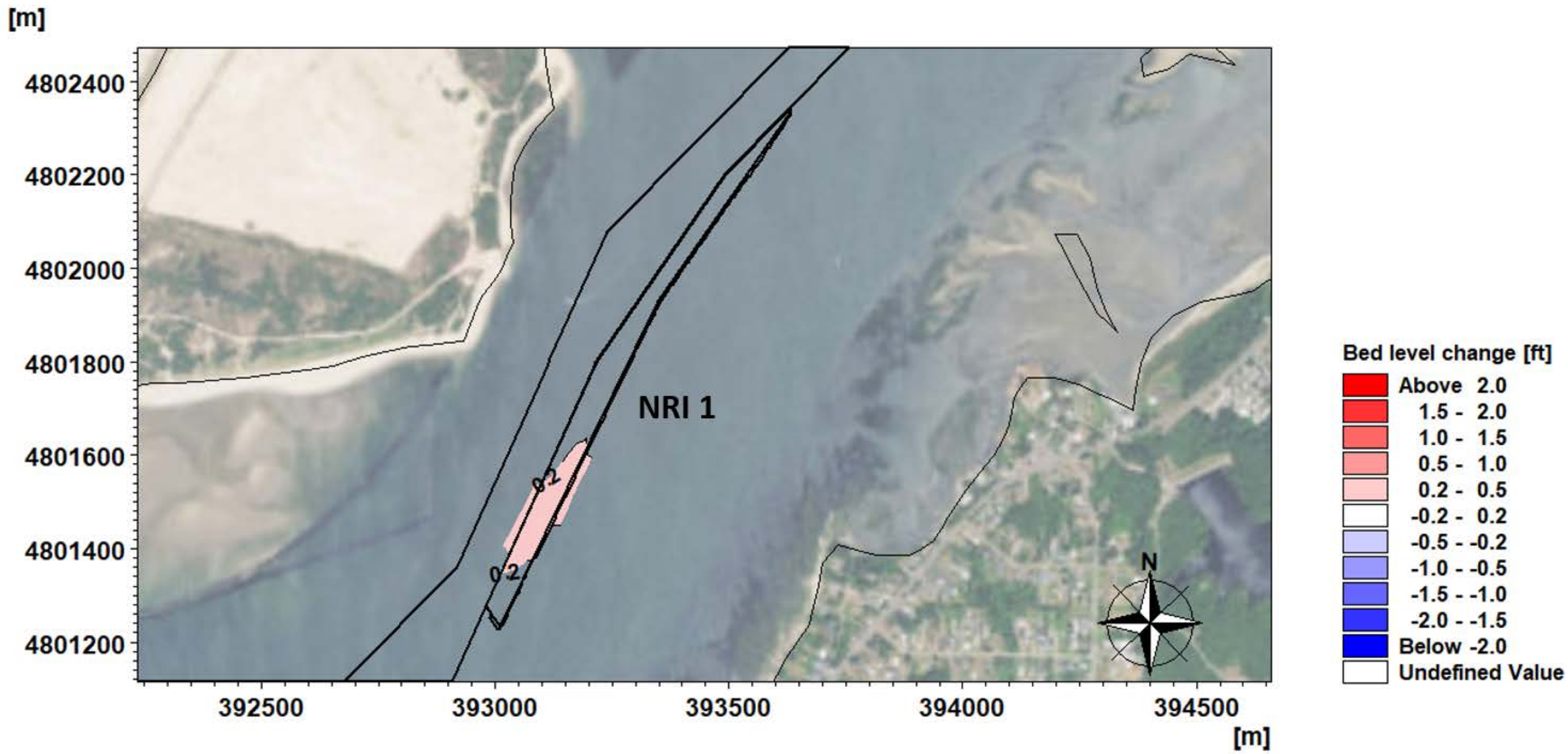

Figure 2-21. Bed Level Changes at NRI 1 after Three Years for With-Project; Red – Shoaling, Blue - Erosion

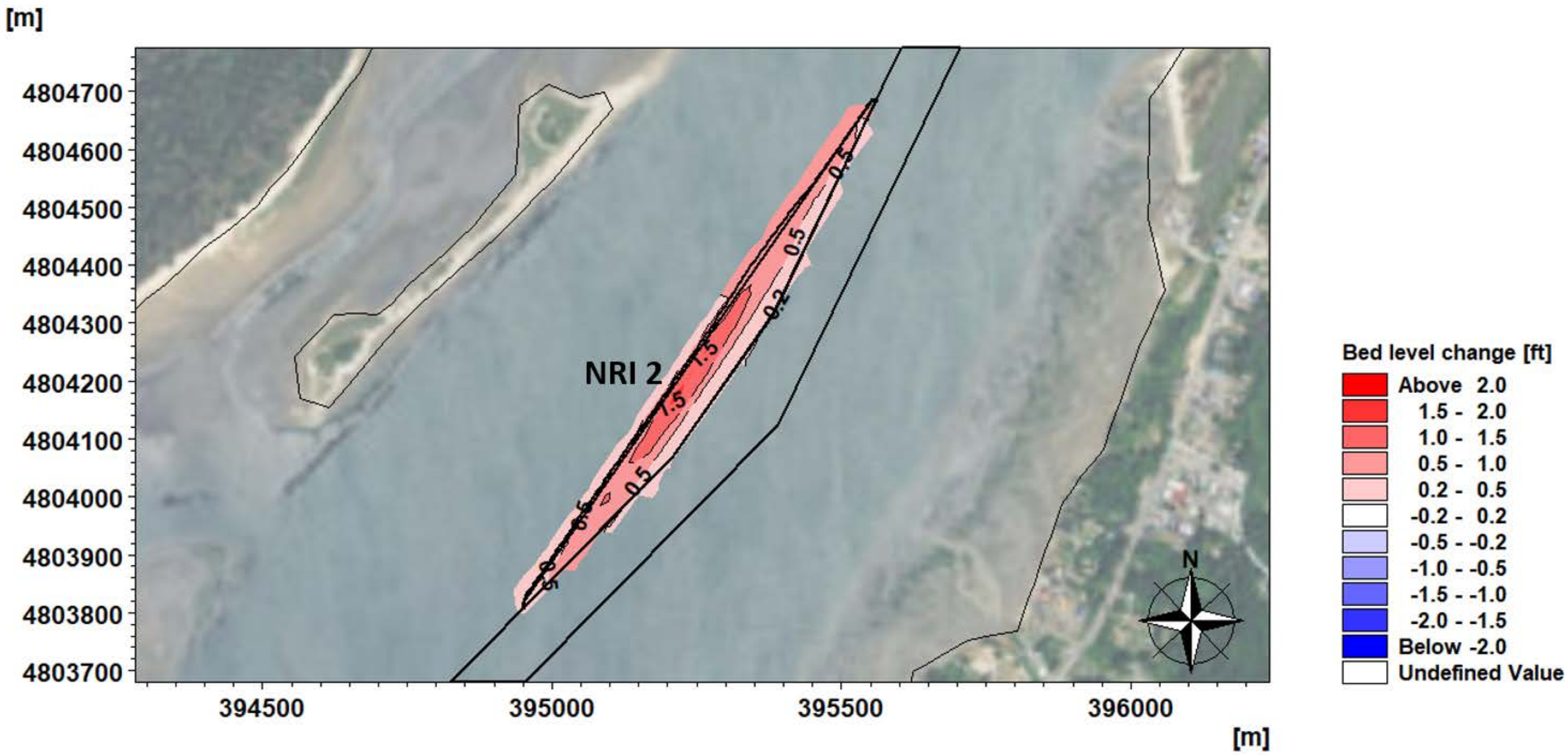

Figure 2-22. Bed Level Changes at NRI 2 after Three Years for With-Project; Red – Shoaling, Blue - Erosion

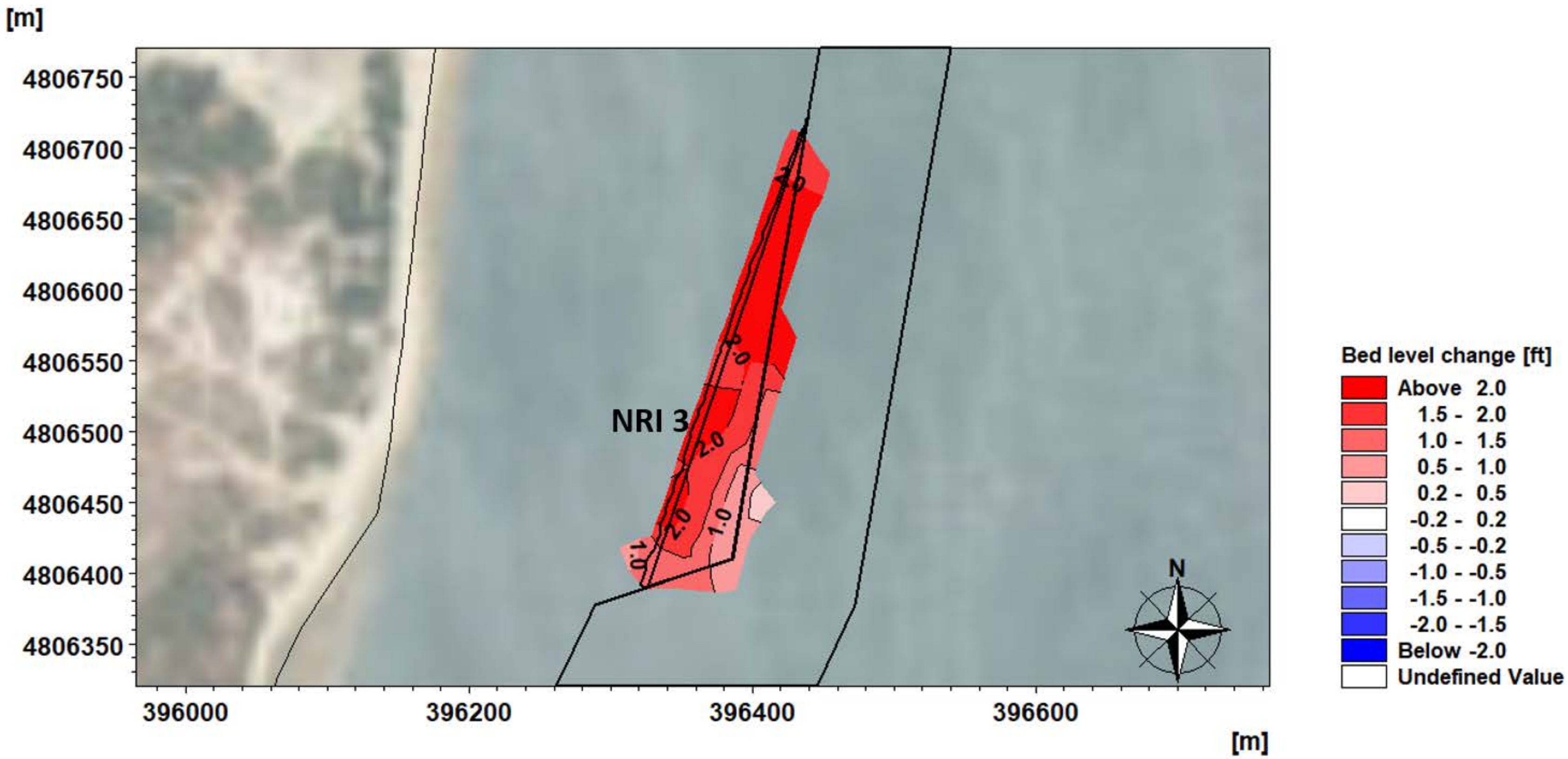

Figure 2-23. Bed Level Changes at NRI 3 after Three Years for With-Project; Red – Shoaling, Blue - Erosion

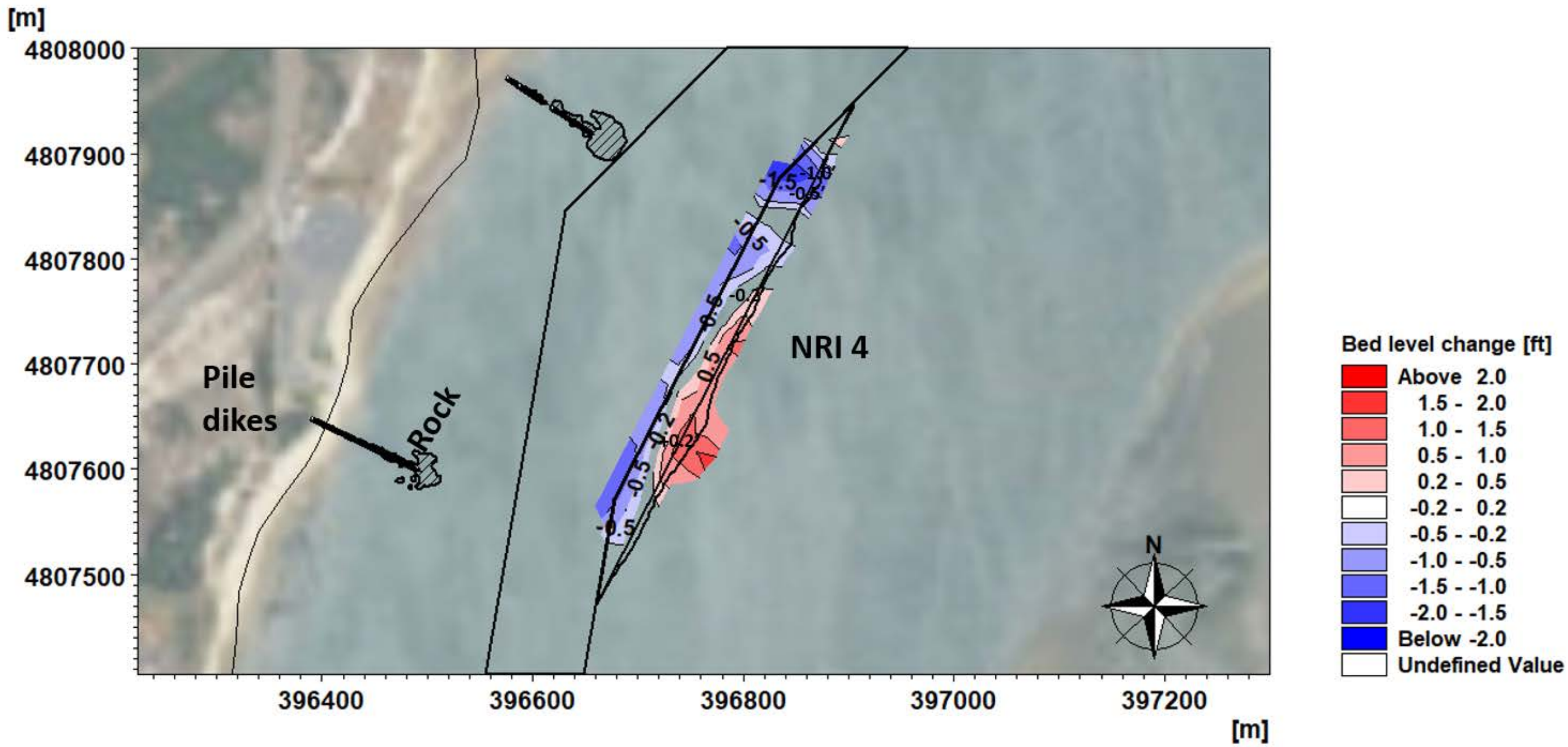

Figure 2-24. Bed Level Changes at NRI 4 after Three Years for With-Project; Red – Shoaling, Blue - Erosion

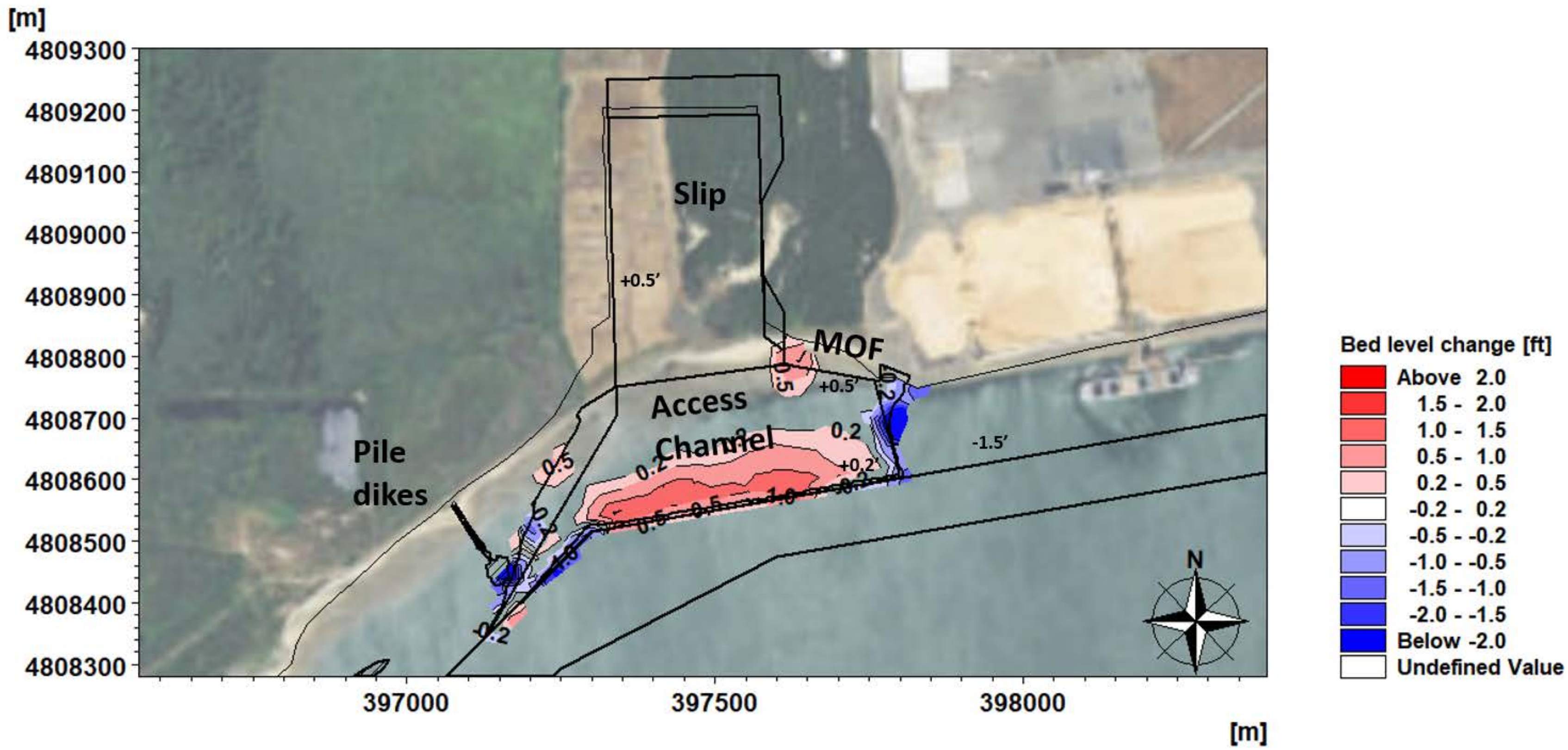

Figure 2-25. Bed Level Changes at the Slip, the Access Channel and the MOF after Three Years for With-Project; Red – Shoaling, Blue - Erosion

3. SUMMARY

M&N conducted a numerical modeling study to evaluate possible changes in sedimentation along the FNC as a result of implementing the With Project Conditions. The model was calibrated against records of annual dredge quantities provided by USACE for the Without Project condition. The model was then used to simulate With-Project condition. Comparison of model results for With-Project and Without-Project conditions indicated potential changes to sedimentation patterns in limited areas within the FNC and adjacent to the offshore end of Pile Dike 7.3.

Results of the one-year and three-year model simulations indicate that comparative (change between With-Project and Without-Project conditions) shoaling and/or erosion rates within the majority of the FNC and most of the non-project areas are less than 0.2 feet. Model results indicated that the JCEP (With-Project condition) could result in limited comparative erosion within the FNC at five locations when compared to the existing (Without-Project) condition. After 3 years, additional erosion of up to 0.4 feet south of NRI 1, 1.5 feet south of NRI 3, 0.7 feet south of NRI 4, 1.8 feet near the intersection of the FNC with the Access Channel, and 1.2 feet near the MOF is indicated.

Up to 2 feet of comparative erosion is indicated near the offshore end of Pile Dike 7.3. These areas of comparative erosion will not increase the overall volume of required maintenance dredging within the FNC or adversely impact navigation. The comparative erosion (bed lowering) near Pile Dike 7.3 will be further analyzed to determine potential effects to Pile Dike 7.3, with results presented in a separate technical memorandum. Only one area within the FNC, adjacent to the Access Channel, indicated comparative deposition (sedimentation) of 1.4 ft. However, this localized change would occur in a historically naturally-deep section of the channel (existing water depth of approximately -39 to -42 feet MLLW which is deeper than the authorized depth of -37 feet MLLW). Actual sedimentation in this historically naturally deep area will be monitored by hydrographic survey in conjunction with monitoring surveys of the Slip, Access Channel, and NRI areas by the JCEP. Should sedimentation in this area over time result in conditions requiring maintenance dredging, maintenance dredging would be executed by JCEP in conjunction with maintenance dredging of the NRI areas and access channel. JCEP will not increase maintenance dredging volumes or dredging intervals.

Modeling results also indicate localized erosion and deposition in the JCEP dredge areas following construction. Anticipated deposition was indicated in the NRI areas, the Access Channel, and the Slip, these areas will be maintained by the JCEP, are outside the FNC, and do not increase maintenance dredging within the FNC. Localized erosion and deposition was indicated adjacent to the MOF outside the FNC.

There are no noticeable sedimentation changes at the Eelgrass Mitigation site.

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APPENDIX J: DRAFT LETTER OF CREDIT

Month, Day, Year

Beneficiary:
State of Oregon acting by and through the
Oregon Department of State Lands
775 Summer Street NE
Salem, Oregon 97301-1279

IRREVOCABLE STANDBY LETTER OF CREDIT

Letter of Credit No. [number] Amount U.S.$ [amount]

At the request and for the account of Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP (Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP at 4000, 585 – 8th Ave. S.W., Calgary, AB T2P 1G1, Canada), we MUFG Bank, Ltd., New York Branch hereby establish, effective immediately, this Irrevocable Letter of Credit No. [number] ("Letter of Credit") in favor of the State of Oregon, by and through the Oregon Department of State Lands ("Beneficiary") in the amount of U.S.$[amount] (as such amount may be reduced from time to time by partial draws hereunder, the "Stated Amount").

This Letter of Credit is being issued in connection with the Removal-Fill Permit No. 60697 granted to Jordan Cove Energy Project L.P. and Pacific Connector Gas Pipeline, LP , dated [date], as may be amended from time to time.

This Letter of Credit is issued, presentable, and payable at our offices at MUFG Bank, Ltd., New York Branch, 1251 Avenue of the Americas, New York, New York 10020, Attn. Trade Service Operations/ Standby LC Section, and expires with our close of business on [date] (the "Expiration Date").

Subject to the terms and conditions herein, funds under this Letter of Credit are available at sight against your draft drawn on us bearing upon its face the clause "Drawn under MUFG Bank, Ltd., New York Branch Letter of Credit Number [number] dated [date]" and accompanied by the following documents:

1. The original of the Letter of Credit and all subsequent amendments, if any; and
2. Your sight draft drawn on us (Exhibit A); and
3. A dated draw certificate signed by an official of the Oregon Department of State Lands on the Oregon Department of State Lands' letterhead in the form of Exhibit B or C to this Letter of Credit.

Partial and multiple draws are permitted under this Letter of Credit, provided that the Stated Amount of this Letter of Credit shall be permanently reduced by the amount of each such draw.

This Letter of Credit may not be transferred nor any of the rights hereunder assigned. Any purported transfer or assignment shall be void.

MUFG Bank, Ltd., New York Branch agrees that a draft drawn and presented in conformity with the terms of this Letter of Credit will be duly honored upon presentation. If a draft made by Beneficiary does not conform to the terms and conditions of this Letter of Credit, we will give Beneficiary prompt notice that the demand for payment will not be effective. Such notice will include a statement or reasons for the denial. Upon being notified that the demand for payment was not in conformity with this Letter of Credit, Beneficiary may attempt to correct the nonconforming demand; provided, however, that any draft or document presented to correct such nonconforming demand must be provided on or before the Expiration Date.

This Letter of Credit sets forth in full our undertaking and such undertaking shall not in any way be modified, amended, amplified, or limited by reference to any documents, instruments, or agreements referred to herein, except only the exhibits referred to above; any such reference shall not be deemed to incorporate by reference any document, instrument, or agreement except for such exhibits.

As far as otherwise expressly stated herein, this Letter of Credit is subject to, and governed by, the laws of the State of Oregon and to the International Standby Practices 1998 ('ISP98'), International Chamber of Commerce Publication No. 590, and as to matters not addressed by ISP98, this Letter of Credit shall be governed by the laws of the State of Oregon.

Sincerely,

____
(Authorized Signature)
(printed or typed name and title)

(This EXHIBIT A is an integral part of the irrevocable letter of credit number _____)

(Letterhead of Beneficiary)

SIGHT DRAFT

[Date]

MUFG BANK, LTD., NEW YORK BRANCH
1251 AVENUE OF THE AMERICAS
NEW YORK, NEW YORK 10020
ATTN. TRADE SERVICE OPERATIONS/ STANDBY LC SECTION

AT SIGHT, PAY TO THE ORDER OF: OREGON DEPARTMENT OF STATE LANDS THE SUM OF
______________________ U.S. DOLLARS

DRAWN UNDER MUFG BANK, LTD., NEW YORK BRANCH LETTER OF CREDIT NO. [number]

DATED (date)

STATE OF OREGON, acting by and through the
DEPARTMENT OF STATE LANDS, as Beneficiary

By: _________________________________
(SIGNATURE)

Name: _________________________________
(PRINTED)
Title: _________________________________

PAYMENT OF THE AMOUNT SPECIFIED IN THIS DRAFT SHOULD BE WIRE TRANSFERRED TO THE BENEFICIARY IN ACCORDANCE WITH THE FOLLOWING INSTRUCTIONS:

Draw Certificate – Breach of Permit)
(This EXHIBIT B is an integral part of the irrevocable letter of credit number _______.)

(Letterhead of Beneficiary)

(Date)

MUFG Bank, Ltd., New York Branch
1251 Avenue of the Americas
New York, New York 10020
Attn. Trade Service Operations/ Standby LC Section

Drawn under MUFG Bank, Ltd., New York Branch Irrevocable Standby Letter of Credit Number [number] dated [Date of Letter of Credit]

Ladies and Gentlemen:

Any capitalized term used herein shall have the meaning defined for that term by the Letter of Credit.

The undersigned, the duly appointed and acting official of the Beneficiary, hereby certifies as follows:

1. Compensatory mitigation on Section (section), Township (township), Range (range), (County) County, Oregon, is not in compliance with Permit No. (ID number).

2. As a result of such breach of the Permit, the Beneficiary is entitled pursuant to the provisions of the Permit to make demand under the Letter of Credit in the amount of U.S.$ [amount].

3. The undersigned has concurrently presented to you its sight draft drawn in the amount specified in paragraph 2 above, which amount does not exceed the lesser of (a) the amount the Beneficiary is entitled to draw pursuant to the terms of the Permit, and (b) the Stated Amount as of the date hereof. The date of the sight draft is the date of this Certificate, which is not later than the Expiration Date.

DATED [date]

STATE OF OREGON, acting by and through the Department of State Lands, as Beneficiary

By: ____________________________

Title: __________________________

(Draw Certificate-election not to extend)

[This EXHIBIT C is an integral part of the irrevocable letter of credit number _____.]

Letterhead of Beneficiary)

[Date]

MUFG Bank, Ltd., New York Branch
1251 Avenue of the Americas
New York, New York 10020
Attn. Trade Service Operations/ Standby LC Section

Drawn under MUFG Bank, Ltd., New York Branch Irrevocable Standby Letter of Credit Number [number] dated [Date of Letter of Credit]

Ladies and Gentlemen:

Any capitalized term used herein shall have the meaning defined for that term by the Letter of Credit.

The undersigned, the duly appointed and acting official of the Beneficiary, hereby certifies as follows:

1. (bank) has heretofore provided written notice to the Beneficiary of the Bank's intent not to renew the Letter of Credit following the present Expiration Date thereof.

2. As a result of such notice, the Beneficiary is entitled pursuant to the provisions of the Permit to make demand under the Letter of Credit in the amount of U.S.$ [amount].

3. The undersigned has concurrently presented to you its sight draft drawn in the amount specified in paragraph 2 above, which amount does not exceed the lesser of (a) the amount the Beneficiary is entitled to draw pursuant to the terms of the Permit, and (b) the Stated Amount as of the date hereof. The date of the sight draft is the date of this Certificate, which is not later than the Expiration Date.

DATED [date]

STATE OF OREGON, acting by and through the
Department of State Lands, as Beneficiary

By: ____________________________

Title: __________________________

APPENDIX O.2

Pacific Connector's Wetland, Waterbody, and Riparian Mitigation Plan

Pacific Connector Gas Pipeline, LP

Wetland, Waterbody, and Riparian Mitigation Plan

Pacific Connector Gas Pipeline Project

October 2017
(Updated May 2018 for DSL Removal-Fill Application)
(Revised July 2018 for DSL Removal-Fill Application)

Table of Contents

List of Figures

List of Attachments

1.0 INTRODUCTION

Construction of the 229.09-mile Pacific Connector Gas Pipeline Project (Pipeline) will directly impact 112.19 acres of wetlands at 154 individual locations. The trench will cross through wetlands for 29,205.07 linear feet (5.53 miles). Of the total impact to wetlands, the Pipeline will affect 106.71 acres of palustrine emergent wetlands, 2.55 acres of palustrine forested wetlands, 2.30 acres of palustrine scrub-shrub wetlands and 0.64 acre of palustrine unconsolidated bottom or aquatic bed wetlands (stock ponds) wetlands will be disturbed. Effects to the estuarine wetlands within Coos Bay have been avoided by incorporating horizontal directional drill (HDD) trenchless crossing methods in the Pipeline design. Most of the impacts to emergent wetlands, approximately 95.1 percent of the total wetland disturbance, are agricultural wetlands (pastures) which have been previously disturbed (i.e., grazed and/or routinely mowed or farmed for hay production). Most of these wetlands occur in the Klamath Basin; however large pasture wetlands are also crossed in coastal floodplains such as along the Coos River, Kentuck and Stock sloughs, and in a number of the valleys crossed by the Pipeline (e.g., Olalla Valley).

The Pipeline will affect 342 waterbodies; 64 of which are not crossed by the centerline (31 streams, 9 lakes or ponds, 23 ditches, and 1 estuarine feature) but are within the right-of-way or workspaces. Of the 342 waterbodies, 66 are perennial, 163 are intermittent, 100 are ditches, 9 are lakes or stock ponds, and 4 are estuarine (Coos Bay/2 HDD crossings, the HDD pullback at MP 0.0, and the Coos River). Available data indicate that 58 of the affected waterbodies are known or assumed to be inhabited by fish.

Tables A.2-2 and A.2-3 (see 'Tables' section in JPA) document the area affected in each waterbody and wetland system crossed by the Pipeline and the impact that will occur within the temporary construction right-of-way, temporary extra work areas (TEWAs), and temporary construction access roads (TARs). Table A.2.-2 and A.2-3 also specify the length of trench through each wetland and the cubic yards (removal and fill) that are estimated for excavation and backfill of the trench in each wetland or waterbody.

2.0 WETLAND AND WATERBODY MITIGATION

Wetland impacts have been or will be mitigated according to federal, state, and local regulations following a standard mitigation sequence. The sequence is as follows: (1) avoidance; (2) mitigation of impacts; and (3) compensation. Current federal and state regulations require that impacts to wetlands be avoided whenever practicable. Where avoidance of wetlands is not possible, impacts will be minimized and mitigated by restoration. Where permanent impacts to wetlands are unavoidable, compensation is required to offset the loss of wetland area and function. Each of the steps in the wetland mitigation sequence as applied to the Pipeline is described below.

2.1 AVOIDANCE AND MINIMIZATION – PIPELINE ROUTING

As described in Attachment A/Project Description, PCGP developed a multidisciplinary team, including engineering, construction and environmental specialists, to identify potential corridors in the area between the interconnects with the GTN Pipeline system and the Ruby Pipeline systems and the proposed LNG Terminal that could be utilized as preliminary pipeline routes. During this routing process, the primary selection criterion was to identify existing corridors such as roads, railroads, pipelines, and powerlines which could be paralleled. Other than existing highway corridors, few contiguous corridors (powerline, pipeline or railroad) were identified. PCGP analyzed the preliminary routes based on a number of criteria/objectives outlined in Attachment B/Alternatives, including:

- Construction feasibility to safely construct and operate a large diameter, underground, high pressure, welded steel natural gas transmission pipeline;
- Pipeline stability (avoiding geohazards where possible, minimizing side hill slopes, and maximizing ridgeline alignments where possible);
- Avoidance of known designated sensitive natural resource areas, including national parks, national monuments, wild and scenic rivers, scenic byways, wilderness areas, and Areas of Critical Environmental Concern;
- Utilization of existing corridors and rights-of-way;
- Minimizing disturbance to sensitive areas such as:
    - Reducing waterbody and wetland crossings;
    - Reducing landowner encumbrances by avoiding populated areas (towns, populations centers, commercial areas, and residential subdivisions);
    - Minimizing disturbance near scenic waterways and/or byways;
    - Avoiding identified cultural and historic resources when feasible; and
    - Avoiding or minimizing removal of significant habitat for protected species.
- Locating the most direct route, taking into consideration the above factors. (Minimizing the length of the route reduces vegetation clearing, grading/trenching requirements, overall disturbance and potential impacts to sensitive resources, landowner encumbrances, and overall costs.)

Based on the routing feasibility analysis, a primary cross-country route was selected which traverses ridgelines and watershed boundaries to ensure the safety, stability, and long-term integrity of the Pipeline. By following ridgelines and watershed boundaries, the route significantly avoids and minimizes impacts to wetlands and waterbodies. Most of the waterbodies that are crossed are intermittent headwater streams that are expected to be dry during the summer construction window. The proposed route is provided on USGS-based topographic maps provided in the 'Figures' section in the JPA

2.1.1 Coos Bay Alternatives MPs 0.00 to 6.37R

As noted in Section 10.4-1 and shown on Figure 10.4-1 in Attachment B, PCGP avoided the Coos Bay estuary by incorporating two HDDs into the design. The first 5,200-foot HDD will cross the Coos Bay estuary from the North Spit at about MP 0.12 to MP 1.11 south of North Point on the west side of Highway 101. From MP 1.40 to MP 3.09, an approximate 9,000-foot HDD will be utilized for the second crossing of the Coos Bay estuary (see Figure 1). Appendix G.2 to Attachment C/Affected Water Resources provides the Feasibility Evaluations for the Coos Bay HDDs.

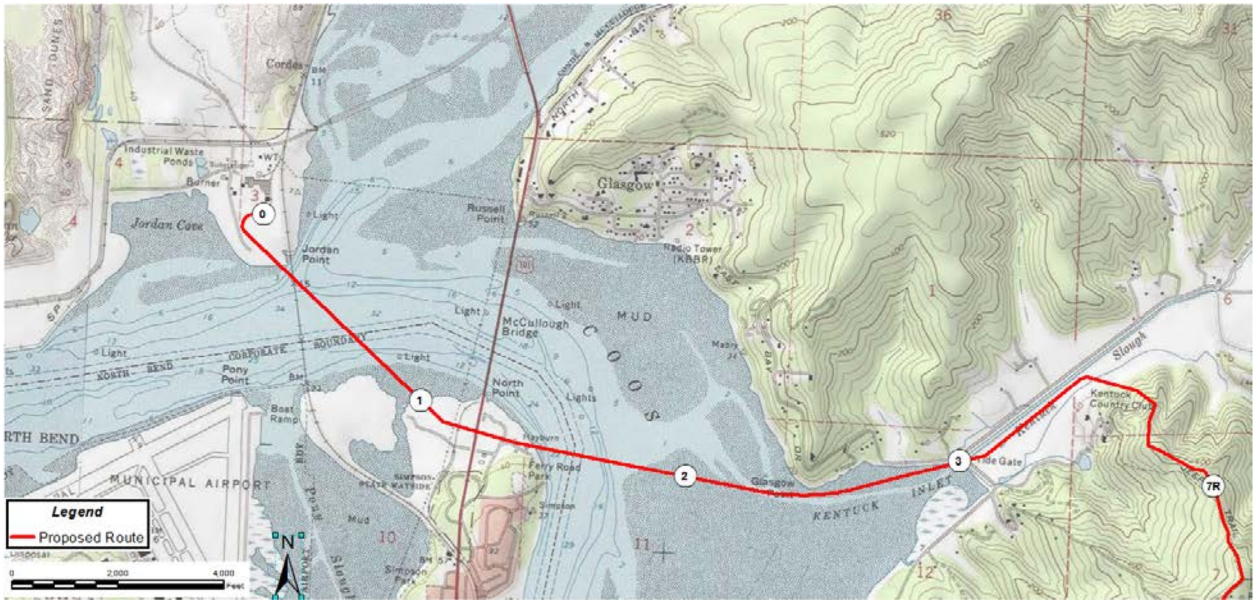

Figure 1
Alignment between MPs 0.00 and 7.0R
Incorporating Proposed HDD Crossings of Coos Bay Estuary

2.1.2 Blue Ridge Route

PCGP incorporated the Blue Ridge Route between MPs 11.29R and 21.8, as described in Section 10.4.1.2 and shown on Figure 10.4-2 in Attachment B/Alternatives. This route, which reduces impacts to private landowners, was incorporated into the alignment based on stakeholder involvement. The Blue Ridge Route also significantly reduces the number of waterbodies crossed: 10 compared to 57 crossed by the modified 2015 FEIS Route and 65 crossed by the 2015 FEIS Route (see Table 10.4.1.2 in Attachment B). As shown in Table 10.4.1.2 in Attachment B, the Blue Ridge Route reduces the number and total length of wetlands crossed by 1.0 mile or more compared to the other alternatives considered in this area.

2.1.3 Clover Creek Alternative

PCGP incorporated the Clover Creek Road Alternative into the design between MPs 171 and 190 to avoid traversing a wet meadow that is known to support the Oregon Spotted Frog (see Section 10.4.1.54 and Figure 10.4-5d in Attachment B/). This alternative also avoids crossing 1.8 miles of Buck Lake, a broad, emergent wetland which has been altered by extensive drainage ditches and grazing activities. Further, incorporating the Clover Creek Road Alternative into the design avoids crossing Spencer Creek, a known redband trout spawning area.

2.2 MEASURES TO MINIMIZE WETLAND IMPACTS

PCGP has further reduced potential wetland and waterbody impacts by incorporating the measures outlined in FERC's Wetland and Waterbody Construction and Mitigation Procedures (Wetland and Waterbody Procedures) and Upland Erosion Control, Revegetation, and Maintenance Plan (Upland Plan) into the design. FERC's Wetland and Waterbody Procedures and Upland Plan are provided in Attachments A and B to the Erosion Control and Revegetation Plan (ECRP – see Appendix B.1 to Attachment A/Project Description). There are situations where PCGP has requested a modification from FERC's Wetland and Waterbody Procedures based on site-specific conditions. Modification requests and rationales are included in Table A.1-1 included in Appendix A.1 to Attachment A/Project Description.

The intent of FERC's Wetland and Waterbody Procedures is to minimize the extent and duration of disturbance in wetlands and waterbodies. The intent of FERC's Upland Plan is to confine disturbance to certificated areas (including construction right-of-way, TEWAs, and access roads), to minimize erosion, and to enhance revegetation in areas affected during construction. The Upland Plan and Wetland and Waterbody Procedures have been developed with the participation of other federal, state and local agencies, industry, and the public nationwide specifically to mitigate potential impacts from pipeline projects.

To minimize impacts to wetlands, PCGP has reduced (or "necked-down") the width of the construction right-of-way through wetlands from 95 to 75 feet where feasible. Neck-downs through wetlands are consistent with FERC's Wetland and Waterbody Procedures. A typical construction right-of-way configuration through wetlands is shown on Drawing 3430.34-X-0005 (see Attachment 4 to this plan, as well as Appendix B.1 to Attachment A/Project Description).

Where clearing is required, PCGP will cut, mow, or shear woody vegetation so that the roots are left intact. This will facilitate the sprouting of tree, shrub and emergent species so that the recovery time following construction is minimized. The roots will also help hold the soils so that erosion is minimized.

Permanent conversion of wetland vegetation types associated with the Pipeline will occur in those few areas where the alignment crosses scrub-shrub or forested wetlands. As required by FERC's Wetland and Waterbody Procedure's (Section VI.D.1), PCGP will not conduct vegetation maintenance over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic pipeline corrosion/leak surveys, a corridor centered on the Pipeline and up to 10 feet wide may be maintained in an herbaceous state. In addition, trees that are within 15 feet of the pipeline may be cut and removed from the permanent right-of-way during the life of the Pipeline. Permanent vegetation type conversion impacts have been quantified in Table A.2-3 (see 'Tables' section in JPA) based on the length of the centerline through palustrine scrub-shrub (PSS) and palustrine forested (PFO) wetlands. As noted in Table A.2-3, only 0.91 acre of wetlands would be converted from either a shrub to an emergent vegetation type or from a forested vegetation type to either an emergent or scrub-shrub type. Where the Pipeline crosses scrub-shrub wetlands, the centerline was buffered by 10 feet to quantify the area of the wetland along the centerline that would be maintained in an herbaceous state. In forested wetlands the centerline was buffered by 30 feet to determine the area that would be permanently converted to scrub shrub or herbaceous vegetation types.

To minimize disturbance, PCGP will verify and clearly mark (with flagging) the construction limits and boundaries of all sensitive areas (including waterbodies and wetlands) prior to construction clearing. Flagged boundaries will be maintained during construction. PCGP will ensure that all construction activities are confined to the certificated work limits authorized for construction.

TEWAs have been located a minimum of 50 feet from the edge of wetlands and waterbodies, where possible, to minimize impacts to wetland buffers and riparian zones as required by FERC's Wetland and Waterbody Procedures. There are a number of situations where PCGP has requested modifications from the Wetland and Waterbody Procedures (see Table A.1-1 in Appendix A.1 to Attachment A/Project Description) based on topographic or other site-specific construction feasibility issues which prevent locating a TEWA 50 feet from the wetland or waterbody boundary.

During construction, PCGP will have multiple Environmental Inspectors (EIs) present during all phases of construction within wetlands and waterbodies to ensure compliance with the Upland Plan and Wetland and Waterbody Procedures as well as other permit stipulations/requirements. Section II A. and B. of FERC's Upland Plan (see Attachment A in Appendix B.1 to Attachment A/Project Description) outlines the responsibility of the EIs.

PCGP's proposed erosion control and revegetation techniques have been developed to minimize erosion and the extent and duration of impacts, as well as to maximize revegetation success. Those techniques are described in the ECRP provided in Appendix B.1 to Attachment A/Project Description. The ECRP incorporates measures outlined in FERC's Upland Plan and Wetland and Waterbody Procedures.

Silt fences and/or hay bales will be installed at the edges of the construction right-of-way in wetlands where there is a possibility for excavated trench spoil to flow into undisturbed areas of the wetland. Dewatering of the trench will be accomplished in a manner such that no heavily silt-laden water flows into any wetland or waterbody. Trench breakers will be installed where necessary to prevent the wetland from draining through the trench and to maintain its hydrologic integrity. A diagram of a trench breaker is provided in the ECRP (see Drawing 3430-34-0011 in Attachment C in Appendix B.1 to Attachment A/Project Description). Where the trench could potentially drain a wetland, the trench bottom will be sealed as necessary to maintain wetland hydrology. After construction, all disturbed areas within wetlands will be returned to their preconstruction contours, to the extent practicable, to maintain the wetland's hydrologic characteristics.

To minimize potential for spills and any impact from such spills, a Spill Prevention, Containment, and Countermeasures (SPCC) Plan has been developed and will be implemented during construction (see Appendix B.2 to Attachment C/Affected Water Resources). Fueling and storage of hazardous materials will be conducted in accordance with PCGP's SPCC Plan and FERC's Wetland and Waterbody Procedures.

2.3 SPECIFIC MEASURES TO MINIMIZE WATERBODY CROSSING IMPACTS

PCGP has incorporated five HDDs to install the pipeline beneath the 1) Coos Bay estuary/2 HDDs; 2) Coos River; 3) Rogue River; and 4) Klamath River. In addition, a Direct Pipe® (DP®) crossing method has been incorporated to cross the South Umpqua River (MP 71.27), which provides an efficient/single trenchless crossing of I-5, the South Umpqua River, Dole Road, and a railroad and eliminates the open cut river crossing. The trenchless HDDs and DP crossing methods will avoid impacts to important aquatic resources. The HDD design reports for the river crossings and feasibility evaluations for the Coos Bay HDDs are included in Appendix G.2 to Attachment C/Affected Water Resources. An overview of the DP® technologies and the DP® Design for the South Umpqua River (MP 71.27) are provided in Appendix J.2 to Attachment C.

Appendix E.2 to Attachment C provides a site-specific crossing plan for the diverted open-cut crossing of the South Umpqua River Crossing at MP 94.73 along with the Diverted Open Cut Crossing Design Support report.

PCGP has also incorporated conventional bore (trenchless) crossing methods into the design to cross the Medford Aqueduct (MP 133.38) and 26 other canals, ditches, and drains which include all of the Bureau of Reclamation's jurisdictional facilities in the Klamath Basin. The conventional bores will minimize potential impacts to these water conveyance features.

All streams flowing at the time of construction, that are not crossed by HDD, DP®, or conventional bores, will be crossed using dry open cut crossing procedures (flume, dam and pump, [or diverted open cut at the South Umpqua River at MP 94.73]). Each crossing method is described in Section 2.2.5.2 in Attachment C/Affected Water Resources. A full discussion of the fluming and dam and pump crossing methods and safeguards are provided in Appendices C.2 and D.2 to Attachment C. A summary of fluming procedures follows:

- A flume pipe (or pipes) is placed on the bottom of the waterbody and aligned with the flow of the stream. The size of the flume pipe and the number of pipes to be used is determined by the amount of flow in the particular waterbody. The flume pipe is longer than the construction area width of the crossing.
- A temporary dam of sandbags and plastic is constructed at the upstream end of the flume, resulting in the entire stream flow passing through the flume and bypassing the construction area. This allows continuous stream flow to downstream reaches.
- A similar temporary dam of sandbags and plastic is constructed at the downstream end of the flume. This prevents the water in the stream from backflowing into the construction area.
- All instream excavation is done between the dams. The dams prevent turbid water created by construction from flowing downstream.
- Adequate flow rates will be maintained.
- Temporary spoil placement will be at least 10 feet from the waterbody and will be contained by sediment barriers.
- Clean gravel or cobbles will be placed in the upper one-foot of trench backfill using specifications provided by the ODFW; and
- All banks will be stabilized and temporary sediment barriers will be installed within 24 hours of completing the crossing.

The dam and pump crossing method is similar to the fluming method, except instead of a flume pipe to divert stream flow to the downstream side of the construction zone, pumps are used to pump water around the upstream and downstream dams isolating the construction zone. Flumes or dams and pumps will be completely installed and functioning prior to any instream disturbance. All dry open cut crossings will be completed as a single effort to minimize the time of instream disturbance. Once stream flow is diverted through the flume pipe or pumps, but prior to pipeline trenching, any fish trapped in the water remaining in the work area between the dams will be removed by seining or electroshocking and released downstream. PCGP will contract with a qualified aquatic consultant to capture fish according to appropriate ODFW permitting requirements. Because the flume will maintain stream flow, fish may move downstream and upstream through the flume pipe. Flumes will be removed as soon as possible following backfilling of the trench. Fish passage using the dam and pump procedures is temporarily restricted during the construction period which is typically less than 48 hours. PCGP proposes to install the pipeline across fish-bearing waterbodies during the ODFW recommended in-water construction windows.

2.4 IMPACT MITIGATION/RECTIFICATION

Temporary impacts to wetlands will be mitigated by restoration of disturbed sites. Impacts to palustrine emergent and palustrine scrub-shrub wetlands are considered temporary and short-term. It is expected that palustrine emergent wetlands can be reestablished within one growing season. Scrub-shrub wetlands typically require approximately two to five years to recover to pre-construction cover and density. Impacts to forested wetlands are considered long-term (10 to 25 years or longer) because of the time required to reestablish these systems. Restoration measures that would be utilized to mitigate impacts to wetlands are described below.

Compaction of wetland soils and soil mixing from rutting within wetlands will be minimized by using low ground-weight equipment and/or by working from prefabricated timber mats. In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing (i.e., clear the right-of-way, dig the trench, fabricate and install the pipe, backfill the trench and restore the right-of-way) will use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, all other equipment traffic in wetlands will be limited to using the construction right-of-way to minimize impacts.

Vegetation in wetlands will be cut to ground level in the construction right-of-way to promote vegetation regeneration. Grading and stump removal will be performed only over the trench, except where required for safety and as determined by PCGP's Chief Inspector. This will facilitate reestablishment of emergent and woody species by enabling sprouting from existing root systems.

To further promote reestablishment of native wetland species, 12 inches of topsoil will be salvaged in all unsaturated wetlands over the trenchline. The salvaged topsoil will be stockpiled to prevent mixing with subsoils or spoil materials and returned to the top of the trench after construction. Topsoil salvaging over the trench line and limiting grading within the construction right-of-way will promote reestablishment of wetland species by preserving the vegetative propagules (seeds, roots, tubers, rhizomes, bulbs) present in the soil. Propagules potentially promote reestablishment of native wetland vegetation by germinating or sprouting from replaced topsoil.

After completion of construction and during final clean-up, original topographic conditions and contours of uplands, wetlands, and streambeds will be restored to reestablish drainage patterns and wetland hydrology. Any excess backfill will be spread over upland areas and stabilized during cleanup. Where the trench may drain a wetland, PCGP will install trench breakers and/or seal the trench bottom as necessary to maintain the original wetland hydrology. A permanent slope breaker and a trench breaker will be installed at the base of slopes near boundaries between the wetland and adjacent upland area. The trench breaker will be located immediately upslope of the slope breaker. A diagram of a trench breaker is provided in the ECRP in Appendix B.1 to Attachment A (see Drawing 3430-34-0011).

Impacts to wetlands will also be mitigated or rectified using general revegetation procedures as outlined in the ECRP. Fertilizer or lime will not be used in wetlands. After construction, wetlands will be seeded using the seed mixtures indicated for each wetland in Table 2-1 in Attachment 2 to this plan to further promote vegetation reestablishment. The seed mixes were developed for specific wetland types and with input from federal and state agencies. Wetland and waterbody/riparian seed mixtures include Seed Mixtures 8 through 12 and 15c which are included in Tables 2.2, 2.3, and 2.5 in Attachment 2. Disturbed emergent wetlands crossed by the Pipeline will be seeded with either Seed Mixture 9, 10, or 11 unless the landowner requests other mixtures. PCGP may also compensate landowners in the Klamath Basin to reestablish their own agricultural fields and wetlands in the pastures and hayfields crossed by the Pipeline. Wetlands that are dominated by native species will be seeded with Seed Mixture 12 or 15c which include native species that occur in wetlands in the region. The seed mixture tables provided in Attachment 2 of this plan list the species and seeding rates of each wetland seed mixture that will be planted. In addition, sprigs (live stakes or cuttings) and woody species will be installed at waterbody and wetland crossings to enhance wetland and riparian functions and to hasten the recovery of these wetland and riparian systems. All restored sites along the pipeline corridor will be planted no later than the first planting season (October through March) after completion of construction.

Selection and planting of woody species will be done in consultation with individual landowners. Woody species (native trees and shrubs) will be planted across the entire construction right-of-way and within riparian zones of all streambanks where woody species are present prior to construction. As indicated on Figure 3430.34-X-0016 provided in Attachment 4 to this plan, on private lands riparian planting will occur across the right-of-way based on Oregon Department of Forestry's (ODF) Riparian Management (RMA) buffer widths (see Table 2-5 in Attachment 2), subject to the 15-foot (trees) either side of centerline planting restriction required for maintenance/corrosion and leak surveys. The riparian planting area will occur to the RMA buffer width or to the limit of existing riparian vegetation where riparian vegetation does not exceed the RMA buffer. On federal lands PCGP will extend riparian strip planting along all perennial and intermittent streams within federally-designated riparian reserves to 100 feet or to the limit of existing riparian vegetation.

Species' placement will be correlated to moisture regime requirements based on three categories of wet, moist, or dry ground as indicated in Table 2-5 provided in Attachment 2. Plantings will conform to FERC's Wetland and Waterbody Procedures (Attachment B to the ECRP in Appendix B.1 to Attachment A) which advise that trees grow no closer than 15 feet to the pipeline. By revegetating streambanks with riparian species, streambank stability will be enhanced over the long-term and will provide for stream shading, sediment intercept, and input of detrital nutrients to the stream, all of which are key functions of riparian zones. FERC's Wetland and Waterbody Procedures limit vegetation maintenance adjacent to waterbodies to allow development of a riparian vegetative strip. Drawings 3430.34-X-0015 and 3430.34-X-0016 included in Attachment 4 (excerpted from Attachment C of the ECRP which is included in Appendix B.1 to Attachment A) show typical drawings of the revegetation and maintenance plan for forested and shrub wetland and riparian areas. Herbicides or pesticides will not be used within 100 feet of a wetland during maintenance activities for the life of the Pipeline.

Additionally, as indicated in the ECRP, PCGP will install supplemental transplanted trees that are root pruned a year in advance of restoration/replanting on the Umpqua National Forest within the riparian areas of East Fork Cow Creek and its tributaries and on South Fork Little Butte Creek on the Rogue River-Siskiyou National Forest. Root pruning a year in advance of replanting is expected to increase the survival success rate of the transplanted stock. Trees that would be root pruned would be selected from areas along the edge of the construction right-of-way or TEWAs that can remain in place without disturbance until the restoration phase of construction. Tree species type and diversity will be the same as what is presently growing at each site. A PCGP representative and the authorized agency representative will identify and flag the appropriate trees to be used for transplanting purposes. Table 2-6 provides the planting distance for the 15- to 20-foot tall root-pruned trees that would be planted on each streambank.

The transplanted root-pruned trees will be monitored annually according to FERC's Wetland and Waterbody Procedures. If the success rate drops below 80 percent, a Forest Service authorized representative will be informed and a plan will be developed between the Forest Service and PCGP to restock these sites.

In consultation with landowners, PCGP may place LWD at appropriate areas in the waterbody within the construction right-of-way to mitigate for potential short-term impacts that may occur to aquatic species from an open cut crossing and instream construction (see Attachment F). LWD placement would occur after the pipe has been installed across the waterbody, during ODFW instream construction windows and during the time when the flume or dam and pump controls are in place to minimize turbidity associated with the installation of the LWD. Other possibilities include placing LWD immediately downstream from the lower flume dam (to create a depositional rather than potential scouring environment at the pipeline crossing) either during or after the flume has been removed. LWD could be placed across a stream channel with minimal or no generation of sediment after construction, as well. Such decisions will be made on a site-by-site basis. Installation of the LWD without the flume or dam and pump control measures in place would only occur with the approval of the appropriate permitting agencies. PCGP has also developed the Stream Crossing Risk Analysis (see Appendix O.2 to Attachment C) which specifies BMPs that incorporate LWD where necessary for bed or bank restoration.

2.5 MITIGATION MONITORING

Typical planting schemes that will apply to forested or scrub-shrub wetlands and riparian areas are provided as Drawings 3430.34-X-0015 and 3430.34-X-0016 in the ECRP in Attachment 4 (also see Attachment C in Appendix B.1 to Attachment A). The proposed plant species and spacings are provided in Table 2-4 in Attachment 2 to this plan. Further Table 2-1 in Attachment 2 provides the proposed treatment for each wetland and waterbody affected by the Pipeline. PCGP will contract with a restoration contactor to provide and install the plantings. The contractor will be familiar with wetland and riparian ecological conditions in the area. Attachment 3 provides the typical procedures for preparing and planting live stakes or sprigs and planting bare root tree seedlings. Based on site-specific conditions, the restoration contractor may substitute or add native species to those provided in Table 2-4 in Attachment 2.

An "As-Built" Report documenting the final design of the restoration areas will be prepared when site construction and planting are completed. The report will include the following:

i. Site vicinity map;
ii. Drawings that identify the boundaries of the restoration areas;
iii. The installed planting scheme providing quantities, densities, sizes, and approximate locations of plants, as well as plant sources and the time of planting;
vii. General notes indicating site conditions, concerns or other issues that might affect site planting success.

A copy of the "As-Built" Report will be provided to the U.S. Army Corps of Engineers and Oregon Department of State Lands by December 31 or other specified date as required by these agencies of the year when planting is complete.

Consistent with FERC's Wetland and Waterbody Procedures and as detailed in PCGP's Long-Term Monitoring Plan (see Attachment 5 to this plan), monitoring of wetlands restored on the right-of-way will be conducted annually for three years following construction or until wetland revegetation is determined to be successful. In summary, qualified biologists will conduct monitoring during the growing season by collecting information on plant survival, percent vegetative cover, as well as hydrologic conditions. Photographs will be taken each year to support the monitoring efforts. Wetland revegetation shall be considered successful based on Oregon Revegetation Performance Criteria for Wetlands and Riparian Areas as outlined in Table 5-1 in Attachment 5, which provides specific criteria for native plant, invasive species and bare ground cover, species diversity, prevalence index and riparian composition.

Reports will be prepared after each monitoring period to document collected data. The reports will be submitted to the U.S Army Corps of Engineers as well as to the Oregon Department of State Lands by December 31 or other specified date as required by these agencies of each monitoring year. If the results of the monitoring at year three (3) show that the restored areas do not satisfy the performance standards, additional monitoring and mitigation may be required (e.g., replanting, soil amendments, selection of alternative species, etc.). Any additional monitoring or mitigation measures are subject to review and approval by the appropriate agencies.

Vegetation cover will be estimated (ocular) as described in the Long-Term Monitoring Plan (see Section 4.0 in Attachment 5) within a 1- to 2-meter plot that is randomly selected by habitat type. Metric measures will include species occurrence, their indicator status, native status, vegetation strata, species foliar cover, and bare substrate. Species foliar cover will be aggregated to total plant foliar cover, herbaceous plant foliar cover, woody foliar cover, and invasive plant foliar cover. Hydrologic conditions will be monitored by visual inspection to determine if the wetland hydrology has been reestablished. Monitoring will note presence of surface water or if groundwater is present in soil pits. Hydrologic indicators will also be noted (i.e., water marks or drift lines, sediment deposits, evidence of ponding, etc.). PCGP will be responsible for maintaining the restoration sites to meet the required performance standards. Maintenance may include, among others, removal of invasive species, removal of trash, and replacement of dead plants.

3.0 COMPENSATORY MITIGATION REQUIREMENTS

Construction of the Pipeline would not require any permanent wetland fill. However, approximately 0.91 acre of wetland type conversion impacts would occur where maintenance of the operational corridor would convert forested or scrub-shrub wetlands to a different wetland type to facilitate corrosion and leak surveys. To mitigate for the 0.91 acre of permanent wetland vegetation type conversion impacts, PCGP proposes to co-locate compensatory mitigation efforts with the LNG Terminal mitigation efforts at the former Kentuck Golf Course in Coos County (Kentuck Project). The Pipeline component of the Kentuck Project would be required to enhance a minimum of 2.73 acres of degraded emergent wetlands within the golf course to mixed forested and scrub-shrub wetlands based on a ratio of 3:1. The compensatory mitigation plan is in conformance with U.S. Army Corps of Engineers and Department of State Lands compensatory wetland mitigation requirements. The proposed mitigation would improve hydrologic function within the wetland by removing existing levees and regrading the site to improve hydrology and micro-topography to support a variety of plant species and providing access and refugia to fish during high flow events. Impacts from pipeline construction would be primarily a result of conversion from a mixture of forested and shrub wetlands to a mixture of shrub and herbaceous wetlands. The compensatory wetland mitigation plan will convert existing, degraded pasture wetland within the former golf course to complex native forested wetland, essentially a reversal of the proposed Pipeline impacts. Approximately 9.12 acres of mitigation will be undertaken to achieve this goal, including 6.39 acres of voluntary habitat improvements (above the minimum mitigation requirements). The Compensatory Wetland Mitigation Plan is provided in Attachment J to Part 2 of the Joint Permit Application.

In addition, PCGP will develop a Compensatory Mitigation Plan (CMP) to mitigate for potential effects on BLM and NFS lands. The BLM and Forest Service have previously proposed a suite of off-site mitigation projects which are intended to be responsive to BLM RMP and Forest Service LRMP objectives that include:

- Compliance with the Aquatic Conservation Strategy of the Northwest Forest Plan;
- Habitat for T&E species including northern spotted owls, marbled murrelets, and coho;
- Mitigation of impacts on LSRs; and
- Specific resource issues as they occur by watershed.

The CMP will include the BLM and Forest Service mitigation projects as supplemental mitigation to address important issues or land management plan objectives that cannot be mitigated on-site. Some of these mitigation projects include placement of LWD in steams, road surfacing and drainage repairs, road decommissioning, fish passage culvert replacements, terrestrial restoration, fire protection, fuels reduction, and projects to enhance special habitats.

PCGP will assess the BLM's proposed mitigation projects in relation to Pipeline effects by watershed, along with the Forest Service's mitigation projects that have been approved in principle by PCGP. The BLM and Forest Service mitigation projects are also being reviewed with respect to PCGP's responsibilities to mitigate for the potential effects to ESA-listed species and their habitats during the consultation process with the U.S. Fish and Wildlife Service.

At the request of the Oregon Department of Environmental Quality (ODEQ), through the 401 Water Quality Certification process, PCGP evaluated thermal impacts on streams crossed by the Pipeline using an effective shade-based analysis where solar load was calculated in the baseline condition, as well as temporary construction impact and permanent right-of-way impacts (see Appendix Q.2 to Attachment C/Affected Water Resources). The results of the thermal impact analysis will be applied to developing a thermal mitigation plan to mitigate temporary impacts at a 1:1 ratio and permanent impacts at a 2:1 ratio, which would be associated with the 30-foot operational easement. Mitigation will consist of widespread riparian plantings within each ecoregion and site potential tree height distribution to provide in-kind mitigation where feasible, and a trading protocol will be developed through consultation with ODEQ to provide out-of-kind mitigation where necessary.

4.0 REFERENCES

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Oregon Department of Forestry and Oregon Department of Fish and Wildlife. 1995. A Guide to Placing Large Wood in Streams. Oregon Department of Forestry, Forest Practices, Salem, OR. and Oregon Department of Fish and Wildlife, Habitat Conservation Division, Portland, OR.

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U.S. Fish and Wildlife Service. 2004. Proposed Rule: Proposed Designation of Critical Habitat for the Jarbidge River, Coastal-Puget Sound, and Saint Mary-Belly River Populations of Bull Trout. Federal Register 69(122):35768-35857.

Washington State Department of Ecology. 2004. Draft. Wetlands in Washington State Volume 2: Managing and Protecting Wetlands. Washington State Department of Ecology Publication # 04-06-024.

ATTACHMENT 1

SUMMARY OF WETLAND IMPACTS

Table 1-1
Summary of Wetland Impacts by Fifth Field/HUC10 Watershed (updated May 2018)

Ecoregion and Sub-basin[1]	HUC 10/Fifth field Watershed[1]	Approximate Milepost Range[2]	Miles Crossed	Cowardin Classification	Width of Crossing (feet)	Acres of Construction ROW in Wetland	Acres of Temporary Extra Work Area in Wetland	Acres of Temporary Access Road in Wetland	Total Construction Disturbance in Wetland (acres)	Total Permanent Wetland Vegetation Type Conversion (or fill) (acres)
Coast Range Ecoregion Coos Subbasin (HUC 17100304)	Coos Bay Frontal (HUC 1710030403)	0.0 – 20.06	15.37	PEM PSS PFO PAB/PUB **Total**	8,736.65 243.07 98.08 0.00 **9,077.80**	19.04 0.16 0.15 0.00 **19.35**	23.13 0.07 0.18 0.64 **24.02**	<0.01 0.00 0.00 0.00 **0.00**	42.17 0.23 0.33 0.64 **43.37**	0.00 0.01 0.07 0.00 **0.08**
Coast Range Ecoregion Coquille Subbasin (HUC 17100305)	North Fork Coquille River (HUC 1710030504)	20.06 - 28.12	11.47	PEM PSS PFO **Total**	21.69 246.16 173.67 **441.52**	0.09 0.49 0.38 **0.96**	0.04 0.35 0.00 **0.39**	0.00 0.00 0.00 **0.00**	0.13 0.84 0.38 **1.35**	0.00 0.06 0.12 **0.18**
Coast Range Ecoregion Coquille Subbasin (HUC 17100305)	East Fork Coquille River (HUC 1710030503)	28.12 - 42.59	9.71	PEM PSS PFO **Total**	36.46 0.00 0.00 **36.46**	0.24 0.00 0.00 **0.24**	0.00 0.00 0.00 **0.00**	0.00 0.00 0.00 **0.00**	0.24 0.00 0.00 **0.24**	0.00 0.00 0.00 **0.00**
Coast Range Ecoregion Coquille Subbasin (HUC 17100305)	Middle Fork Coquille River (HUC 1710030501)	35.81 - 47.27	7.45	PEM PSS PFO **Total**	0.00 0.00 39.41 **39.41**	<0.01 0.00 0.07 **0.07**	0.00 0.00 0.00 **0.00**	0.00 0.00 0.00 **0.00**	<0.01 0.00 0.07 **0.07**	0.00 0.00 0.03 **0.03**
Klamath Mountains Ecoregion Coquille Subbasin (HUC 17100305)	Middle Fork Coquille River (HUC 1710030501)	47.27 – 53.16	8.32	PEM PSS PFO **Total**	0.00 0.00 0.00 **0.00**	0.00 0.01 0.00 **0.01**	0.00 0.00 0.00 **0.00**	0.00 0.00 0.00 **0.00**	0.00 0.01 0.00 **0.01**	0.00 0.00 0.00 **0.00**

Ecoregion and Sub-basin[1]	HUC 10/Fifth field Watershed[1]	Approximate Milepost Range[2]	Miles Crossed	Cowardin Classification	Width of Crossing (feet)	Acres of Construction ROW in Wetland	Acres of Temporary Extra Work Area in Wetland	Acres of Temporary Access Road in Wetland	Total Construction Disturbance in Wetland (acres)	Total Permanent Wetland Vegetation Type Conversion (or fill) (acres)
Klamath Mountains Ecoregion South Umpqua Subbasin (HUC 17100302)	Olalla Creek - Lookingglass Cr (HUC 1710030212)	53.16 - 62.41	8.83	PEM PSS PFO **Total**	1703.25 0.00 530.50 **2,233.75**	3.63 0.00 0.93 **4.56**	0.40 0.00 0.43 **0.83**	0.00 0.00 0.00 **0.00**	4.04 0.00 1.36 **5.39**	0.00 0.00 0.37 **0.37**
Klamath Mountains Ecoregion South Umpqua Subbasin (HUC 17100302)	Clarks Branch -South Umpqua River (HUC 1710030211)	62.41 - 74.24	12.76	PEM PSS PFO **Total**	249.88 0.00 0.00 **249.88**	0.30 0.00 0.00 **0.30**	0.25 0.00 0.00 **0.25**	0.00 0.00 0.00 **0.00**	0.55 0.00 0.00 **0.55**	0.00 0.00 0.00 **0.00**
Klamath Mountains Ecoregion South Umpqua Subbasin (HUC 17100302)	Myrtle Creek (HUC 1710030210)	74.24 – 82.71	8.86	PEM PSS PFO **Total**	196.39 0.00 0.00 **196.39**	0.33 0.00 0.00 **0.33**	0.06 0.00 0.00 **0.06**	0.00 0.00 0.00 **0.00**	0.39 0.00 0.00 **0.39**	0.00 0.00 0.00 **0.00**
Klamath Mountains Ecoregion South Umpqua Subbasin (HUC 17100302)	Days Creek - South Umpqua River (HUC 1710030205)	82.71 – 102.58	19.16	PEM PSS PFO **Total**	1060.82 0.00 0.00 **1060.82**	2.21 0.00 0.00 **2.21**	1.27 0.40[3] 0.00 **1.67**	0.01 0.00 0.00 **0.01**	3.49 0.40[3] 0.00 **3.89**	0.00 0.00 0.00 **0.00**
Cascades Ecoregion South Umpqua Subbasin (HUC 17100302)	Upper Cow Creek (HUC 1710030206)	102.58-109.40	2.93	PEM PSS PFO **Total**	0.00 47.21 0.00 **47.21**	0.00 0.11 0.00 **0.11**	0.00 0.05 0.00 **0.05**	0.00 0.00 0.00 **0.00**	0.00 0.16 0.00 **0.16**	0.00 0.01 0.00 **0.01**
Klamath Mountains South Umpqua Subbasin (HUC 17100302)	Upper Cow Creek (HUC 1710030206)	109.40-111.10	2.34	PEM PSS PFO Total	93.95 0.00 0.00 **93.95**	0.22 0.00 0.00 **0.22**	0.00 0.00 0.00 **0.00**	0.00 0.00 0.00 **0.00**	0.22 0.00 0.00 **0.22**	0.00 0.00 0.00 **0.00**

Ecoregion and Sub-basin[1]	HUC 10/Fifth field Watershed[1]	Approximate Milepost Range[2]	Miles Crossed	Cowardin Classification	Width of Crossing (feet)	Acres of Construction ROW in Wetland	Acres of Temporary Extra Work Area in Wetland	Acres of Temporary Access Road in Wetland	Total Construction Disturbance in Wetland (acres)	Total Permanent Wetland Vegetation Type Conversion (or fill) (acres)
Klamath Mountains Upper Rogue Subbasin (HUC 17100307)	Trail Creek (HUC 1710030706)	111.10 - 121.78	10.68	PEM PSS PFO **Total**	27.89 0.00 0.00 **27.89**	0.05 0.00 0.00 **0.05**	0.00 0.00 0.00 **0.00**	0.00 0.00 0.00 **0.00**	0.05 0.00 0.00 **0.05**	0.00 0.00 0.00 **0.00**
Klamath Mountains Ecoregion Upper Rogue Subbasin (HUC 17100307)	Shady Cove-Rogue River (HUC 1710030707)	121.78 – 130.09	8.10	PEM PSS PFO **Total**	157.55 0.00 0.00 **157.55**	0.35 0.00 0.00 **0.35**	0.04 0.00 0.00 **0.04**	0.00 0.00 0.00 **0.00**	0.39 0.00 0.00 **0.39**	0.00 0.00 0.00 **0.00**
Klamath Mountains Ecoregion Upper Rogue Subbasin (HUC 17100307)	Big Butte Creek (HUC 1710030704)	130.09 - 135.04	5.09	PEM PSS PFO **Total**	1,392.74 253.24 34.15 **1,680.13**	2.86 0.34 0.08 **3.28**	0.89 0.03 0.00 **0.92**	0.01 0.00 0.00 **0.01**	3.76 0.37 0.08 **4.21**	0.00 0.07 0.02 **0.09**
Klamath Mountains & Cascades Ecoregion Upper Rogue Subbasin (HUC 17100307)	Little Butte Creek (HUC 1710030708)	135.04 – 168.00	32.92	PEM PSS PFO **Total**	1,584.04 1.68 0.00 **1,585.72**	3.94 0.01 0.00 **3.95**	1.88 0.04 0.00 **1.92**	0.04 0.00 0.00 **0.04**	5.86 0.05 0.00 **5.91**	0.00 <0.01 0.00 **<0.01**
Eastern Cascades Slopes and Foothills Ecoregion Upper Klamath R. Subbasin (HUC 18010206)	Spencer Creek (HUC 1801020601)	168.00 – 183.02	15.13	PEM PSS PFO **Total**	182.67 115.67 178.27 **476.61**	0.30 0.24 0.31 **0.85**	0.00 0.00 0.02 **0.02**	0.00 0.00 0.00 **0.00**	0.30 0.24 0.33 **0.87**	0.00 0.03 0.12 **0.15**

Ecoregion and Sub-basin[1]	HUC 10/Fifth field Watershed[1]	Approximate Milepost Range[2]	Miles Crossed	Cowardin Classification	Width of Crossing (feet)	Acres of Construction ROW in Wetland	Acres of Temporary Extra Work Area in Wetland	Acres of Temporary Access Road in Wetland	Total Construction Disturbance in Wetland (acres)	Total Permanent Wetland Vegetation Type Conversion (or fill) (acres)
Eastern Cascades Slopes and Foothills Ecoregion Lost River Subbasin (HUC 18010204)	Lake Ewauna - Klamath River (HUC 1801020412)	188.40 - 205.64	16.31	PEM PSS PFO **Total**	11,627.47 0.00 0.00 **11,627.47**	26.54 0.00 0.00 **26.54**	17.39 0.00 0.00 **17.39**	0.00 0.00 0.00 **0.00**	43.93 0.00 0.00 **43.93**	0.00 0.00 0.00 **0.00**
Eastern Cascades Slopes and Foothills Ecoregion Lost River Subbasin (HUC 18010204)	Mills Creek-Lost River (HUC 1801020409)	205.64 – 228.81	23.00	PEM PSS PFO **Total**	172.51 0.00 0.00 **172.51**	0.50 0.00 0.00 **0.50**	0.69 0.00 0.00 **0.69**	0.00 0.00 0.00 **0.00**	1.19 0.00 0.00 **1.19**	0.00 0.00 0.00 **0.00**
Total					**29,205.07**	**63.88**	**48.25**	**0.06**	**112.19**	**0.91**

1 Subbasin and Fifth Field Watersheds/HUC 10 USGS Hydrologic Unit Codes
2 Mileposts overlap between fifth field watersheds when alignment is located on the boundary between two adjacent watersheds.
3 Acres within Milo Pipe Yard 2. No permanent wetland vegetation type conversion.

ATTACHMENT 2

SUMMARY OF WETLAND RESTORATION TREATMENTS

Table 2-1
PCGP Wetland and Waterbody Restoration Treatments
(Subject to PCGP EI's or Restoration Representative's determination at the time of restoration based on site-specific conditions)

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
Coast Range Ecoregion, Coos Subbasin (HUC 17100304), Coos Bay-Frontal Pacific Ocean (HUC 1710030403) 5th Level Watershed [3], Coos County, Oregon										
Alt_Wetl_NA	0.00	Private	PFOC	Depressional	12	Yes	Wetland	None	N/A	Forested depressional wetland, seasonally flooded.
Alt_Wetl_NE	0.00	Private	PABH/PUBH	Depressional	12	None	Wetland	None	N/A	Depressional aquatic bed wetland, unconsolidated shore, permanently flooded.
Coos Bay Alt Wet NH (West)	0.00	State	E2EM	Estuarine	12	None	Wetland	None	N/A	Estuary Drain
J	0.14	Private	PEMA	Slope/Flats	12	None	Wetland	None	None	Tidally influenced emergent wetland
NE-26 Coos Bay	0.28 to 1.00	State	E1UBL, E2USN, E2USP	Estuarine	Avoid by HDD Crossing	Avoid by HDD Crossing	Avoid by HDD Crossing	Avoid by HDD Crossing	Avoid by HDD Crossing	Coos Bay – HDD (Trenchless Crossing)
APC-C2	1.16	State	PSS1R	Slope/Flats	12	Yes	Wetland	None	None	Scrub-shrub wetland, broad-leaved deciduous, seasonally flooded, tidally influenced
EE-WW-9902	1.20 1.41	State	PSSC/ PEM1A	Slope/Flats	9	Yes	Wetland	None	N/A	Scrub-shrub wetland, seasonally flooded
NE-26 Coos Bay	1.46-3.02	State	E1UBL, E2USN, E2USP	Estuarine	Avoid by HDD Crossing	Avoid by HDD Crossing	Avoid by HDD Crossing	Avoid by HDD Crossing	Avoid by HDD Crossing	Coos Bay – HDD (Trenchless Crossing)
KEN-A1 (NW-117/EE-6A0	3.25	State	PEM1Ad	Slope/Flats	JCEP [5, 6]	JCEP [5, 6]	JCEP [5, 6]	JCEP [5, 6]	JCEP [5, 6]	Emergent wetland, temporarily flooded, partially drained/ditched
KEN-A2 (NW-117/EE-6A)	3.33	State	PEM1Ad	Slope/Flats	JCEP [5, 6]	JCEP [5, 6]	JCEP [5, 6]	JCEP [5, 6]	JCEP [5, 6]	Emergent wetland, temporarily flooded, partially drained/ditched
KEN-A1 W1-01 (NW-117/EE-6A) Trib to Coos Bay – S1-01 (EE-6)	6.39R	Private	PEM	Slope/Flats	JCEP [5, 6]	JCEP [5, 6]	JCEP [5, 6]	JCEP [5, 6]	JCEP [5, 6]	Off-site determination south of Kentuck Slough. Slough sedge and reed canarygrass dominate – includes ditched drainage – Trib to Coos Bay
KEN-A2 W1-01 (NW-117/EE-6A) Trib to Coos Bay	6.39R	Private	PEM	Slope/Flats	JCEP [5, 6]	JCEP [5, 6]	JCEP [5, 6]	JCEP [5, 6]	JCEP [5, 6]	Emergent wetland
W1-02	6.47R	Private	PFO	Slope/Flats	12	Yes	Wetland	None	N/A	Spring fed wetland dominated by skunk cabbage.
S1-04 (EE-7 (MOD)) Willanch Slough	8.27R	Private	R2	Riverine F/T	9	Yes	Stream Banks and Riparian	Yes[10]	Yes (12.60)	Perennial tributary to Coos Bay
W1-04	8.33R	Private	PEM	Depressional	9	None	Wetland	None	N/A	Wetland in floodplain of Willanch Slough.
W-T01-001A-1	8.40R	Private	PEM1E	Slope/Flats	9	None	Wetland	None	N/A	Wetland pasture actively grazed by horses.
GDX-30 Trib. to Willanch Slough	8.48R	Private	R4	Riverine F/T	9	Yes	Stream Banks and Riparian	Yes[10a]	Yes (4.67)	Intermittent tributary to Willanch Slough
SS-100-002 Trib. to Cooston Channel	10.21R	Private	R4	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10]	Yes (6.74)	Echo Creek - Intermittent
WW-100-001	11.01R	Private	PEMA	Slope/Flats	9	None	Wetland	None	N/A	Freshwater Emergent Wetland
Coos River W-T01-002E-1 (WW-100-001)	11.10R	State	E2EM	Estuarine	Avoid by HDD Crossing	Avoid by HDD Crossing	Avoid by HDD Crossing	Avoid by HDD Crossing	Avoid by HDD Crossing	Low topographic bench/emergent wetland along the Coos River
BSP-119 Coos River	11.13R	State	E1UBL	Estuarine	Avoid by HDD Crossing	Avoid by HDD Crossing	Avoid by HDD Crossing	Avoid by HDD Crossing	Avoid by HDD Crossing	Coos River, ~650' wide – HDD (Trenchless Crossing)
WW-222-002	11.26R	Private	PEMAd	Slope/Flats	9	None	Wetland	None	N/A	Depressional herbaceous wetland
WW-500-001	11.39BR	Private	PEMA	Slope/Flat	9	None	Wetland	None	N/A	Small wetland swale w/in ditch in pasture
SS-100-005 (BR-S-02) Vogel Creek	11.55BR	Private	R2UBHx	Estuarine	9	None	Stream Banks and Riparian	Yes[10]	Yes (4.60)	Coos River Crossing – perennial stream
BR-W-03	11.74BR 12.00BR	Private	PEMA	Slope/Flats	9	None	Wetland	None	N/A	Wetland associated with Vogel Creek
BR-S-04 Ditch	11.88BR	Private	R2UBHx	N/A/Ditch	9	None	Stream Banks and Riparian	None (ag)	Yes (5.35)	Perennial ditch

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
Trib. to Vogel Creek										
BR-S-06 Ditch Trib. to Vogel Creek	12.11BR	Private	R2UBHx	N/A/Ditch	9	None	Stream Banks and Riparian	None (ag)	Yes (1.10)	Perennial ditch
EE-WW-9927	12.12BR	Private	PEM/PSS	Slope/Flats	9	None	Wetland	None	N/A	Emergent and shrub wetland, temporarily flooded.
BR-S-31 Trib. to Stock Slough	14.72BR	Private	R4SBC	Riverine F/T	9	None	Stream Banks and Riparian	None (ag)	Yes (0.72)	Intermittent stream
BR-W-04A	15.01BR	Private	PEMA	Slope/Flats	9	None	Wetland	None	N/A	Pasture wetland fed by Trib. to Stock, Slough (Lazxtrom Gulch), temporarily flooded
BR-W-04B	15.08BR	Private	PEMS	Slope/Flats	9	None	Wetland	None	N/A	Pasture wetland (Lazxtrom Gulch), seasonally flooded/saturated
BR-S-36 Stock Slough	15.11BR	Private	R2UBHx	Riverine F/T	9	Yes	Stream Banks and Riparian	Yes[10]	Yes (4.42)	Stock Slough, perennial stream
BR-W-05	15.15BR	Private	PEMS	Slope/Flats	9	None	Wetland	None	N/A	Pasture wetland fed by Stock Slough, seasonally flooded/saturated
Trib. To Stock Slough (Laxtrom Gulch) BR-S-30	15.16Br	Private	R4SBC	Riverine F/T		None	Stream Banks (not expected to be disturbed - crossed by existing access road)	None	None	Intermittent stream crossed by access road – no improvement
EE-SS-9068 Stock Slough	15.32BR	Private	R4SBC	Riverine F/T	9	Yes	Stream Banks and Riparian	Yes[10]	Yes (3.81)	Stock Slough, perennial stream, seasonally flooded
Coast Range Ecoregion, Coquille Sub-basin (HUC 17100305), North Fork Coquille River (HUC 1710030504) Fifth field Watershed [2,] Coos County, Oregon										
SS-500-003 (BR-S-63) Steinnon Creek	20.20BR	BLM-Coos Bay District	R4SB3	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10]	Yes (4.25)	Steinnon Creek
WW-500-003	20.99BR	Private	PEM/PSS	Slope/Flats	12	None	Wetland	None	N/A	Emergent and scrub-shrub wetland
BR-S-63 Steinnon Creek	24.32BR	BLM-Coos Bay District	R3UBH	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10]	Yes (8.63)	Steinnon Creek
W-T02-003A-1	22.50	Private	PSS1C	Depressional	12	Yes	Wetland	None	N/A	Approx. 80% of wetland is PEM with a few patches of PSS comprising the remaining 20%. However, permanent impacts assume 100% PSS.
DA-10X Ditch	22.72	Private	R4SBx	N/A/Ditch	1 or 9	No	Ditch Banks	None	None	3' wide ditch; drains agricultural field
NW-40	22.78	Private	PEMC	Slope/Flats	9	None	Wetland	None	N/A	Emergent wetland
W-T02-002A-1	22.90	Private	PEMC	Depressional	2 or 9	None	Wetland	None	N/A	Pasture wetland actively grazed.
BSP207 North Fork Coquille River	23.06	Private	R2UBH	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10]	Yes (24.02)	N. Fork Coquille River, only flagged north bank, no access; 20' wide
WW-222-009 (CW-10)	23.38	BLM - Coos Bay District	PFOC	Slope/Flats	12 [13]	Yes	Wetland and Riparian Reserve	None	N/A	Red alder dominated low area
S-T02-001 (EE-SS-9073) Trib. to Middle Creek	25.18	Private	S4SBC	Riverine F/T	12	Yes	Wetland and Riparian Reserve	Yes[10a]	Yes (1.69)	Seasonal intermittent stream
BSI-137 Trib. to Middle Creek	27.01	BLM - Coos Bay District	R4SB3C	Riverine F/T	13 [13 and 13a]	Yes [13a]	Drainage and Riparian Areas	Yes [13a]	Yes (6.70)	3-7' wide, parallel to BSI 136, ~10% gradient at top
WW-222-005 (BW-134)	27.02	BLM - Coos Bay District	PEMC	Slope/Flats	12 or 13 [13 and 13a]	Yes [13a]	Wetland and Riparian Reserve	Yes[10, 13a]	N/A	Flat area; intermittent stream outfalls from wetland
BSI-135 Trib. to Middle Creek	27.03	BLM - Coos Bay District	R4SB3C	Riverine F/T	13 [13 and 13a]	Yes [13a]	Drainage and Riparian Areas	Yes [13a]	N/A	Narrow int. drainage that starts at BW134, steep at top
BSP-133 Middle Creek	27.04	BLM - Coos Bay District	R2SB4H	Riverine F/T	12 or 13 [13 and 13a]	Yes [13a]	Stream banks and Riparian Reserve	Yes[10, 13a]	Yes (25.83)	Middle Creek-steep banks, 30-60' wide,< 2% gradient
Coast Range Ecoregion, Coquille Subbasin (HUC 17100305), East Fork Coquille River (HUC 1710030503) 5th Level Watershed [3], Coos County, Oregon										
BSP-77 Trib. to E. Fork Coquille	28.86	Private	R3SB1F	Riverine F/T	12	Yes	Stream banks and Riparian	Yes [10]	Yes (7.88)	Forested 1-8' wide stream; 30-40% gradient
BSP-74 Trib. To E. Fork	29.30	Private	R4UB1C	Riverine F/T	12	Yes	Stream banks and Riparian	Yes[10]	Yes (4.46)	Intermittent stream, 3-6' wide, 5-10% gradient

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
Coquille										
BW-72	29.52	Private	PEMC	Slope/Flats	9	None	Wetland	None	N/A	Pasture wetland fed by hillside seeps
BSI-76 Trib. to E. Fork Coquille	29.47	Private	R4SB1C	N/A/Ditch	12	Yes	Stream banks and Riparian	Yes[10]	Yes (5.23)	Intermittent stream connected to BSP74 outside corridor
BSP-71 East Fork Coquille River	29.85	Private	R3OWH	Riverine F/T	12	Yes	Stream Banks	Yes[10]	Yes (28.79)	East Fork Coquille River
SS-003-007A Trib. To East Fork Coquille	30.22	Private	R4SBx	Riverine F/T	12	Yes	Stream banks and Riparian	Yes[10]	No	3' wide ditch; drains agricultural field
SS-003-007B Trib. To East Fork Coquille	30.29	Private	R4SBx	Riverine F/T	12	Yes	Stream banks and Riparian	Yes[10]	No	3' wide intermittent tributary
BSI-70 Trib. to E. Fork Coquille	31.64	BLM - Coos Bay District	R4UB1C	Riverine F/T	13 [13]	Yes	Stream Banks and Riparian Reserves	Yes[10a]	Yes (0.59)	1' wide, flows subsurface in areas
BSP-57 Elk Creek	32.40	Private	R3RB2H	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10]	Yes (9.30)	3-10' wide, 1-5% gradient stream at base of canyon
S-T01-008 (BSP-55) Trib. To Elk Creek	32.50	Private	R3SB1H	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10a]	Yes (5.34)	Elk Creek; 1-5% gradient; 1-5' wide
S-T01-004 (SS-100-030) Trib. To Elk Creek	32.56	Private	R4SB1C	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10a]	Yes (2.13)	Intermittent stream, seasonally flooded
BSP-49 Trib. To Elk Creek	32.99	Private	R3SB1C	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10a]	Yes (1.24)	10' average width; 2-3% gradient
CW-6	34.45	Private	PEMC	Slope/Flats	12	None	Wetland	None	N/A	Similar to CW4, adjacent to Elk Creek
CSP-5 S. Fork Elk Creek	34.46	Private	R3SB1H	Riverine F/T	12	Yes	Stream Banks and Riparian Areas	Yes[10]	Yes (9.35)	Elk Creek; 10-15' wetted width; <2% gradient
CW-4	34.46	Private	R3SB1H/PEM	Riverine Slope/Flats	12	None	Wetland	None	N/A	Fringe wetland associated with Elk Creek
BSI-251 Trib. to S. Fork Elk Creek	35.51	BLM - Coos Bay District	R4UB1J	Riverine F/T	13 [13]	Yes	Stream banks and Riparian Reserves	Yes[10a]	None	Small 4' wide intermittent headwater tributary
Coast Range Ecoregion, Coquille Sub-basin (HUC 17100305), Middle Fork Coquille River (HUC 1710030501) Fifth field Watershed [3], Coos County, Oregon										
BLM-35.87/CSP-2 Trib.to Big Creek	35.87	BLM - Coos Bay District	R4SB	Riverine F/T	13 [13]	Yes	Stream banks and Riparian Reserves	Yes[10a]	None	Small intermittent headwater tributary, Crossing occurs within Elk Creek Road (BLM 28-11-29-0) and flows through a 12" culvert which will be replaced.
BLM 36.48 Trib. to Big Creek	36.48	BLM - Coos Bay District	R4SB	Riverine F/T	13 [13]	Yes	Stream banks and Riparian Reserves	Yes[10a]	None	Small intermittent headwater tributary
GSI-25 (BSI-253) Trib. to Big Creek	36.54	BLM - Coos Bay District	R4UB1J	Riverine F/T	13 [13]	Yes	Stream banks and Riparian Reserves	None	None	Intermittent stream, 4' average width
BLM 36.85 Trib. to Big Creek	36.85	BLM - Coos Bay District	R4SB	Riverine F/T	13 [13]	Yes	Stream banks and Riparian Reserves	Yes[10a]	None	Small intermittent headwater tributary, Crossing occurs within Elk Creek Road (BLM 28-11-29-0) and flows through a 12-18" culvert which will be replaced.
BSI-252 Trib. To Big Creek	36.92	BLM - Coos Bay District	R4UB1J	Riverine F/T	13 [13]	Yes	Stream banks and Riparian Reserves	in road lay minimize effects to waterbody	None	Intermittent stream, 3' average width
ESI-19 Trib. To Big Creek	37.32	BLM - Coos Bay District	R4UB1J	Riverine F/T	13 [13 and 13a]	Yes [13a]	Stream banks and Riparian Reserves	Yes[10, 13a]	Yes (3.55)	Narrow creek
ESP-20 Trib. To Big Creek	37.35	BLM - Coos Bay District	R3UB1H	Riverine F/T	13 [13 and 13a]	Yes [13a]	Stream banks and Riparian Reserves	Yes[10, 13a]	Yes (5.79)	10-15' wide broad U-shaped channel with cobble/silt substrate
WW-222-006 (CW-1)	43.63	Private	R4UB1Cx/PEM	N/A/Ditch	9	None	Wetland	None	N/A	Small wet ditch west of logging road; wetland vegetation

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
BSP-41 Upper Rock Creek	44.21	Private	R3UB1C	Riverine F/T	12	Yes	Wetlands and Riparian Areas	Yes[10]	Yes (13.82)	Unnamed perennial stream
Klamath Mountains Ecoregion, Coquille Subbasin (HUC 17100305), Middle Fork Coquille River (HUC 1710030501) 5th Level Watershed [3], Douglas County, Oregon										
W3-01 (BW-38 (MOD))	46.56	Private	PFO1	Riverine Imp.	12	Yes	Wetlands	None	N/A	Riverine impounding wetland adjacent to road, in clearcut
S3-07 (BW-38) Trib. to Upper Rock Creek	46.56	Private	R2UBH	Riverine F/T	12	Yes	Stream banks	Yes[10]	N/A	Perennial tributary to Upper Rock Creek.
S3-06 Ditch	48.21	Private	R4SBx	N/A/Ditch	1 or 11	None	Ditch	None	Yes (2.43)	Ditch
BSP-257 (MOD) Deep Creek	48.27	Private	PSS/R3UB1H	Slope/Flats	13 [13 and 13a]	Yes [13a]	Stream banks and Riparian Reserves	Yes[10, 13a]	Yes (3.26)	Broad perennial stream with associated wetland.
BDX-31 Ditch	50.02	Private	R4UB1Cx	N/A/Ditch	11	None	Ditch	None	None	3-5' wide trapezoidal drainage ditch along farm fence line
BSP-30 Middle Fork Coquille River	50.28	Private	R2OWH	Riverine F/T	12	Yes	Stream Banks and Riparian Areas	Yes[10]	Yes (14.52)	Middle Fork Coquille River; 1-3% gradient, 15-25' wide
GDX-36 (BS-66/67) Trib. to Middle Fork Coquille	50.45	Private	R4UB3C	Riverine F/T	11	None	Stream Banks	None	None	BSI066 Up to 1' wide. BSI067 continues to the rerouted alignment. 2-3' wide channel with upland forest species.
GSI-37 (BSP-61) Trib to Middle Fork Coquille	50.71	Private	R3UB3H	Riverine F/T	11	Yes	Stream Banks	Yes[10]	Yes (1.62)	3-10' wide stream in forest. Gravel substrate with 2-6" deep water
S1-07 (GSI-38) Trib to Middle Fork Coquille	51.02	Private	R4SBC	Riverine F/T	13 [13]	Yes	Riparian Reserves	None	None	Ephemeral drainage, no defined channel with vine maple and lady fern
Klamath Mountains Ecoregion, South Umpqua Subbasin (HUC 17100302), Olalla Creek-Lookingglass Cr (HUC 1710030212) 5th Level Watershed [3], Douglas County, Oregon										
BSI-202 Trib. to Shields Creek	55.90	Private	R4SB3C	Riverine F/T	11	Yes	Stream Banks	Yes[10]	Yes (13.92)	Small ephemeral drainage in heavily grazed pasture
BSI-203 Trib. to Shields Creek	55.94	Private	R4SB3C	Riverine F/T	11	Yes	Stream Banks	Yes[10]	None	Intermittent stream, portions of which are grazed
BW-164	55.98	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Depressional swale dominated by pennyroyal
DA-13 Trib to Shields Creek	56.28	Private	R4SB	Riverine F/T	11 or 12	Yes	Stream Banks	Yes[10a]	Yes (0.67)	Small 3-4' wide intermittent tributary
DA-14 Trib to Shields Creek	56.34	Private	R4SB	Riverine F/T	11 or 12	Yes	Stream Banks	Yes[10a]	Yes (1.94)	Small 3-4' wide intermittent tributary
DA-15	56.69	Private	PFO	Slope/Flats	12	Yes	Wetland	None	N/A	Palustrine forested wetland
BW-160	56.75	Private	PFOC	Slope/Flats	12	Yes	Wetland	None	N/A	Adjacent to BW161, separated by a gravel road
W-T02-004A-1 (BW-161)	56.78	Private	PEMC	Depressional	12	Yes	Wetland	None	N/A	Emergent wetland with scattered ash
Trib. to Olalla Creek S-T02-002	56.80	Private	R3SBC	Riverine F/T	12	Yes	Stream Banks	None	None	Small 3-4' wide intermittent tributary associated with emergent wetland W-T02-0041-1
BW-162	56.83	Private	PFO/PEMC	Slope/Flats	12	Yes	Wetland	None	N/A	Spring-fed wetland with forested and emergent portions
BW-163	56.97	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Continuation of BW162 on east side of driveway
BSI-140 Trib. Olalla Creek	57.11 57.14	Private	R4SB1C	Riverine F/T	12	Yes	Stream banks	Yes[10]	None	Narrow intermittent drain that joins BSI 138; <2% gradient
BW-142	57.18	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Seep-fed wetland on gentle slope above BW141
BW-141	57.25	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Depressional area in field, compacted soils
BSI-138 Trib. to Olalla Creek	57.31	Private	R4SB1C	Riverine F/T	12	Yes	Stream banks	Yes[10]	None	2-10' wide, <2% gradient, incised channel
BW-145	57.46	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Very small swale, connected to BW146
EE-12 (BSI-147) Trib. to Olalla Creek	57.84	Private	R4SB3C	Riverine F/T	12	Yes	Stream banks	Yes[10a]	Yes (2.25)	3-12' (average 4') wide, incised. Banks to 5' high. Cobble/gravel
BDX-148 Irrigation Canal	57.97	Private	R4UB3Cx	N/A/Ditch	11	None	Stream banks	None	None	1' wide irrigation canal
BW-150	58.07	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Along edge of corridor, connects to BSI151

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
BSI-151 Trib. to Olalla Creek	58.20	Private	R4SB1C	Riverine F/T	11	Yes	Stream Banks	Yes[10a]	None	2-3' wide, <5% gradient, U-shaped channel
W4-02 (BW-158 (MOD))	58.42	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Low area receives hydrology from irrigation
BSP-159 Trib. to Olalla Creek	58.55	Private	R2SB1H	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10a]	Yes (5.59)	Overflow channel of Olalla Creek, ends abruptly in a pool
BSP-155 Olalla Creek	58.78	Private	R2SB1H	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10]	Yes (46.14)	Olalla Creek; <5% gradient, 50' wide at TOB
BW-154	58.98	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	100' west of BDX153, similar to BW146
BDX-153 Ditch	59.02	Private	R4UB1Cx	N/A/Ditch	11	None	Ditch	None	None	2-4' wide, 2-3' deep ditch
BSI-132 Trib. to Olalla Creek	59.29	Private	R4UB1Cx	Riverine F/T	11	None	Stream Banks	Yes[10]	None	Mostly <2% gradient, deeply incised, 2-8' wide
BW-130	59.56	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Small seep wetland at farm road cut and below
BSI-129 Trib. to Olalla Creek	59.65	Private	R4SB3C	Riverine F/T	12	Yes	Stream Banks	Yes[10]	Yes (9.88)	< 2% gradient, cobble/gravel, 6-12' wide, mostly dry
BW-127	59.93	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Seep-fed subtle swale, connects to BW126; heavily grazed
BW-126	60.01	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Swale-like wetland dominated by pennyroyal
NSP-14 Trib. to McNabb Creek	60.13	Private	R3SB1H	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10]	Yes (4.39)	Forested tributary to McNabb Creek
NSP-13 McNabb Creek	60.48	Private	R3SB1H	Riverine F/T	12	Yes	Stream Banks	Yes[10]	Yes (5.14)	McNabb Creek
Klamath Mountains Ecoregion, South Umpqua Subbasin (HUC 17100302), Clarks Branch -South Umpqua River (HUC 1710030211) 5th Level Watershed [3], Douglas County, Oregon										
BSI-241 Trib. to Kent Creek	63.95	Private	R4UB1J	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10a]	None	Tributary to Kent Creek
BSP-240 Kent Creek	63.97	Private	R2UB1H	Riverine F/T	12	Yes	Stream Banks Banks and Riparian	Yes[10]	Yes (8.71)	Kent Creek
BSP-227 Rice Creek	65.76	Private	R3SB1H	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10]	Yes (44.63)	Rice Creek
BW-229	65.83	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Small, emergent wetland near road
BSI-230 Trib. to Willis Creek	66.87	Private	R4SB1J	Riverine F/T	11	None	Stream Banks	None	None	2' wide intermittent tributary to BSP-168
BSP-168 Willis Creek	66.95	Private	R3SB1C	Riverine F/T	12	Yes	Stream Banks	Yes[10]	Yes (21.22)	Willis Creek, 30-50' wide
BSI-169 Trib. to Willis Creek	67.00	Private	R4SB3J	Riverine F/T	11	Yes	Stream Banks	Yes[10a]	None	Intermittent tributary to Willis Creek, confluence at MP 65.45
WW-004-005	69.25	Private	PEM	Slope/Flats	11	None	Wetland	None	N/A	Seep fed wetland in floodplain of stream.
SS-004-004 (SS-100-012) Trib. to S. Umpqua	69.29	Private	R3UBF	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10]	Yes (3.91)	Small perennial tributary
SS-004-005 (SS-100-013) Trib. to S. Umpqua	69.35	Private	R3UBF	Riverine F/T	1 or 12	Yes	Stream Banks	Yes[10a]	Yes (5.54)	Small perennial tributary
SS-004-006 (SS-100-014) Trib. to S. Umpqua	69.57	Private	R4SBC	Riverine F/T	1 or 12	Yes	Stream Banks	Yes[10a]	No	2'to 3' foot wide headwater tributary
WW-005-002	71.08	Private	PEM	Slope/Flats	11	None	Wetland	None	N/A	Wetland on hillslope.
WW-501-009	71.18	Private	PEM	Slope/Flats	11	None	Wetland	None	N/A	Wetland on hillslope.
BSP-26 South Umpqua River	71.27	Private	R3OWH	Riverine F/T	Avoid by Direct Pipe Crossing	Avoid by Direct Pipe Crossing	Avoid by Direct Pipe Crossing	Avoid by Direct Pipe Crossing	Avoid by Direct Pipe Crossing	Major Perennial Waterbody
SS-005-007 Trib. to South Umpqua River	71.34	Private	R4	Riverine F/T	On edge of Proposed Roth Pipe Yard/ Can be avoided	On edge of Proposed Roth Pipe Yard/ Can be avoided	On edge of Proposed Roth Pipe Yard/ Can be avoided	On edge of Proposed Roth Pipe Yard/ Can be avoided	On edge of Proposed Roth Pipe Yard/ Can be avoided	Intermittent stream, obscured by blackberry thickets – If Yard is Used – this intermittent drainage would be
SS-005-008	71.35	Private	R4UB1C	Riverine F/T	1 & 11	Yes	Stream banks and	Yes[10a]	Yes	Intermittent stream, passes through culvert on a

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
(SS-100-016) Trib. to South Umpqua River	71.51						Riparian		(5.61)	road.
SS-005-009 (SS-100-019) Trib. to S. Umpqua	73.04	Private	R4SBA	Riverine F/T	1 & 12	Yes	Stream banks and Riparian	Yes[10a]	No	2'to 3' foot wide headwater tributary
SS-005-013 (SS-100-020) Trib. to S. Umpqua	73.51	Private	R4UB3Cx	Riverine F/T	1 or 11	Yes	Stream Banks	Yes[10a]	No	2'to 3' foot wide headwater tributary
SS-005-011 & 012 (SS-100-021) Trib. to S. Umpqua	73.56	Private	R4SBA	Riverine F/T	1 or 12	Yes	Stream Banks and Riparian	Yes[10a]	No	2'to 3' foot wide headwater tributary
WW-005-006	73.6	Private	PEM	Slope/Flats	11	None	Wetland	None	N/A	Wetland in mostly old channel with small PSS component. Narrow part transected by road
SS-005-010 Trib. to Richardson Creek	73.73	Private	R4	Riverine F/T	11	None	Stream Banks and Riparian	Yes[10a]	No	2'to 3' foot wide headwater tributary
Klamath Mountains Ecoregion, South Umpqua Subbasin (HUC 17100302), Myrtle Creek (HUC 1710030210) 5th Level Watershed [3], Douglas County, Oregon										
EE-SS-9032 Rock Creek	75.33	Private	R4SBC	Riverine F/T	1 & 12	Yes	Stream Banks and Riparian	Yes[10]	Yes (8.85)	Rock Creek, perennial stream
EE-SS-9033 Trib to Rock Creek	75.34	Private	R4SBA	Riverine F/T	1 & 12	Yes	Stream Banks and Riparian	Yes[10a]	Yes (9.81)	Perennial tributary to Rock Creek
S-T02-004 (BSP-1) Bilger Creek	76.38	Private	R3UB1C/PFOC	Riverine F/T	12	Yes	Stream banks and riparian	Yes[10]	Yes (10.57)	Bilger Creek
BW-2	76.69	Private	PEMC	Slope/Flats	12	None	Wetland	None	N/A	Wet meadow
BW-258	77.62	Private	PEMC	Slope/Flats	12	None	Wetland	Yes[10]	N/A	Seep/spring fed wetland
BW-5	77.66	Private	PEMC	Slope/Flats	12	None	Wetland	None	N/A	Seep/spring fed wetland
BSP-6 Little Lick	77.71	Private	R3SB7/PSS1C	Riverine F/T	12	Yes	Stream banks and riparian	Yes[10a]	Yes (4.15)	Little Lick Creek, heavily vegetated
BSI-8 Trib. to Little Lick Creek	77.93	Private	R3SB1H	Riverine F/T	1 or 11	None	Stream Banks	Yes[10a]	None	Tributary to Little Lick Creek
BSI-10 Trib. to Little Lick Creek	78.02	Private	R4SB3C	Riverine F/T	1 or 11	None	Stream Banks	Yes[10]	None	Tributary to Little Lick Creek
W4-03 (BW-011 (MOD))	78.05	Private	PEMC	Slope/Flats	1 & 12	None	Wetland	None	N/A	Seep/spring fed wetland
NSP-37 North Myrtle Creek	79.12	Private	R3SB1H	Riverine F/T	1 & 12	Yes	Stream banks and riparian	Yes[10]	Yes (15.87)	Myrtle Creek
NSP-38 Trib. to North Myrtle Creek	79.15	Private	R3SB1H	Riverine F/T	1 & 12	Yes	Stream banks and riparian	Yes[10a]	Yes (4.22)	Tributary to NSP37 (Myrtle Creek)
EE-SS-9038 Trib. to N. Myrtle Creek	79.17	Private	R3SB1H	Riverine F/T	1 & 12	Yes	Stream banks and riparian	Yes[10a]	Yes (3.65)	Small intermittent tributary to NSP-37
EE-SS-9039 Trib. to N. Myrtle Creek	79.19	Private	R3SB1H	Riverine F/T	1 & 12	Yes	Stream banks and riparian	Yes[10a]	Yes (14.56)	Small intermittent tributary to NSP-37
S-T02-003 (BSP-172) South Myrtle Creek	81.20	Private	R3OWH	Riverine F/T	1 & 12	Yes	Stream banks and riparian	Yes[10a]	Yes (19.90)	South Myrtle Creek
BW-173	81.39	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Seasonal emergent wetland
BSP-259 Trib. to S. Myrtle Creek	81.38	Private	R3SB1H	Riverine F/T	1 & 12	Yes	Stream banks and riparian	Yes[10]	None	Trib. to S. Myrtle Creek
SS-100-023 Trib. to S. Myrtle Creek	81.45	Private	R4SBA	Riverine F/T	1 & 12	Yes	Stream banks and riparian	Yes[10a]	N/A	Small intermittent drainage to BSP-172

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
EE-SS-9074 Trib. to S. Myrtle Creek	81.93	Private	R4SBA	Riverine F/T	1 & 12	Yes	Stream banks and riparian	Yes[10]	Yes (1.67)	Small intermittent drainage to BSP-172
Klamath Mountains Ecoregion, South Umpqua Subbasin (HUC 17100302), Days Creek - South Umpqua River (HUC 1710030205) 5th Level Watershed [3, 4], Douglas County, Oregon										
BSP-226 Wood Creek	84.17	Private	R3SBH	Riverine F/T	1 & 12	Yes	Stream banks and riparian	Yes[10]	Yes (4.34)	Wood Creek
EW-24	84.23	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Small wetland at base of slope between slope and roadbed
EW-25	84.23	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Unnamed tributary to Woods Creek with PEM features
EW-26	84.23	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Small, slightly depressional wetland at base of slope.
EE-SS-9040 Trib. to Wood Creek	85.38	Private	R4SBC	Riverine F/T	1 & 11	Yes	Stream banks and riparian	Yes[10a]	No	Seasonal tributary to Wood Creek
EE-SS-9041 Trib. to Wood Creek	85.69	Private	R4SBC	Riverine F/T	1 & 11	Yes	Stream banks and riparian	Yes[10]	No	Seasonal tributary to Wood Creek
EE-SS-9042 Trib. to Wood Creek	85.71	Private	R3UBF	Riverine F/T	1 & 11	Yes	Stream banks and riparian	Yes[10]	No	Perennial, semi-permanently flooded drainage to Wood Creek
EE-SS-9043 Trib. to Wood Creek	85.88	Private	R4SBA	Riverine F/T	1 & 11	Yes	Stream banks and riparian	Yes[10a]	No	8' wide intermittent stream
EE-SS-9044 Trib. to Wood Creek	86.07	Private	R4SBA	Riverine F/T	1 & 11	Yes	Stream banks and riparian	Yes[10]	No	16' wide intermittent stream
BSI-236 Trib. to Fate Creek	88.20	Private	R4SB1J	Riverine F/T	11	None	Ditch Banks	Yes[10]	N/A	Intermittent stream, flows into BW237
BW-239	88.22	Private	PEMC	Slope/Flats	11	None	Wetlands	None	N/A	Emergent wetland associated with BSI238
BSI-238 (MOD) Trib. to Fate Creek	88.23	Private	R4SB1J	Riverine F/T	11	Yes	Stream banks and riparian	Yes[10a]	Yes (1.06)	Forested drainage along roadside
BSP-232 Fate Creek	88.48	Private	R3SB1H	Riverine F/T	12	Yes	Stream banks and riparian	Yes[10a]	Yes (5.70)	Fate Creek, flows into Days Creek
BSP-233 Days Creek	88.60	Private	R3SB1H	Riverine F/T	12	Yes	Stream banks and riparian	Yes[10]	Yes (12.03)	Days Creek
Cascades Ecoregion, South Umpqua Subbasin (HUC 17100302), Days Creek - South Umpqua River (HUC 1710030205) 5th Level Watershed [3, 4], Douglas County, Oregon										
ASP-303 Saint John Creek	92.62	Private	R3RB2H	Riverine F/T	12	Yes	Stream banks and riparian	Yes[10]	Yes (7.77)	St. John's Creek
WW-504-012 (AW-197 (MOD))	94.51	Private	PEMC	Slope/Flats	1 or 11	None	Wetland	None	N/A	Pennyroyal dominated seasonal wetland
WW-502-003 (AW-201 (MOD))	94.65	Private	PEMC	Slope/Flats	1 or 11	None	Wetland	None	N/A	Grass dominated seasonal wetland
WW-GM-39	94.66	Private	PSS1C	Depressional	11	Yes	Wetland	None	N/A	Depressional wetland, broad-leaved deciduous, seasonally flooded. If Potential Yard area used, this wetland should be able to be avoided.
ASP-196 South Umpqua River	94.73	Private	R2OWH	Riverine F/T	12	Yes	Stream banks and riparian	Yes[10a]	Yes (64.99)	S. Umpqua River, ~160' wide, 1% gradient
ASI-193 (ASI-191) Trib. to S. Umpqua River	94.85	Private	R4SB3C	Riverine F/T	11 or 12	Yes	Stream Banks	Yes[10a]	None	Tributary to S. Umpqua River, 5-10' wide, 5% gradient
WW-504-013 (AW-194/AW-195 (MOD))	94.96	Private	PEMC	Slope/Flats	1 or 11	None	Wetland	None	N/A	Adjacent and similar to AW194, connects to ASI193
ASI-193 (ASI-191) Trib. to S. Umpqua River	95.03	Private	R4SB3C	Riverine F/T	11 or 12	Yes	Stream banks and riparian	Yes[10]	N/A	Small intermittent stream
ASI-190 Trib. to S. Umpqua River	98.46	BLM - Roseburg District	R4SB1	Riverine F/T	13 [13]	Yes	Stream Banks	Yes[10a]	None	v-shaped ditch, 2-4' wide, 25-70% gradient
Klamath Mountains Ecoregion, South Umpqua Sub-basin (HUC 17100302), Upper Cow Creek (HUC 1710030206) Fifth field Watershed [3], Douglas County, Oregon										
WW-003-006 (CW-55)	103.90	Private	PEMC	Slope/Flats	13 [13]	None	Wetland	None	N/A	Swale-like depression south of centerline

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
Cascades Ecoregion, South Umpqua Sub-basin (HUC 17100302), Upper Cow Creek (HUC 1710030206) Fifth field Watershed [2], Douglas County, Oregon										
CDX-50 Ditch (Beaver Creek)	105.41	Forest Service - Umpqua NF	R4UB3Cx	N/A/Ditch	17 [13]	None	Ditch	None	None	1-4' wide roadside ditch, 20% gradient; extends off-site
CDX-47 Roadside Ditch	108.08	Forest Service - Umpqua NF	R4UB3Cx	N/A/Ditch	17 [13]	None	Ditch	None	None	2' wide roadside ditch, 5-10% gradient; dissipates in forest
CDX-48 Roadside Ditch	108.40	Forest Service - Umpqua NF	R4UB3Cx	N/A/Ditch	17 [13]	None	Ditch	None	None	2' wide roadside ditch; 10% gradient
WW-111-001 (GW-14 (FS-HF-C))	109.15	Forest Service - Umpqua NF	PSS	Slope/Flats	17 [13 and 13a]	Yes [13a and 13b]	Wetland [13a]	Yes[10,13a]	N/A	Seep wetland with shrubs, crosses road and continues on. USFS considers this wetland as a perennial stream.
WW-111-001	109.17	Forest Service - Umpqua NF	PSS	Slopes/Flats	17 [13 and 13a]	Yes [13a]	Wetland [13a]	None[13a]	N/A	Connects to GW-14. Seep wetland on USFS
GSI-16 (FS-HF-F) Trib. to East Fork Cow Creek	109.33	Forest Service - Umpqua NF	R4	Riverine F/T	17 [13 and 13a]	Yes [13a]	Stream and Riparian Reserve [13a]	Yes[10a,13a]	None	3' wide intermittent stream
GSP-19 (ASP-297FS-HF-G) East Fork Cow Creek	109.47	Forest Service - Umpqua NF	R3UB1	Riverine F/T	17 [13 and 13a]	Yes [13a and 13b]	Stream and Riparian Reserve [13a]	Yes[10, 13a]	Yes (18.18)	Cow Creek – 28' wide, broad, cobbles, boulders, 2' wide
WW-111-005 (GW-21 (FS-HF-H))	109.47	Forest Service - Umpqua NF	PEM/R3UB1	Riverine F/T	17 [13 and 13a]	None [13a and 13b]	Wetland [13a]	None [13a]	N/A	Emergent wetland seep, connects to GSP019
FS-HF-J Trib. to East Fork Cow Creek	109.69	Forest Service - Umpqua NF	R3UB1H	Riverine F/T	17 [13 and 13a]	Yes [13a and 13b]	Stream and Riparian Reserve [13a]	Yes [10a, 13a]	Yes (5.46)	Perennial stream on FS land,– Willow dominated wetland
FS-HF-K Trib. to East Fork Cow Creek	109.78	Forest Service - Umpqua NF	R3UB1H	Riverine F/T	17 [13 and 13a]	Yes [13a and 13b]	Stream and Riparian Reserve [13a]	Yes[10, 13a]	Yes (3.59)	Perennial stream on FS land, – Willow dominated wetland
Cascades Ecoregion, Upper Rogue Sub-basin (HUC 17100307), Trail Creek (HUC 1710030706)) Fifth field Watershed [2], Jackson County, Oregon										
EW-69 Pond Trib. to W. Fork Trail Creek	110.57	Forest Service - Umpqua NF	PUB3C	Depressional	None	None	Disturbance to be avoided by project activities	None	None	1-2' deep pond in borrow pit.
ESI-68 Trib. to W. Fork Trail Creek	110.57	Forest Service - Umpqua NF	R4SB1H	Riverine F/T	None	None	Disturbance to be avoided by project activities	None	None	Ephemeral drainage from snowmelt, broad u-shaped cobble 1-2' wide.
Cascades Ecoregion, South Umpqua Subbasin (HUC 17100302), Upper Cow Creek (HUC 1710030206) 5th Level Watershed [3], Jackson County, Oregon										
FS-HF-N (ESI-68) Trib. to East Fork Cow Creek	110.96	Forest Service – Umpqua NF	R4SB1H	Riverine F/T	17 [13]	Yes [13b]	Stream and Riparian Reserve	Yes[10]	Yes (7.37)	Ephemeral drainage, U-shaped, cobble 1-2' wide
Klamath Mountains Ecoregion, Upper Rogue Sub-basin (HUC 17100307), Trail Creek (HUC 1710030706)) Fifth field Watershed [2], Jackson County, Oregon										
SS-100-032 Trib to West Fork Trail Creek	118.80	Private	R4SB1H	Riverine F/T	4	Yes	Stream banks and Riparian Areas	Yes[10a]	None	Small intermittent tributary,2' wide
ASP-202 West Fork Trail Creek	118.89	Private	R2SB1H	Riverine F/T	12	Yes	Stream banks and Riparian Areas	Yes[10]	Yes (12.82)	Trail Creek; 30-40' wide, 2-3% gradient
S1-06 (DA-16 (MOD)) Trib to Trail Creek	119.84	Private	R4SB1H	Riverine F/T	12	Yes	Stream banks and Riparian areas	Yes[10a]	No	1-2' wide intermittent drainage
NSP-11 Canyon Creek	120.45	BLM - Medford District	R4SB1H	Riverine F/T	15 [13]	Yes	Stream banks and Riparian Reserves	Yes[10]	Yes (2.24)	Canyon Creek
AW-204	120.83	Private	PEMC	Slope/Flats	12	Yes	Wetland	None	N/A	Spikerush dominated emergent wetland near Canyon Creek
ASI-205 Trib. to Trail Creek	120.90	Private	R4UBC	Riverine F/T	4	None	Stream Banks	Yes[10a]	N/A	4-6' wide, U-shaped channel; 4-5% gradient
ASI-206 Trib. to Trail Creek	121.57	Private	R4UBC	Riverine F/T	4	None	Stream Banks	Yes[10]	N/A	4-20' wide (average 8'), U-shaped channel; 3% gradient
Klamath Mountains Ecoregion, Upper Rogue Sub-basin (HUC 17100307), Shady Cove-Rogue River (HUC 1710030707)) Fifth field Watershed [2], Jackson County, Oregon										

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
ASP-235 Rogue River	122.65	Private	R3UBH	Riverine F/T	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	Rogue River; ~50' wide, <2% gradient; cobble, gravel, sand; with bank
ASI-223 Trib. to Indian Creek	125.91	Private	R4UB1C	Riverine F/T	4	Yes	Stream banks and Riparian Reserves	Yes[10a]	None	Seasonal Creek, U-shaped channel, 2-4' wide.
ASI-222 Trib. to Indian Creek	125.98	Private	R4UB1C	Riverine F/T	4	Yes	Stream banks and Riparian Reserves	Yes[10a]	None	Seasonal Creek, U-shaped channel
RS-4 Trib. to Indian Creek	126.53	BLM - Medford District	R4UB1C	Riverine F/T	15 [13]	Yes	Stream banks and Riparian Reserves	Yes[10a]	None	1-2' wide intermittent drainage
ASI-221 Trib. to Indian Creek	126.59	BLM - Medford District	R4UB1C	Riverine F/T	15 [13]	Yes	Stream banks and Riparian Reserves	Yes[10a]	None	Seasonal Creek, U-shaped channel, 4' wide, 6-10% gradient
ADX-285	127.35	Private	R4UB3Cx	Riverine F/T	4	None	Ditch	None	None	Trap-shaped
ASP-307 Deer Creek	128.49	Private	R3SB1H	Riverine F/T	4 or 11	Yes (heavily grazed)	Stream Banks	Yes[10]	Yes (4.40)	40-50' wide perennial stream
AW-278 Indian Creek	128.61	Private	PEMC/R3UB3	Slope/Flats	11	Yes (heavily grazed)	Wetland and Stream Banks	Yes[10]	Yes (6.49)	Herb wetland/perennial stream; continues as AW-308
ASP-310 Trib. to Indian Creek	128.68	Private	R3SB1H	Riverine F/T	11	None	Ditch	Yes[10]	None	At eastern edge of AW309
AW-309 Trib. to Indian Creek	128.89	BLM - Medford District	PEM	Slope/Flats	15 [13]	Yes	Wetland/stream banks and Riparian Reserves	Yes[10a]	None	Forested wetland/stream
ASI-400 Trib. to Indian Creek	129.13	BLM - Medford District	R4	Riverine F/T	15 [13]	Yes	Stream banks and Riparian Reserves	Yes[10a]	None	Small headwater intermittent stream
ASI-277 Trib. to Indian Creek	129.46	Private	R4UB1C	Riverine F/T	4	None	Stream banks	Yes[10a]	None	Intermittent stream
Klamath Mountains Ecoregion, Upper Rogue Sub-basin (HUC 17100307), Big Butte Creek (HUC 1710030704) Fifth field Watershed [2], Jackson County, Oregon										
WW-201-003a (AW-245 (MOD))	130.81	Private	PSSC	Slope/Flats	12	Yes	Wetlands	None	N/A	Wetland with small stream running through middle separated from WW-201-003 by a culvert
SS-201-14a & b	130.83	Private	R4UB1C	Riverine F/T	12	Yes	Stream Banks and Riparian	Yes[10a]	None	Small stream running through middle of wetland.
WW-201-003b (AW-244 (MOD))	130.83	Private	PSSC	Riverine F/T	12	Yes	Wetland	None	None	Wetland with small stream running through middle
WW-201-001 (AW-248 (MOD))	131.26	Private	PEMC	Slope/Flats	11	None	Wetland	None	None	Spring fed wetland on hillside. Slope 3-5%.
S2-02 (ADX-253 (MOD)) Irrigation Ditch	132.03	Private	R4UB3x	N/A/Ditch	11	None	Ditch	None	None	Irrigation ditch, U-shaped with two shallow deeper ditches running parallel
WW-502-002 (W2-02 (MOD))	132.08	Private	PEMA	Depressional	11	None	Wetland	None	N/A	Wetland on valley floor, potentially along previous alignment of Neil Creek.
ASP-252 Neil Creek	132.12	Private	R4SB1C	Riverine F/T	12	Yes	Stream Banks	Yes[10]	Yes (3.42)	Incised perennial stream used for irrigation. OHWM 3-5' wide, 1' deep.
WW-502-001	132.22	Private	PEM1C	Slope/Flats	11 or 12	None	Wetland	None	N/A	Wetland on hillside connects to W3-05
EDX-75 Ditch	132.26	Private	R4UB3x	N/A/Ditch	11 or 4	None	Ditch	None	None	Ditch
W3-05 (AW-243 (MOD))	132.33 132.47	Private	PEMC	Slope/Flats	11	None	Wetland	None	None	Bisected by two ditches, connected to AW242 across road
AW242	132.48	Private	PEMC	Slope/Flats	11	None	Wetland	None	None	Grazed wet meadow connected to ASP241
W5-01	132.54	Private	PEMC	Slope/Flats	11	None	Wetland	None	None	Emergent wetland
W5-02 (AW-242)	132.69	Private	PEMC	Slope/Flats	11	None	Wetland	None	None	Grazed wet meadow connected to ASP241
S5-01 (ASI-265) Trib. to Quartz Creek	132.75	Private	R4SB1C	Riverine F/T	12	None	Stream Banks	Yes[10a]	None	Seasonally flooded trib. to Quartz Creek, 2-3' wide.
S5-02 (AW-264) Quartz Creek	132.77	Private	R4SB1C/PFO	Riverine F/T	12	None	Stream Banks	Yes[10a]	None	Tributary to stream in AW264; U-shaped channel, ~1' wide; Quartz Creek
R5-02 (AW-264 (MOD))	132.77	Private	PFO	Riverine F/T	12	Yes	Wetland	None	None	Wetland with perennial stream running through it
AW-263	133.09	Private	PEMC	Slope/Flats	12	Yes	Wetland	None	None	Large, spring fed, slope wetland; continues off site

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
ASP-241 Trib. to Quartz Creek	133.35	BLM - Medford District	R3UB3H	Riverine F/T	16 [13]	Yes	Wetland and Riparian Reserves	Yes[10a]	None	Braided channels; at edge of corridor
ASP-240 Medford Aqueduct (Ditch 3)	133.38	BLM - Medford District	R3UB3x	Riverine F/T	None Avoided By Bore	None Avoided By Bore	None Avoided By Bore	None Avoided By Bore	None Avoided By Bore	Medford Aqueduct
R5-05 (AW-239)	133.92	Private	PSSC	Slope/Flats	12	Yes	Wetland	None	N/A	Scrub-shrub wetland dominated by spiraea and rose.
Klamath Mountains Ecoregion, Upper Rogue Sub-basin (HUC 17100307), Little Butte Creek (HUC 1710030708) Fifth field Watershed [2], Jackson County, Oregon										
ASI-207 Whiskey Creek	137.48	Private	R4UB3C	Riverine F/T	4 & 12	Yes	Stream Banks and Riparian	Yes[10a]	None	Whiskey Creek; 4-6% gradient; 2' deep, U-shaped channel
SS-200-006 Trib. To Whiskey Creek	137.50	Private	R4SBA	Riverine F/T	4 & 12	Yes	Stream Banks and Riparian	Yes[10a]	None	Small, braided intermittent headwater stream
SS-200-008 Trib. To Whiskey Creek	137.60	Private	R4SBA	Riverine F/T	4 & 12	Yes	Stream Banks and Riparian	Yes[10a]	None	2' wide intermittent headwater stream
ASI-208 Trib. to Lick Creek	138.26	Private	R4UB3C	Riverine F/T	4 & 12	Yes	Stream Banks and Riparian	Yes[10a]	None	10-12' wide, V-shaped channel; 6-8% gradient
SS-GM-9 Trib. to Lick Creek	138.36	Private	R4SB3	Riverine F/T	4 & 12	Yes	Stream Banks and Riparian	Yes[10a]	None	Intermittent stream. 10' wide
SS-GM-10 Trib. to Lick Creek	138.44	Private	R3UB1	Riverine F/T	4 & 12	Yes	Stream Banks and Riparian	Yes[10]	None	Intermittent stream, 8' wide
ASI-210 Trib. to Lick Creek	138.45	Private	R4UB1C	Riverine F/T	4 & 12	Yes	Stream Banks and Riparian	Yes[10a]	None	6-10' wide, U-shaped channel; >10% gradient
SS-GM-11 Trib. to Lick Creek	138.55	Private	R4SB3	Riverine F/T	4 & 12	Yes	Stream Banks and Riparian	Yes[10]	None	Intermittent stream, 8-10' wide
ASI-211 Trib. to Lick Creek	138.71	Private	R4UB1C	Riverine F/T	4 or 11	None (Heavily grazed)	Stream banks	Yes[10a]	None	12-15' wide, U-shaped channel; 4-6% gradient
SS-GM-13 Trib. to Lick Creek	138.74	Private	R4SB7	Riverine F/T	4 & 12	Yes	Stream Banks and Riparian	Yes[10]	None	Intermittent stream, 8' wide, vegetated
SS-GM-14 Trib. to Lick Creek	139.07	Private	R4SBC	Riverine F/T	4 & 12	Yes	Stream Banks and Riparian	Yes[10]	None	Intermittent stream, 8' wide, vegetated
S-T04-002A Ditch	139.10	Private	R4SBCx	N/A/Ditch	4	None	Ditch Banks	None	N/A	Road ditch
WW-GW-33 (ASI-214)	139.15	Private	PEMC/R4UB1C	Riverine F/T	4 or 11	None (Heavily grazed)	Wetland	None	None	Tributary to Lick Creek with PEM features, seasonally flooded
WW-GM-37	139.17	Private	PEMA	Slope/Flats	4	None	Wetland	None	N/A	Emergent wetland, temporarily flooded.
AL-215 Stock Pond	139.17	Private	PUBYx	Depressional	11	None	Pond/banks	None	None	Small stock pond ~ 1' deep.
SS-GM-15 Trib. to Lick Creek	139.21	Private	R4SB1C	Riverine F/T	4	Yes	stream bank and Riparian	Yes[10]	None	Intermittent stream, 10-12' wide, seasonally
SS-GM-16 Trib. to Lick Creek	139.28	Private	R4SB3	Riverine F/T	4	Yes	Stream Banks and Riparian	Yes[10]	None	Intermittent stream 8-10' wide
ASI-217 Trib. to Lick Creek	139.42	Private	R4SB1C	Riverine F/T	4 or 11	Yes (Heavily grazed)	Stream Banks	Yes[10a]	None	10' wide, U-shaped channel; 5% gradient
ASI-226 Trib. to Lick Creek	139.59	Private	R4SB1C	Riverine F/T	4 or 11	None (Heavily grazed)	Stream Banks	Yes[10a]	None	Meandering creek, 1-2' wide, U-shaped channel; flows into AW225
ASI-227 Trib. to Lick Creek	139.63	Private	R4SB1C	Riverine F/T	4 or 11	None (Heavily grazed)	Stream Banks	Yes[10a]	None	Meandering creek, 1-2' wide, U-shaped channel; flows into AW225
ASI-228 Trib. to Lick Creek	139.68	Private	R4EMC	Riverine F/T	4 or 11	None (Heavily grazed)	Stream Banks	Yes[10a]	None	<0.5' deep, 1-2' wide poorly defined channel

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
SS-GM-43 (AW-230) Trib. to Lick Creek	139.75	Private	PEMC	Slope/Flats	4 or 11	None (Heavily grazed)	Stream Banks	None	N/A	Swale feature, partially channelized
ASI-232 Trib. to Lick Creek	139.83	Private	R4SB1C	Riverine F/T	4 or 11	None (Heavily grazed)	Stream Banks	Yes[10a]	None	1-1.5' wide dry channel
ASI-233 Lick Creek	140.27	BLM - Medford District	R4SB1C	Riverine F/T	15 or 16 [13]	Yes	Stream Banks and Riparian Reserves	Yes[10]	None	Lick Creek, 10-20' wide, U-shaped channel
ADX-234 Ditch	140.32	BLM - Medford District	R4SB1C	Riverine F/T	15 or 16 [13]	Yes	Ditch Banks	None	None	3' wide at OHWM, V-shaped channel
ASI-189 Trib. to Lick Creek	140.58	Private	R4SB1	Riverine F/T	4 or 11	None (Heavily grazed)	Stream Banks	Yes[10a]	None	1-2' wide intermittent stream
ADX-186 Ditch	140.94	BLM - Medford District	R4SB1	Riverine F/T	15 or 16 [13]	Yes	Ditched Drainage Banks	None	None	Rocky, intermittent stream
EW-77	141.01	Private	PEMC	Slope/Flats	11	None	Wetland if disturbed	None	None	Herbaceous wetland at base of Star Lake Reservoir
EW-78 (EW-82)	141.01	Private	PEMC	Slope/Flats	11	None	Wetland if disturbed	None	None	Herbaceous wetland at base of Star Lake Reservoir.
EW-76	141.01	Private	PEMC	Slope/Flats	11	None	Wetland if disturbed	None	None	Herbaceous wetland at base of Star Lake Reservoir
ASI-187 Trib. to Salt Creek	141.18	BLM - Medford District	R4SB1	Riverine F/T	15 or 16 [13]	Yes	Stream Banks and Riparian Reserves	Yes[10a]	None	1-2' wide intermittent stream with little vegetation
ASI-188 Trib. to Salt Creek	141.48	BLM - Medford District	R4SB1	Riverine F/T	15 or 16 [13]	Yes	Stream Banks and Riparian Reserves	Yes[10a]	None	3-4' average width, U-shaped channel, 8% gradient
RS-17 Trib. to Salt Creek	141.49	BLM - Medford District	R4SB3C	Riverine F/T	15 or 16 [13]	Yes	Stream Banks and Riparian Reserves	Yes[10a]	None	1-2' wide intermittent drainage
ESI-30 Trib. to Salt Creek	141.95	Private	R4SB1	Riverine F/T	4	Yes	Stream Banks	Yes[10a]	None	3' wide intermittent stream, trap-shaped, cobble substrate; QUsp, TODI, CAQU
EDX-32 Ditch	142.28	Private	R4SB3Cx	Riverine F/T	11	None	Ditch Banks	None	None	Pasture stream, likely excavated
ESI-31 Ditch	142.32 142.35	Private	R4SB3Cx	Riverine F/T	11	None	Ditch Banks	Yes[10a]	None	3' wide, trap-shaped, intermittent stream; cobble substrate, JUEF
EW-33	142.45	Private	PEMC	Slope/Flats	11	None	Ditch Banks	None	None	Large PEM complex, associated with floodplain of Salt Creek
EW-35	142.61	Private	PEMC	Slope/Flats	11	None	Ditch Banks	None	None	Large PEM complex, associated with floodplain of Salt Creek
ESP-34 Salt Creek	142.57	Private	R3SB3H	Riverine F/T	12	Yes	Stream banks and Riparian Areas	Yes[10a]	Yes (16.54)	Salt Creek, flows through NW3
EDX-36 Ditch	142.65	Private	R4SB3Cx	N/A/Ditch	11	None	Ditch Banks	None	None	Pasture Ditch
ESI-37 Trib. to Salt Creek	143.12	Private	R4SB3C	Riverine F/T	4	Yes	Stream Banks	Yes[10a]	None	4' wide, U-shaped, cobble substrate; QUsp, Ceanothus sp, upland grasses
ESI-38 Trib. to Long Branch Creek	143.51	Private	R4SB3C	Riverine F/T	4	Yes	Stream Banks	Yes[10a]	None	2' wide, V-shaped, cobble/silt substrate, no veg in channel
ESI-39 Trib. to Long Branch Creek	143.74	Private	R4SB3C	Riverine F/T	4	None (Heavily grazed)	Stream Banks	Yes[10a]	None	Tributary/irrigation ditch
ESI-40 Trib. to Long Branch Creek	143.77	Private	R4SB3C	Riverine F/T	4	None (Heavily grazed)	Stream Banks	Yes[10a]	None	Tributary/irrigation ditch to stock pond
ESI-38 Trib. to Long Branch Creek	144.11	Private	R4SB3C	Riverine F/T	4	Yes	Stream Banks and Riparian	Yes[10]	None	2' wide, V-shaped, cobble/silt substrate, no veg in channel
EDX-42	144.14	Private	R4UBx	N/A/Ditch	4 or 11	None	Ditch Banks	None	None	Irrigation ditch

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
GSP-5 (ESP-48) Trib. to S. Fork Long Branch	144.70	Private	R4	Riverine F/T	11	Yes	Stream Banks and Riparian	Yes[10]	Yes (3.74)	3' wide extension of ESI048 intermittent drainage
GSI-6 (ESP-59) South Fork Long Branch	145.27	Private	R4SBC	Riverine F/T	11	Yes	Stream Banks	Yes[10a]	Yes (3.42)	3' wide extension of ESI048
NDX-107 Irrigation Ditch	145.32	Private	R4UBx	N/A/Ditch	11	None	Ditch Banks	None	None	Near possible vernal pool complex
NDX-56 Irrigation Ditch	145.37	Private	R4UBx	N/A/Ditch	2, 4 or 11	None	Ditch Banks	None	None	Ditch
ESI-61 Trib. to S. Fork Long Branch	145.54	Private	R4SBC	Riverine F/T	11	Yes	Stream Banks and Riparian	Yes[10a]	None	1' wide, U-shaped, cobble substrate; RUDI, FRLA, pasture veg
EW-63	145.55	Private	PEMC/PSSC	Slope/Flats	12	Yes	Wetland	None	N/A	Emergent wetland associated with ESI061
EDX-64 Irrigation Ditch	145.57	Private	R4UBx	N/A/Ditch	11	None	Ditch Banks	None	None	Linear, 2' wide ditch along Highway 140, V-shaped; CANE, DIFU
EW-67	145.63	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Emergent wetland, associated with surround ditches
ESP-66 North Fork Little Butte Creek	145.69	Private	R3SB3H	Riverine F/T	12	Yes	Stream Banks	Yes[10]	Yes (23.90)	North Fork Little Butte Creek
ESI-56 Trib. to N. Fork Little Butte Creek	146.05	Private	R4SBC	Riverine F/T	4	Yes	Stream Banks	Yes[10a]	None	4' wide, U-shaped, cobble substrate; QUsp, water control structure
ESI-55 Trib. to N. Fork Little Butte Creek	146.38	Private	R4SBC	Riverine F/T	4	Yes	Stream Banks	Yes[10a]	None	Connected to EW054; 2' wide, U-shaped, cobble substrate; RUDI, TODI, QUGA
EDX-51 Irrigation Ditch	146.80	Private	R4UBx	N/A/Ditch	4 or 11	None	Canal Banks	None	None	6' wide irrigation canal along road
Cascades Ecoregion, Upper Rogue Sub-basin (HUC 17100307), Little Butte Creek (HUC 1710030708) Fifth field Watershed [2, 3], Jackson County, Oregon										
ASP-165 South Fork Little Butte Creek	162.45	Forest Service - Rogue River-Shady Cove NF	R3SB1H	Riverine F/T	17 [13 and 13a]	Yes [13a and 13b]	Stream Banks and Riparian Reserves	Yes[10, 13a]	Yes (6.62)	2-30' wide, U-shaped, 1% gradient, braided channels
ESI-76 (ESI-84) Daley Creek	166.21	Forest Service - Rogue River-Shady Cove NF	R4UBC	Riverine F/T	17 [13]	Yes	Stream Banks and Riparian Reserves	Yes[10a]	Yes (15.50)	30-40' wide braided channel, coble/gravel substrate, trib. to Daley Creek.
Eastern Cascades Slopes and Foothills Ecoregion, Upper Klamath River Sub-basin (HUC 18010206), Spencer Creek (HUC 1801020601) Fifth field Watershed [2, 3], Klamath County, Oregon										
WW-001-013 (EW-85)	171.07	Forest Service - Fremont-Winema NF	PFO/PSS	Slope/Flats	17 [13]	Yes	Stream Banks and Riparian Reserves	Yes[10a]	Yes (3.84)	Wetland swale, culverted under road
WW-201-004	171.60	Private	PFO1A	Slope	12	Yes	Wetland	N/A	N/A	Forested wetland influenced by spring (lodgepole pine/spiraea)
SS-201-001(GSP-7) Trib to Spencer Creek	171.57	/Private	R3SBC	Riverine F/T	12	Yes	Stream Banks	Yes[10a]	None	2' wide stream that fans out into a wetland/stream complex
ESI106a Trib. to Spencer Creek	173.74	Forest Service - Fremont-Winema NF	R4SB2	Riverine F/T	17 [13]	Yes	Stream Banks and Riparian Reserves	Yes[10a]	None	4' wide, snowmelt ephemeral stream
ESI-69 Trib. to Spencer Creek	176.54	BLM – Lakeview District	R4SB2	Riverine F/T	17 [13]	Yes	Stream Banks and Riparian Reserves	Yes[10]	None	1' wide intermittent, shrubbed stream 4' wide, 2' deep
ESI-10 Trib. to Spencer Creek	176.56	BLM – Lakeview District	R4SB2	Riverine F/T	17 [13]	Yes	Stream Banks and Riparian Reserves	Yes[10]	None	1' wide intermittent, shrubbed stream
SS-502-EW-103 Clover Creek	177.76	Private	R4SB2/PEMC/PSSC	Riverine F/T	12	Yes	Wetland and stream banks and Riparian Areras	Yes[10a]	None	2' wide stream with associated wetland. Extension of EW103
WW-502-EW-103 (EW-103 (MOD))	177.76	Private	PEMC/PSSC	Riverine F/T	12	Yes	Wetland and stream banks and Riparian Areras	Yes[10a]	None	Seep wetland

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
GSI-11 Clover Creek	177.76	Private	R4SB2	Riverine F/T	12	Yes	Wetland and stream banks and Riparian Areras	Yes[10a]	None	Intermittent stream, 7-8' wide
WW-203-002	182.50	Private	PEM1C	Depressional	10	No	Wetland	N/A	N/A	Sparsely vegetated depressional wetland, seasonally inundated
Eastern Cascades Slopes and Foothills Ecoregion, Upper Klamath R. Sub-basin (HUC 18010206), John C Boyle Reservoir-Klamath River (HUC 1801020602) Fifth field Watershed [2], Klamath County, Oregon										
ESI-97 Trib. to Klamath River	186.61	Private	R4SB2C	Riverine F/T	10	None	Stream Banks	None	None	Boulders, cobbles 2-5' wide, <1' deep
ESI-99 Trib. to Klamath River	186.65	Private	R4SB2C	Riverine F/T	10	None	Stream Banks	None	None	Small intermittent stream 3? wide, feeds pond
ESI-100 Trib. to Klamath River	186.74	Private	R4SB2C	Riverine F/T	10	None	Stream Banks	None	None	Small intermittent stream 2' wide, feeds pond
Eastern Cascades Slopes and Foothills Ecoregion, Lost River Sub-basin (HUC 18010204), Lake Ewauna-Klamath River (HUC 1801020412) Fifth field Watershed [2], Klamath County, Oregon										
SS-001-001 (SS-100-025) Trib. to Klamath River	188.90	Private	R4EM2	Riverine F/T	6	Yes	Stream Banks and Riparian	Yes[10a]	None	Main channel (ave 4' wide) & side channel (ave 3')
W2-03	191.47	Private	PEMC	Depressional	10	None	Ditch Banks	None	None	Wetland in roadside ditch.
(WW-200-001 (W2-06a)	192.20	Private	PEMC	Slope/Flats	11 or 3	None	Wetland	None	N/A	Wetland edged by man-made dike at north boundary. Actively grazed cow pasture, strongly alkaline soil
WW-200-001 (W2-06b)	192.2	Private	PEMC	Slope/Flats	11 or 3	None	Wetland	None	N/A	Actively grazed cow pasture, strongly alkaline soil
S2-07 (ADX-63 (MOD)) Irrigation Ditch	192.67	Private	R4UB3Cx	N/A/Ditch	8	None	Canal Banks	None	None	Irrigation ditch in pasture
AW-65	192.71	Private	PEMC	Slope/Flats	11 or 3	None	Wetland	None	None	Irrigated pasture wetland
WW-200-003	192.80	Private	PEM1C	Slope/Flats	11 or 3	None	Wetland (Not expected to be disturbed by dewatering activities)	None	N/A	Actively grazed cow pasture, appears to be shallowly inundated in the spring, strongly alkaline soil
AW-66	192.86	Private	PEMC	Slope/Flats	11 or 3	None	Wetland	None	None	Irrigated pasture wetland
WW-200-004 (NW-71)	192.89	Private	PEMC	Slope/Flats	11 or 3	None	Canal Banks (Not expected to be disturbed by dewatering activities)	None	None	Irrigated pasture wetland, continues off-site to the south
ADX-67 Ditch	192.99	Private	R4UB3Cx	N/A/Ditch	8	None	Canal Banks	None	None	12' average width, <1% gradient, u-shaped ditch
AW-68	193.03	Private	PEMC	Slope/Flats	11 or 3	None	Wetland	None	N/A	Pasture wetland within harvested hayfield
ADX-69 Ditch	193.07	Private	R4UB3x	N/A/Ditch	8	None	Canal Banks	None	None	12' average width, <1% gradient, trapezoidal ditch
AW-71	193.17	Private	PEMC	Slope/Flats	11 or 3	None	Wetland	None	None	Slight depression in alfalfa field, similar to AW70
WW-504-014 (NW-72)	193.21	Private	PEMC	Slope/Flats	11 or 3	None	Wetland (Not expected to be disturbed by dewatering activities)	None	N/A	Irrigated pasture wetland, continues off-site to the south
AW-70	193.21	Private	PEMC	Slope/Flats	11 or 3	None	Wetland	None	N/A	Pasture wetland within harvested hayfield
WW-504-001 (NW-74)	193.51	Private	PEMC	Slope/Flats	11 or 3	None	Wetland (Not expected to be disturbed by dewatering activities)	None	None	Irrigated pasture wetland, continues off-site to the south
WW-201-009a (AW-74 & AW-75)	194.50	Private	PEM1A	Flats	11 or 3	None	Wetland	None	None	Extensive flat area with some small, shallow depressions. WW-201-009a, WW-201-009b & WW-201-009c are extensions of WW-201-009.
WW-201-009 (WW-001-00 (ADX-77, AW-76)	194.57	Private	PEM1A	N/A/Ditch	10 or 3	None	Canal Banks (Not expected to be disturbed by dewatering activities)	None	None	Irrigation ditch, u-shaped ditch
WW-201-009c	194.57	Private	PEM1A	Slope/Flats	11or 3	None	Wetland	None	N/A	Pasture wetland adjacent to canal

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
(WW-504-015 (NW-76))										
WW-201-009c (NDX-77)	194.57	Private	PEMC	N/A/Ditch	8 or 11	None	Wetland (Not expected to be disturbed by dewatering activities)	None	N/A	Irrigated pasture wetland, continues off-site to the south
SS-201 (WW-001-010/ (ADX-78))	194.64	Private	PEM	Slope Flats	11	None	Canal Banks	None	N/A	Trapezoidal irrigation ditch with emergent wetland fringe
SS-201-003 (WW-001-010 (ADX-78)) Irrigation Ditch	194.64	Private	R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	Trapezoidal, <1% gradient irrigation ditch
WW-201-010a	194.67	Private	PEM1A	Flats	11 or 3	None	Wetland (Not expected to be disturbed by dewatering activities)	None	N/A	Palustrine emergent wetland in pasture along irrigation canal, with strongly alkaline soil
WW-200-006	194.70	Private	PEM1C	Slope/Flats	11 or 3	None	(Not expected to be disturbed by dewatering activities)	None	N/A	Pasture wetland, mostly grazed and heavily compacted due to clay rich soil, with strongly alkaline soil.
NDX-80	194.88	Private	PEM/R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks (Not expected to be disturbed by dewatering activities)	None	None	Irrigation ditch with wetland
ADX-81	194.92	Private	PEM/R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	<1% gradient, u-shaped drainage ditch, wetland
WW-502-AW-82 (AW-82 (MOD))	194.92	Private	PEMC	Slope/Flats	11 or 3	None	Wetland (Not expected to be disturbed by dewatering activities)	None	N/A	Large wetland swale within hayfield
AW-85	195.14	Private	PEMC	Slope/Flats	11 or 3	None	Wetland	None	N/A	Wetland in hayfield, associated with adjacent ditch
WW-200-007	195.30	Private	PEM1C	Slope/Flats	11 or 3	None	Wetland (Not expected to be disturbed by dewatering activities)	None	N/A	Pasture wetland, mostly grazed and heavily compacted due to clay rich soil, with strongly alkaline soil.
AW-88	195.34	Private	PEMC	Slope/Flats	11 or 3	None	Wetland	None	N/A	Wetland within hayfield
AW-21	195.45	Private	PEM/R4UB2x	N/A/Ditch	11 or 3	None	Wetland	None	N/A	Hydric portion of ditch dug through hydric soils
ADX-19 Ditch	195.46	Private	R4UB2x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	8' wide, 3' deep ditch
GDX-4 Ditch	195.67	Private	R4	N/A/Ditch	11 or 3	None	Wetland	None	N/A	5' wide ditch with pasture grasses
GDX-3 Ditch	195.70 195.73	Private	R4	N/A/Ditch	11 or 3	None	Wetland	None	N/A	Connected to GDX001
GDX-1 Ditch	195.80	Private	PEMA/R4	N/A/Ditch	11 or 3	None	Wetland	None	N/A	7-8' wide ditch with pasture grass
GDX-2 Ditch	195.91	Private	R4	N/A/Ditch	11 or 3	None	Wetland	None	N/A	3-10' wide irrigation ditch
ADX-30 Irrigation Ditch	196.53	Private	R4UB2x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	Irrigation ditch
WW-GM-29	196.62	Private	PEMA	Slope/Flats	11 or 3	None	Wetland	None	N/A	Irrigated pasture wetland, temporarily flooded
ADX-32 Irrigation Canal	196.64	Private	R4UB2x	N/A/Ditch	8	None	Canal Banks	None	None	Large irrigation channel
WW-GM-28	196.70	Private	PEMA	Slope/Flats	11 or 3	None	Wetland	None	N/A	Irrigated pasture wetland, temporarily flooded
ADX-36 Irrigation Ditch	196.76	Private	R4UB2x	N/A/Ditch	11 or 3	None	Ditch Banks	None	None	Narrow irrigation ditch
ADX-38 Irrigation Ditch	196.78	Private	R4SBFx	N/A/Ditch	11 or 3	None	Canal Banks	None	None	Irrigation ditch
AW-37	196.79	Private	PEMAx	N/A/Ditch	11 or 3	None	Canal Banks	None	None	Wet ditch

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
NW-91	196.82	Private	PEMC	Slope/Flats	11 or 3	None	Wetland	None	N/A	Irrigated pasture wetland
DX-GM-7	196.88	Private	PEMKx	N/A/Ditch	11	None	Canal Banks	None	None	Wet ditch, excavated and artificially flooded.
ADX-39 Irrigation Ditch	196.89	Private	R4SBFx	N/A/Ditch	11 or 3	None	Canal Banks	None	None	Irrigation ditch, connected to ADX38; 2' deep
WW-GM-27	196.94	Private	PEMC	Slope/Flats	11 or 3	None	Wetland	None	N/A	Irrigated pasture wetland
ADX-40 Irrigation Ditch	197.08	Private	R4SB	N/A/Ditch	11 or 3	None	Canal Banks	None	None	Irrigation ditch
DX-GM-6	197.10	Private	PEMKx	N/A/Ditch	10 or 3	None	Canal Banks	None	None	Wet ditch, excavated and artificially flooded
DX-GM-5	197.17	Private	PEMKx	N/A/Ditch	11 or 3	None	Canal Banks	None	None	Wet ditch, excavated and artificially flooded
DX-GM-3	197.28	Private	PEMKx	N/A/Ditch	11 or 3	None	Canal Banks	None	None	Wet ditch, excavated and artificially flooded
WW-GM-23 (AW-43)	197.80	Private	PEMC	Slope/Flats	11 or 3	None	Wetland	None	None	Irrigated pasture wetland
ASP-151 Klamath River	199.38	State	L1UBHh	Riverine F/T	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	Klamath River/large irrigation channel
AW-152	199.49	Private	PEM/R4UB3x	N/A/Ditch	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	Wet ditch, excavated and artificially flooded.
WW-001-004 (AW-154)	199.54	Private	PEMC	Slope/Flats	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	Emergent wetland seasonally flooded.
WW-001-005 AW-155)	199.55	Private	PEMC	Slope/Flats	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	None Avoided By HDD	Emergent wetland seasonally flooded.
WW-001-006 (AW-156)	199.59	Private	PEMC/R4UB3x	N/A/Ditch	11	None	Wetland	None	N/A	HDD Crossing for Klamath River. Similar to AW155, on east side of Highway 97
AW-157	199.59	Private	PEMC/R4UB3x	N/A/Ditch	11	None	Wetland	None	N/A	Wet ditch associated with AW159
AW-158	199.60	Private	PEMC/R4UB3x	N/A/Ditch	11	None	Wetland	None	N/A	Wet ditch associated with AW159
WW-GM-36 (AW-160)	199.78	Private	PEMC/R4UB3x/PSS	Slope/Flats	11	None	Wetland	None	N/A	Emergent wetland, seasonally flooded.
WW-001-003 (AW-312)	200.03	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Emergent wetland, seasonally flooded.
AW-255	200.06	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Irrigated livestock pasture surrounded by lg. Irrigation ditch
ADX-294 Irrigation Canal (No. 1 Drain)	200.54	BOR	R2UB3Hy	N/A/Ditch	None Avoided By Bore	None	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	Trap-shaped canal
ADX-94 Irrigation Ditch	201.49	Private	R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	Trapezoidal drainage ditch, <1% gradient
WW-001-002 (AW-95)	201.51	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Irrigated hay field wetland, similar to AW93
SS-201-007 (ADX-96) Irrigation Ditch (C-4-E Lateral)	201.63	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	16' average width, u-shaped ditch, <1% gradient
WW-GM-35 (AW-98)	203.94	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Depressional wetland adjacent to ditch (ADX99)
ADX-99 Roadside Ditch	203.97	Private	R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	Ditch along County Highway 888
ADX-100 Irrigation Canal (C-4 Lateral)	204.12	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	20' average width, trapezoidal ditch, <1% gradient
ADX-101 Irrigation Canal (C-4-F Lateral)	204.33	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Avoided By Bore	None Avoided By Bore	None Avoided By Bore	15' average width, trapezoidal ditch, <1% gradient
ADX-105 Ditch No. 3 Drain	204.74	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	20' average width, trapezoidal ditch, <1% gradient
ADX-106 Irrigation Canal	204.91	Private	R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	3' average width, u-shaped ditch, <1% gradient

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
AW-108	205.11	Private	PEMC	Slope/Flats	11	None	Wetland	None	N/A	Irrigated pasture
ADX-109 Ditch (C-4-C Lateral)	205.50	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None	None	20' average width, u-shaped ditch, <1% gradient
Eastern Cascades Slopes and Foothills Ecoregion, Lost River Sub-basin (HUC 18010204), Mills Creek-Lost River (HUC 1801020409) Fifth field Watershed [2], Klamath County, Oregon										
ADX-110 Ditch	205.94	Private	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	Maintained drainage ditch, 2-4' wide, 1-2" deep
ADX-111 Canal (C Canal)	205.96	Private	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	25-30' wide canal adjacent to ADX110 and 112
ADX-112 Wetland Ditch	205.97	Private	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	Wet ditch, may be jurisdictional
ADX-113 Irrigation Ditch (D-2 Lateral)	206.51	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	12' wide irrigation ditch connects to ADX111
AW-114	207.12	Private	PEM/R4UB3x	Slope/Flats	8 or 10	None	Canal Banks	None	None	Wet portion of drainage ditch
ADX-115 Roadside Drainage Ditch (5-A Drain)	207.26	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	Roadside drainage ditch, ~20' wide
ADX-116 Irrigation Lateral (C-4-7 Lateral)	207.40	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	Mostly unvegetated drainage ditch adjacent to ADX117
ADX-117 Irrigation Drain 5-A Drain	207.42	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	Adjacent to ADX116, eastern 50' contains wetland species
ADX-118 Irrigation Drain (5-A Drain)	207.60	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	30' wide drainage ditch with steep banks.
ADX-119 Irrigation Drain (5-A Drain)	207.99	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	30' wide drainage ditch with no vegetation on banks
ADX-120 Irrigation Ditch	208.07	Private	R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	2' wide irrigation ditch
ADX-121 Irrigation Ditch	208.07	Private	R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	Associated with AW122
ADX-123 Drainage Ditch Irrigation Drain (5-A Drain)	208.18	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	Deep drainage ditch with reed canary grass
ADX-124 Ditch	208.23	Private	R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	3-5' wide ditch, 1' deep water with little vegetation
ADX-125 Irrigation Ditch	208.28	Private	R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	2' wide irrigation ditch, 8" deep water with little vegetation
ADX-126 Irrigation Ditch	208.29	Private	R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	2-2.5' wide irrigation ditch
WW-201-015	208.70	Private	PEM1A	Slope/Flats	3 or 11	None	Wetland	None	N/A	Shallowly inundated wetland in pasture under power lines and north of dairy operation.
ADX-128 Roadside Drainage Ditch	208.78	Private	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	Roadside drainage ditch with little vegetation
AW-127	208.79	Private	PEM/R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	Roadside drainage ditch with wetland characteristics
ADX-129	208.85	Private	R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	Roadside ditch, trapezoidal, <2% gradient, 10-12'

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
Roadside Drainage Ditch										wide
ADX-130 Irrigation Drain 5-K Drain	209.02	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	20' wide drainage ditch with no vegetation, 2' water
ADX-131 Roadside Drainage Ditch	209.05	Private	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	1-2' wide roadside drainage ditch
ADX-133 Irrigation	209.15	Private	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	1-2' wide ditch with wetland species
ADX-134 Irrigation Ditch C-9 Lateral	209.15	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	10-12' wide irrigation lateral drainage
ADX-135 Irrigation Ditch	209.16	Private	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	15' wide irrigation lateral drainage, 2-3' deep water
ADX-142 Roadside Ditch	210.16	Private	R4UB3x	N/A/Ditch	8	None	Canal Banks	None	None	Roadside ditch, connects to other waters, 9-10' wide
SS-003-001 (ADX-143) Irrigation Ditch (No. 5 Drain) (Trib. to Lost River)	210.26	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	Deep, steep sided ditch, 35' wide at top of bank
ADX-260 Irrigation Ditch 5-H Drain (Trib. to Lost River)	210.85	BOR	R4UB3x	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	U-shaped irrigation ditch 2-5' deep, 2'wide
ADX-261 Irrigation Ditch	210.87	Private	R4UB3x	N/A/Ditch	8 or 11	None	Canal Banks	None	None	U-shaped irrigation ditch 2-5' deep, 2'wide
WW-202-005 (WW-003-002)	211.19	Private	PEMC	Slope/Flats	8 or 11	None	Canal Banks	None	None	Seasonally flooded wetland.
WW-003-001	211.20	Private	PEMC	Slope/Flats	8 or 11	None	Canal Banks	None	None	Wetland located in lowest part of ditch that runs along south side of private drive.
SS-003-002 (NDX-29) Ditch	211.32	Private	R4UB3Cx	N/A/Ditch	8	None	Canal Banks	None	None	Seasonally flooded ditch
SS-003-003 (NDX-30) Ditch	211.34	Private	R4UB3Cx	N/A/Ditch	8	None	Canal Banks	None	None	Seasonally flooded ditch
NDX-92 Ditch	211.52	Private	R4UB3Cx	N/A/Ditch	8 or 11	None	Canal Banks	None	None	Seasonally flooded ditch
SS-003-004 (NDX-93) Irrigation Ditch	211.53 211.68	Private	R4UB3Cx	N/A/Ditch	8 or 11	None	Canal Banks	None	None	Irrigation ditch
WW-003-003 (EDX-1)	211.67 211.97	Private	R4UB3Cx\PEMC	Slope/Flats	8 or 11	None	Canal Banks	None	None	Wetland ditch along north side of Cemetery Road. Eventually connects with Lost River via culverts and a ditch
SS-003-005 (NSP-1) Lost River	212.07	State	R3UBH	Riverine F/T	8, 10 or 11	Yes	Stream Banks	Yes[10a]	Yes (38.87)	Lost River
WW-001-001 (EW-86)	212.51	Private	PEMC	Slope/Flats	10	None	Wetland	None	N/A	Emergent wetland associated with Lost River
WW-001-001 (EW-87)	212.54	Private	PEMC	Slope/Flats	10	None	Wetland	None	N/A	Emergent wetland associated with Lost River
ADX-318 EDX055/EDX-90 Irrigation Ditch	213.23	Private	R4UB3Cx	N/A/Ditch	8 or 10	None	Canal Banks	None	None	10' wide at TOB, 4' at OHWM, V-shaped ditch
ADX 318 Irrigation Ditch	213.45	Private	R4UB3Cx	N/A/Ditch	8	None	Canal Banks	None	None	10' wide at TOB, 4' at OHWM, V-shaped ditch
ADX-274	213.85	Private	R4UB3Cx	N/A/Ditch	None	None	None	None	None	Ag. Ditch/canal dominated by Lemna sp.

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
Irrigation Ditch					Avoided By Bore	Avoided By Bore	Canal Banks Avoided By Bore	Avoided By Bore	Avoided By Bore	
ADX-275 G Canal	213.87	BOR	R4UB3Cx	N/A/Ditch	None Avoided By Bore	None Avoided By Bore	None Canal Banks Avoided By Bore	None Avoided By Bore	None Avoided By Bore	Ag. Canal dominated by Typha latifolia, Alisma sp.
ASI-51 Unnamed Creek	216.10	Private	PEMA	Riverine F/T	7 or 11	None	Stream Banks	None	None	6' wide, 2-3% gradient, 1-2" flowing water, 2-3" deep pools
ASI-50 Unnamed Creek	216.30	Private	R4SBC	Riverine F/T	7 or 11	None	Stream Banks	None	None	Seep/stream with v-shape in northern portion, some wetland
ASI-49 Unnamed Creek	216.44	Private	R4SBC	Riverine F/T	7 or 11	None	Stream Banks	None	None	1-6' wide seep/stream; originates upslope of road off-site
ASI-136 Trib. to D Canal	218.09	Private	R4SB1x	Riverine F/T	7 or 11	None	Stream Banks	None	None	4-25' wide ephemeral stream
ASI-137 Trib. to D Canal	218.46	Private	R4SB1x	Riverine F/T	7	None	Stream Banks	None	None	1-8' (Ave 3') wide ephemeral stream
AW-292	219.69	Private	PEM/R4UB3C	Riverine/FT	10	None	Wetland	None	None	Herb wetland
ASI-291 Trib. to D Canal	219.69	Private	R4UB3C	Riverine F/T	7	None	Stream Banks	None	None	Intermittent stream
SS-502-12	220.72	Private	R4SB2	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 1.5-8 foot wide OHW, 2% slope, stable banks
SS-502.013 & b	221.15	Private	R4SB2	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 2-4 foot wide OHW, 8% slope, stable banks
SS-502-014	221.30	Private	R4SB2	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 4-8 foot wide OHW, 12% slope, stable banks
SS-502-016	221.72	Private	R4SB1	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 3-5 foot wide OHW, 7% slope, stable banks
SS-502-003a &3b	222.80	Private	R4SB1 & R4SB2	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 2-3 foot wide OHW, 4% slope, stable banks
SS-502-004	222.99	Private	R4SB1	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 5-6 foot wide OHW, 3% slope, stable banks
SS-502-005	223.08	Private	R4SB2	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 7 foot wide OHW, 3% slope, stable banks
SS-502-006	223.12	Private	R4SB2	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 5-8 foot wide OHW, 5% slope, stable banks
SS-502-023	223.39	Private	R4SB2	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 4-6 foot wide OHW, 5% slope, stable banks, channel dissipates in meadow south of the ROW
SS-502-011	223.54	Private	R4SB1	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 10-15 foot wide OHW, 8% slope, stable banks
SS-502-009a	224.03	Private	R4SB1	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 3-6 foot wide OHW, 8% slope, some banks with nearly 1:1 slopes that show evidence of erosion
SS-502-009	224.04	Private	R4SB1	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 3-6 foot wide OHW, 8% slope, some banks with nearly 1:1 slopes that show evidence of erosion
SS-502-008	224.17	Private	R4SB2	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 4-10 foot wide OHW, 8% slope, stable banks
SS-502-007	224.21	Private	R4SB2	Riverine F/T	7	None	Wetland	None	None	Ephemeral stream, 4-6 foot wide OHW, 5% slope, stable banks
SS-502-021	224.44	Private	R4SB2	Riverine F/T	7 or 11	None	Wetland	None	None	Ephemeral stream, 3-6 foot wide OHW, 4% slope, stable banks
SS-502-025 (ASI-140 Trib. to V Canal)	225.96	Private	R4SB1	Riverine F/T	7	Yes	Stream Banks	None	None	Ephemeral stream, 12-15 foot wide OHW, 5% slope, deeply entrenched channel, recent erosion and deposition evident
SS-502-024	225.99	Private	R4SB1	Riverine F/T	7	Yes	Stream Banks	None	None	Ephemeral stream, 3-10 foot wide OHW, 2-3% slope, stable banks
SS-502-020	227.14	Private	R4SB1	Riverine F/T	7	Yes	Stream Banks	None	None	Ephemeral stream, 3-5 foot wide OHW, 11%

Wetland ID [1] (Waterbody [2])	Milepost	Jurisdiction	Cowardin Classification	Dominant Oregon HGM	Recommended Wetland Seed Mixture [7]	Woody Species Plantings [8]	Planting Locations [9]	Large Woody Debris / Boulder Placement [10, & 10a]	Streambed Gravel [11] (cu. yds)	Wetland Description [12]
										slope, bed and banks somewhat unstable, deeply incised
SS-502-017	227.57	Private	R4SB1	Riverine F/T	7	Yes	Stream Banks	None	None	Ephemeral stream, 2-4 foot wide OHW, 5% slope, stable banks, a few dormant side channels

[1] Ecology and Environment. 2017. Pacific Connector Gas Pipeline Updated Wetland Delineation Report. September 2017. National Hydrography Dataset, Jones and Stokes Field Surveys from 2006, 2007, and 2009, StreamNet, LIDAR photo interpretation, and consultation with BLM and Forest Service
[2] National Hydrography Framework Clearinghouse Database, Jones and Stokes and E&E Field Surveys
[3] USGS Hydrologic Unit Codes.
[4] Key Watershed
[5] Kentuck Project Compensatory Mitigation Site for JCEP and PCGP.
[6] Mitigation/rehabilitation/restoration measures are as specified in the Compensatory Mitigation Plan provided in Attachment J to Part 2 of the Removal-Fill Application.
[7] The Environmental Inspector may substitute appropriate seed mixtures based on site specific conditions to benefit restoration efforts/success and the intent of these mixtures. The landowner may specify alternate seed mixtures.
[8] See Table 2-3 for the suggested woody species plantings based on site moisture regime. Species to be planted will be determined at the time of planting based on site specific conditions and available planting locations. Some sites may require land owner approval.
[9] Planting location for seed mixtures and woody species. Upland Riparian Areas seeding will be as specified in the Erosion Control and Revegetation Plan (see Attachment A.4 to Part 2 of the Removal-Fill Application). Planting locations of woody species will be coordinated with landowners based on existing land use conditions (i.e., agricultural areas).
[10] Placement of in-stream/riparian zone LWD and/ or boulders will occur during the crossing when the flume or dam and pump is in place as specified in the Stream Crossing Risk Analysis and Addendum (GeoEngineers, 2017a and 2017b) (see Attachment C.17 to Part 2 of the Removal-Fill Application). Site-specific BMPs will be determined in the field, at the time of construction by the Environmental Inspector following training as specified in the Stream Crossing Risk Analysis and Addendum (GeoEngineers, 2017a and 2017b) included in Attachment C.17 to Part 2 of the Removal-Fill Application. The Risk Analysis Addendum (GeoEngineers, 2017b) provides a library of BMPs to be utilized depending on site-specific conditions. Attachment J.1 to Part 2 of the Removal-Fill Application provides an estimate for all net fill associated with stream restoration (i.e., 302 CY).
[10a] Additional LWD may be placed within the riparian zone on stream banks for watershed restoration and habitat benefits. LWD Placement is assumed to be above the OHWM and would not be included in the fill estimates provided in Attachment J.1 to Part 2 of the Removal-Fill Application.
[11] The top 12-inches of the trench will be backfilled with clean spawning gravel in fish-bearing streams where gravel, cobble or existing rock substrates are present. Where gravel, cobble or existing rock substrates are not present, the native streambed materials will be utilized for backfill. The cubic yards provided in (parentheses) are the fill estimates for the top 1-foot of the trench at certain waterbodies that may be backfilled with clean spawning gravels (see Figure A.2-2 and Table A.2-2 in the Tables section of Part 2 of the Removal-Fill Application).
[12] Jones and Stokes and Ecology and Environment survey description of wetland and waterbody.
[13] The BLM and Forest Service will approve seed mixtures on their specific districts or forests.
[13a] The restoration measures outlined in the BLM and Forest Services Technical Memorandum Site-Specific Stream Crossing Procedures Perennial Streams on BLM and National Forest System Lands Task 14 (North State Resources, 2014) will be applied, as appropriate, in conjunction with the restoration measures and BMPs specified in the ECRP (Attachment A.4 to Part 2 of the Removal-Fill Application); Wetland, Waterbody, Riparian and Mitigation Plan (see Attachment I to Part 2 of the Removal-Fill Application); and the Stream Crossing Risk Analysis (see Attachment C.17 to Part 2 of the Removal-Fill Application).
[13b] See Section 2.4 and Table 2-6 in Attachment 2 regarding planting of root pruned trees at perennial stream crossing Forest Service lands. Also see Section 10.12 in the ECRP (Attachment A.4 to Part 2 of the Removal-Fill Application).

Table 2-2
(Excerpted from Table 10.9-1 of the ECRP)
Recommended Seed Mixtures for Private Lands

Seed Mixture 1 – Erosion Control – Upland Right-of-Way Areas for Coos, Douglas, and Jackson Counties[1]

Common Name	Scientific Name	lbs/ac (PLS)
Perennial Grasses		
Bentgrass	*Agrostis spp.*	0.5
Red Fescue	*Festuca rubra*	6.0
Fescue, Tall (endophyte free)	*Festuca arundinacea*	6.0
Orchardgrass	*Dactylis glomerata*	6.0
Ryegrass, Annual or Italian	*Lolium multiflorum*	6.0 [2]
Ryegrass, Perennial	*Lolium perenne*	4.0
Timothy	*Phleum pretense*	2.0
Legumes		
Clover, Red	*Trifolium pretense*	3.0
Clover, White	*Trifolium repens*	2.0
Trefoil, Birdsfoot	*Lotus corniculatus*	3.0
	Total PLS lb/acre	**38.5**
Total Acres Estimated for Seed Mixture: 1435 acres		**Total lbs (PLS) 55,248.0**

[1] Mountain or California brome (*Bromus marginatus or B. carinatus)* and Blue Wildrye *(Elymus glaucus)* to be added to the mixture at 5 lbs/acre PLS each in substitute for Timothy between MPs 65.6 – 88.3.
[2] On slopes greater than 20 percent or where seeding occurs after September 30th annual ryegrass will be increased to 10 lbs/acre.

Seed Mixture 2 – Pasture and Hayland Mixes (Coos, Douglas, and Jackson Counties)

Common Name	Scientific Name	lbs/ac (PLS)			
Perennial Grasses		Mix A[1]	Mix B [1]	Mix C[1]	Mix D[1]
Fescue, Tall (endophyte free)	Festuca arundinacea		20.0		
Orchardgrass	*Dactylis glomerate*	10.0			16.0
Ryegrass, Perennial or English	*Lolium perenne*	10.0		25.0	
Ryegrass, Annual or Italian	*Lolium multiflorum*	3.0	3.0	3.0	3.0
Legumes					
Clover, Red	*Trifolium pratense*	2.0	2.0	2.0	2.0
Clover, ladino[2]	*Trifolium repens*	2.0	2.0	2.0	2.0
	Total PLS lb/acre	**27.0**	**27.0**	**32.0**	**23.0**
Total Acres Estimated for Seed Mixtures: 176 acres		**Total lbs (PLS) @ 27 lbs/ac = 4,743.0**			

[1] Seed Mix 2-A will be utilized as the primary pasture mixture unless landowners request other specific mixtures or a single species pasture mixture is requested such as Mix 2-B, 2-C, or 2-D.
[2] In Coos County, substitute New Zealand white clover for ladino white clover at 3 lbs/acre. New Zealand white clover is more slug resistance than Ladino white clover. Big trefoil can also be substituted or supplemented in the mixture (6-10 lbs/acre) on poorly drained, strongly acidic soils. Lundin. F. 1996. Pasture Management Guide. Coastal Pastures in Oregon and Washington. Oregon State University Extension Service. EM8645.

Seed Mixture 3 – Irrigated Pasture and Hayland Mixes (Klamath County) [1]					
Common Name	**Scientific Name**	**lbs/ac (PLS)**			
Perennial Grasses		Mix A	Mix B	Mix C	Mix D
Orchardgrass	*Dactylis glomerate*		8.0		
Tall fescue (endophyte free)	Festuca arundinacea	15.0			15.0
Ryegrass, Perennial	*Lolium multiflorum*		8.0		
Intermediate Wheatgrass	*Elytrigia intermedia ssp. Intermedia*			12.0	
Ryegrass, Annual or Italian	*Lolium multiflorum*	2.0	2.0	2.0	2.0
Legumes					
Alfalfa	*Medicago L.*			2.0	
Clover, ladino	*Trifolium repens*	2.0	2.0	2.0	2.0
Clover, Red	*Trifolium pratense*	2.0	2.0		
Strawberry clover	*Trifolium fragiferum*				1.0
Trefoil, Birdsfoot	*Lotus corniculatus*				1.0
	Total Bulk lb/acre	**21.0**	**22.0**	**18.0**	**21.0**
Total Acres Estimated for Seed Mixtures: 445 acres		**Total lbs (PLS) @ 21 lbs/ac = 9,350.0**			

[1] University of California Division of Agriculture and Natural Resources. 1993. Intermountain Irrigated Pastures and Mountain Meadows. Intermountain Workgroup, University of California Cooperative Extension.

Mix A – Recommended for pastures that receive winter feeding operations (high yield forage with reasonable quality and a strong sod). Recommended for horse pastures.
Mix B – High yield, high quality pasture mixture.
Mix C – Recommended on irrigated pastures with marginal water supply.
Mix D – Recommended on alkaline irrigated pastures (use Fawn tall fescue)

Seed Mixture 4 – Erosion Control – Upland Right-of-Way Areas for Jackson County (non-federal land) MPs 113.2 to 150.45, precipitation ranges between 24 and 36 inches		
Common Name	**Scientific Name**	**lbs/ac (PLS)**
Perennial Grasses		
Mountain or California brome	*Bromus marginatus or B. carinatus*	4.0
Blue Wildrye	*Elymus glaucus*	4.0
Red fescue	*Festuca rubra*	3.0
Orchardgrass	*Dactylis glomerata*	6.0
Ryegrass, Annual or Italian	*Lolium multiflorum*	6.0
Legumes		
Pine or Sickle-Keel Lupine [1]	*Lupinus albicalus*	4.0
Clover, White	*Trifolium repens*	2.0
Subclover	*Trifolium subterranean*	1.0
	Total PLS lb/acre	**30.0**
Total Acres Estimated for Seed Mixture: 323 acres		**Total lbs (PLS) 9,688.0**

[1] To be applied if readily available from commercial sources.

Seed Mixture 5 – Erosion Control – Upland Right-of-Way Areas Control for Jackson and Klamath Counties (non-federal land) MPs 169.4 to 181.0 precipitation ranges between 20 and 36 inches		
Common Name	**Scientific Name**	**lbs/ac (PLS)**
Perennial Grasses		
Mountain or California brome	*Bromus marginatus or B. carinatus*	5.0
Orchardgrass	*Dactylis glomerata*	6.0
Timothy	*Lolium multiflorum*	4.0
Red fescue	*Festuca rubra*	3.0
Ryegrass, Annual or Italian	*Lolium multiflorum*	4.0
Legumes		
Clover, White	*Trifolium repens*	2.0
Subclover	*Trifolium subterranean*	2.0
	Total PLS lb/acre	**26.0**
Total Acres Estimated for Seed Mixture: 92 acres		**Total lbs (PLS) 2,397.0**

Seed Mixture 6 – Erosion Control – Upland Right-of-Way Areas Control for Klamath County (non-federal land) MPs 181.0 to 198.0 precipitation ranges between 16 and 20 and inches		
Common Name	**Scientific Name**	**lbs/ac (PLS)**
Perennial Grasses		
Bluebunch wheatgrass	*Pseudoroegneria spicata*	4.0
Slender wheatgrass	*Elymus trachycaulus*	4.0
Blue wildrye	*Elymus glaucus*	4.0
Idaho fescue	*Festuca idahoensis*	3.0
Orchardgrass	*Dactylis glomerata*	3.0
Legumes		
Clover, White	*Trifolium repens*	2.0
Shrubs		
Antelope bitterbrush	*Purshia tridentata*	1.0
Birchleaf mountain mahogany	*Cercocarpus montanus*	1.0
	Total PLS lb/acre	**22.0**
	Total Acres Estimated for Seed Mixture: 58 acres	**Total lbs (PLS) 1,269.0**

Seed Mixture 7 – Rangeland Mixture for Klamath County MPs 198 to 228 precipitation ranges between 10 and 16 inches		
Common Name	**Scientific Name**	**lbs/ac (PLS)**
Perennial Grasses		
Bluebunch wheatgrass	*Pseudoroegneria spicata*	6.0
Canby bluegrass	*Poa canbyi*	1.0
Sheep fescue	*Festuca ovina*	1.0
Legumes		
Alfalfa	*Medicago L.*	1.0
Shrubs		
Antelope bitterbrush	*Purshia tridentata*	2.0
	Total PLS lb/acre	**11.0**
	Total Acres Estimated for Seed Mixture: 143 acres	**Total lbs (PLS) 1,571.0**

Seed Mixture 8 – Ditch and Canal Banks < 16 inches precipitation – Klamath County			
Common Name	**Scientific Name**	**lbs/ac (PLS)**	
Perennial Grasses		**Mix A**	**Mix B**[1]
Streambank wheatgrass	*Elymus lancelotus ssp. Psammophilus*	20.0	5.0
Tall wheatgrass	*Elytrigia elongata*		15.0
Sheep fescue	*Festuca ovina*	4.0	4.0
	Total PLS lb/acre	**24.0**	**24.0**
	Total Acres Estimated for Seed Mixture: 7.7 acres	**Total lbs (PLS) 185.0**	
[1] moist or subirrigated, saline areas			

Seed Mixture 9 – Seed Mixture for Disturbed Emergent Wetlands (Pastures) – Coos County		
Common Name	**Scientific Name**	**lbs/ac (PLS)**
Perennial Grasses		
Ryegrass, Annual	*Lolium multiflorum*	10.0
Bentgrass, Colonial	*Agrostis tenuis (Agrostis capillaries)*	6.0
Legumes		
Trefoil, Birdsfoot	*Lotus corniculatus*	8.0
New Zealand White Clover	*Trifolium repens*	2.0
	Total PLS lb/acre	**26.0**
	Total Acres Estimated for Seed Mixture: 38.6 acres	**Total lbs (PLS) 1,004.0**

Seed Mixture 10 – Seed Mixture for Disturbed Emergent Wetlands Klamath County		
Common Name	**Scientific Name**	**lbs/ac (PLS)**
Perennial Grasses		
Ryegrass, Annual	*Lolium multiflorum*	10.0
Hairgrass, Tufted	*Deschampsia caespitosa*	3.0
Barley, Meadow [1]	*Hordeum brachyantherum*	5.0
Creeping bentgrass	*Agrostis stolonifera*	0.4
Garrison creeping foxtail	*Alopercurus arundianceus*	2.0
	Total PLS lb/acre	**20.4**
	Total Acres Estimated for Seed Mixture: 1.5 acres	**Total lbs (PLS) 31.0**
Seed Mixture 11 – Seed Mixture for Disturbed Emergent Wetlands (Pastures) – Douglas, Jackson, and Klamath Counties		
Common Name	**Scientific Name**	**lbs/ac (PLS)**
Perennial Grasses		
Ryegrass, Annual	*Lolium multiflorum*	10.0
Meadow foxtail	*Alopercurus pratensis*	8.0
Creeping bentgrass	*Agrostis stolonifera*	1.0
Legumes		
Trefoil, Birdsfoot	*Lotus corniculatus*	2.0
	Total PLS lb/acre	**21.0**
	Total Acres Estimated for Seed Mixture: 87 acres	**Total lbs (PLS) 1,827.0**
Seed Mixture 12 – Wetland Seed Mixture		
Common Name	**Scientific Name**	**lbs/ac (PLS) (broadcast seeding rate)**
Perennial Grasses		
Ryegrass, Annual	*Lolium multiflorum*	10
Quick Guard		40
Fescue, Fine or Creeping Red	*Festuca rubra*	2.0
Hairgrass, Tufted	*Deschampsia caespitosa*	2.0
Mannagrass, Reed [1]	*Glyceria grandis*	2.0
American sloughgrass [1]	*Beckmannia syzigachne*	2.0
Barley, Meadow [1]	*Hordeum brachyantherum*	5.0
Western Mannagrass [1]	*Glyceria occidentalis*	2.0
Fowl bluegrass [1]	*Poa palustris*	1.0
	Total PLS lb/acre	**66.0**
	Total Acres Estimated for Seed Mixture: 39.6 acres	**@ 58 lbs/ac 2,297.0**

[1] These species may be included in the seed mixture if they are readily available from a commercial seed supplier.
lbs/acre = pounds per acre
PLS = pure live seed

Table 2-3
(Excepted from Table 10.9-2 of the ECRP)
Bureau of Land Management Coos Bay, Roseburg, Medford, and Lakeview Districts Seed Mixtures

Seed Mixture 13 – Coos Bay BLM Lands - Erosion Control - Upland Right-of-Way Areas		
Californian brome	*Bromus carinatus*	8
Blue Wildrye	*Elymus glaucus*	12
Regreen or Quickguard [1]		
	Total PLS lb/acre	**40**
	Total Acres Estimated for Seed Mixture: 143 acres	**Total lbs (PLS) 5,723**

[1] The use of native seed mix is preferred; however, there may be instances in highly erosive soils on steep slopes, where mixing sterile perennials such as sterile wheatgrass species or non-persistent annual grasses like Annual Rye could be appropriate. In these areas the PCGP will include Regreen, Quickguard or annual ryegrass in the seeding mixture at 20 lbs/acre for erosion control, if approved, or at a rate specified by the BLM.

Seed Mixture 14 – Roseburg BLM Lands

The seeding rate will be 30 seeds Pure Live Seed per square foot (30 seeds PLS/ft^2). The seed mix must include at least two species of grasses and at least two species of forbs. Species may include any of those listed below or a different species upon approval by the Roseburg BLM. The seed mix ratio will consist of 60% grasses and 40% forbs. Dominant species proposed by PCGP are footnoted ([1]). The other species listed will be utilized where the proposed species are not available. Other species may also be used upon approval by the BLM.

Common Name	**Scientific Name**	**Variety**	**Mixture Percentage**
Grasses			
California brome	*Bromus carinatus*	Native [1]	25%
Blue wildrye	*Elymus glaucus*	Native [1]	35%
California fescue	*Festuca californica*	Native	
Roemer's fescue	*Festuca roemeri*	Native	
Harford's onion-grass	*Melica harfordii*	Native	
Forbs			
big deervetch	*Lotus crassifolius*	Native	
sickle-keeled lupine	*Lupinus albicaulis*	Native [1]	20%
silver lupine	*Lupinus albifrons* var. *eminens*	Native	
miniature lupine	*Lupinus bicolor*	Native	
slender goldenbanner	*Thermopsis gracilis* var. *gracilis*	Native	
tomcat clover	*Trifolium willdenowii*	Native	
grassy tarweed	*Madia gracilis*	Native [1]	20%
woodland tarweed	*Madia madioides*	Native	
Regreen or Quickguard [2]			20 lbs/acre
Total Acres Estimated for Seed Mixture: 219 acres			**Total lbs (PLS) 4,643**

Note: where slopes exceed 25 percent, PCGP proposes to include Regreen or Quickguard in the seeding mixture at 20 lbs/acre for erosion control. Prior to application of Regreen or Quickguard, PCGP would receive approval from the Roseburg BLM.

Seed Mixture 15a–Medford BLM Lands – Oak woodland, Grasslands, Chaparral Types

Common Name	**Scientific Name**	**Variety**
Grasses [2]		
Roemer's fescue	*Festuca roemeri*	Native [1]
California Oatgrass	*Danthonia californica*	Native
Prairie Junegrass	*Koeleria macrantha*	Native
Pine bluegrass	*Poa secuda*	Native
California brome	*Bromus carinatus*	Native [1]
Blue wildrye	*Elymus glaucus*	Native [1]
Total Acres Estimated for Seed Mixture: 77 acres		**Total lbs (PLS) 517.0 total lbs**

Seed Mixture 15b – Medford BLM Lands - Conifer stands		
Common Name	**Scientific Name**	Variety
California fescue	*Festuca californica*	Native
Western fescue	*Festuca occidentalis*	Native
Harford's onion-grass	*Melica hardfordii*	Native
Blue wildrye	*Elymus glaucus*	Native[1]
Total Acres Estimated for Seed Mixture: 157.5 acres		**Total lbs (PLS) 666.0 total lbs**
Regreen/Quickguard or annual ryegrass [2]		20 lbs/acre
Seed Mixture 15c –Medford BLM Lands – Wet Sites		
Slender hairgrass	*Deschampsia elongate*	Native
Note: Seeding rates – The seeding rate will be 10-20 seeds Pure Live Seed per square foot (10-20 seeds PLS/ft^2). Other species may also be used upon approval by the BLM. The BLM will specify genetically appropriate seed sources/seed zones for all species to be planted/seeded.		

Table 2-4
Native Shrub and Tree Plantings for Restoring Wetland and Riparian Areas [1]
(Excerpted from the ECRP - Table 10.12-1)

Common Name	**Scientific Name**	**Planting size [2]**	**Plant Spacing [3]**
Shrubs			
Wet Sites			
Red-osier dogwood	*Cornus stolonifera*	36" cuttings	3'
Willow spp	*Salix spp.*	36" cuttings	3'
Moist Sites			
Pacific ninebark	*Physocarpus capitatus*	1 gal	8'
Red elderberry	*Sambucus racemosa*	1 gal	8'
Blue elderberry	*Sambucus cerulean*	1 gal	8'
Vine maple [4]	*Acer circinatum*	1 gal	6'
Salmonberry	*Rubus spectabilis*	1 gal	4'
Nootka rose/woods rose	*Rosa nutkana/ Rosa woodsii*	1 gal	4'
Golden Currant	*Ribes aureum*	1 gal	6'
Dry Sites			
Snowberry	*Symphoricarpos albus*	1 gal	4'
Serviceberry [4]	*Amelanchier alnifolia*	1 gal	8'
Oceanspray [4]	*Holodiscus discolor*	1 gal	8'
Beaked hazelnut	*Corylus cornuta*	1 gal	8'
Lewis' mock orange	*Philadelphus lewisii*	1 gal	8'
Redstem Ceanothus [4]	*Ceanothus sanguineus*	1 gal	8'
Deerbrush [4]	*Ceanothus integerrimus*	1 gal	8'
Wedge-leaf ceanothus [4]	*Ceanothus cuneatus*	1 gal	8'
Oregon Grape	*Mahonia aquifolium*	1 gal	4'
Salal	*Gaultheria shallon*	1 gal	4'
Kinnikinnik	*Arcostaphylos uva-ursi*	1 gal	6'
Hairy manzanita [4]	*Arcostaphylos columbiana*	1 gal	8'
Trees			
Wet Sites			
Oregon ash	*Fraxinus latifolia*	1 gal	10'
Red alder	*Alnus rubra*	1 gal	10'
Sitka spruce	*Picea sitchensis*	2 gal or bare root	15'
Western red cedar [5]	*Thuja plicata*	2 gal or bare root	12'
Oregon crabapple	*Malus fusca*	1 gal	10'
Black cottonwood	*Populus balsamifera ssp. trichocarpo*	36" cuttings or poles	10'
Moist Sites			
Cascara buckthorn	*Frangula purshiana*	1 gal	8'

Common Name	Scientific Name	Planting size [2]	Plant Spacing [3]
Western hemlock [5]	*Tsuga heterophylla*	1 gal	12'
Dry Sites			
Douglas' fir [5]	*Pseudotsuga menziesii*	1 gal or bare root	12'
Big-leaf maple	*Acer macrophyllum*	2 gal	15'

[1] The Forest Service and BLM will specify genetically appropriate seed sources/seed zones for all species to be planted.
[2] Planting stock sizes may include bare root equivalents.
[3] Shrubs will be installed in clusters of 5 to 10, while trees will be individual specimens.
[4] Shrubs to be planted on NFS Lands 15 feet each side of the centerline and the outer edge of the construction limits (see Table 10.13-1 in the ECRP).
[5] Riparian areas on the BLM's Coos Bay District lands will be replanted with a coniferous mixture of 50% Douglas-fir, 25% western hemlock, and 25% western red cedar on a 15 ft x 15 ft spacing.
Note: The Umpqua NF requested the following species be planted to provide additional habitat elements: Asclepias cordifolia (heartleaf milkweed) for monarch butterflies, and Lonicera ciliosa (orange honeysuckle) for humming birds. These species will be included in the shrub clusters, or planted separately in appropriate habitats scattered along the construction right-of-way. Heartleaf milkweed will primarily be planted by seed or rhizome cuttings. Orange honeysuckle will be planted as containerized stock or bare root specimens.

Table 2-5
Riparian Management Area Widths for Streams of Various Sizes and Type[1]
(Excepted from Section 10.12 of the ECRP)

Size	Type F [2]	Type D [2]	Type N
Large	100 feet	70 feet	70 feet
Medium	70 feet	50 feet	50 feet
Small	50 feet	20 feet	Apply specified water quality protection measures, and see OAR 629-640-0200

[1] OAR 629-635-0000: http://arcweb.sos.state.or.us/pages/rules/oars_600/oar_629/629_635.html
[2] Type F stream have fish use, including fish use streams that have domestic water use. Type D streams have domestic water use, but not fish use. Type N streams are all other streams.

Table 2-6
Optimal Planting Distance of 15-20-foot Transplanted Root-Pruned Trees
(Excepted from Table 10.12-2 of the ECRP)

Site Identifier	Waterbody	Milepost	Jurisdiction	Proposed Planting Distance (feet) from Stream Channel High Water Mark: Left Bank[1]	Right Bank[1]
WW-111-001 (GW014/ FS-HF-C)	Trib. to East Fork Cow Creek	109.17	Umpqua National Forest	12	12
GSP019/FSHF-G	East Fork Cow Creek	109.47	Umpqua National Forest	15	12
FS-HF-J	Trib. to East Fork Cow Creek	109.69	Umpqua National Forest	18	25
FS-HF-K	Trib. to East Fork Cow Creek	109.78	Umpqua National Forest	19	26
ESI068/ FS-HF-N	Trib. to East Fork Cow Creek	110.96	Umpqua National Forest	12	12
ASP 165	South Fork Little Butte Creek	162.45	Rogue River-Siskiyou National Forest	18	12

[1] Looking downstream

ATTACHMENT 3

PROCEDURES FOR PREPARING AND PLANTING LIVE STAKES OR SPRIGS AND PLANTING BARE ROOT TREE SEEDLINGS

Cuttings and Live Staking or Sprigging

Preparation and Handling of Cuttings

In preparing and handling cuttings prior to planting, the following guidelines will increase the chances for success:

1. Select healthy wood of reasonable straightness from plant species that root easily and are native to the planting site.

2. Make clear cuts with unsplit ends. Stems up to 1½ inches in diameter can best be cut with two-handled brush pruning shears. Several stems of small diameter may be cut at a time with a carpenter's hatchet. Larger branches can be cut with chain saws. The butt end of cuttings should be pointed to facilitate driving. Long straight "whips" are ideal since they indicate a healthy growing plant.

3. Trim branches from cuttings as close as possible.

4. Length: Cuttings of small diameter (up to 1 ½ inches) should be 12 to 24 inches long. Where water tables are low or receding, 3 to 5 foot whips 1 inch or more in diameter can be used to improve survival.

5. Diameter: The minimum diameter is ¼ inch; the thicker the cutting, the greater the food reserves. Cuttings greater than 1 inch are desirable, although their numbers may be limited by supply.

6. Location of buds and bud scars: Cuttings put out their greatest concentration of shoots and their strongest ones just below an annual ring (formed from a terminal bud scar). Cutting should be cut so that a terminal bud scar is within 1 to 4 inches of the top. At least two buds and/or bud scars should be above the ground after planting.

7. Handling of stakes between cutting and planting: Cuttings must not be allowed to dry out. They must be kept covered and moist during transport, storage, and during the planting operation. Cuttings should be wrapped in most burlap or stored in plastic garbage bags with moist newsprint, sawdust or peat moss. Cuttings may also be kept submerged in water for one to several days after perpetration to ensure that they remain moist. The cutting should be kept out of direct sunlight and at no time should cuttings be left exposed to the air to dry out prior to planting.

8. Cutting tips should also be treated with a combination of growth hormone and fungicide, substances such as Rootone which contain indolebutvric acid, napthaleneacetic acid, or napthaleneacetamide. This aids in survival by inhibiting fungus development, and also stimulates rood development. Following treatment, it is recommended that the cuttings be allowed to dry for 30 minutes to an hour in open air. This will minimize loss of rooting hormone through handling and planting and increases the chances of successful planting.

The cuttings will normally be salvaged from the area to be cleared of vegetation prior to right-of-way clearing. However, in the event additional materials need to be collected for planting to reduce impacts to donor sites, the following procedures will be strictly followed:

1. Obtain permission from landowners before collecting on private land;

2. Take scattered cuttings throughout the donor site and collect no more than 1/3 of any shrub;

3. Collect only the material needed so that material will not be wasted;

4. Prevent soils and vegetation from being trampled and trails from being created; and

5. Collect from large stands in a checkerboard pattern.

Time to Plant Stakes

Stakes should be cut and planted when willows or other suitable species are dormant. This period extends from the time the leaves start to turn yellow in autumn until the time growth starts in the spring. McCluskey *et al.* (1984) indicated that early spring planting prior to the breaking of dormancy is probably the best. In moist soils, willow stakes can sometimes be planted successfully during the summer season, but usually this should not be attempted. When this procedure is attempted, the cuttings should be defoliated. Additional soaking of cuttings prior to planting may be required for late plantings.

How to Plant Stakes

In addition to the way in which stakes are prepared and stored, the way in which they are set in the ground is also crucial for success. The following guidelines should be observed.

1. Plant the cuttings right side up (i.e. with the butt ends in the ground). It is not always easy to tell the top from the butt of a leafless cutting. A good rule is to have the butt end of all stakes painted or marked immediately by the cutting crew at the time they are made. Alternatively, the tops of bundles of cuttings maybe painted with a water-soluble latex paint. The paint also seals the ends and reduces desiccation of the cuttings.

2. Set the cutting as deep as possible. Most of the sprig length should be planted in the ground. It is preferable that at least 80 percent of the sprig length be in the ground. Two reasons for deep planting are to minimize water loss due to transpiration and to lessen the problem of root breakage caused by movement between the cutting and the ground.

3. Avoid stripping the bark or needless bruising of the stakes when setting them in the ground. In fairly soft soil the stakes can be driven with a wooden maul. Do not use an ax or sledge. In hard ground, use an iron bar or star drill to prepare the holes for the cuttings.

4. Tamp the soil around the cutting. The cutting must be firm in the ground so that it cannot be readily moved or pulled out.

5. If the area receives grazing pressures, the site should be fenced or deferred from grazing to ensure cutting establishment.

Recommended propagation techniques for the following species are according to Zeigler (1990) and Stevens and Vanbianchi (1991):

Red-osier Dogwood	Cuttings. Cuttings of 1 year old wood collected and planted before buds start to open; cuttings should be about 18” long and ¾” in diameter. Propagation by seeds requires cold stratification after removal of pulp.

	Cold storage from 30-60 days at 35-41 degrees. Sow seed in ordinary loam to start.
Douglas spirea	Cuttings, as with willows. Use whips where water table is low or receding.
Ninebark	Cuttings
Oceanspray	Cuttings from August to September. Seeds or layering. Has wide range of soil and moisture tolerances.
Black Cottonwood	Cuttings. Does well in almost any soil but best in lowlands and along streams. 4 foot long whips soaked in water for 48 hours prior to planting enhances rooting. Plant on 6 foot plus center.
Oregon Ash	Propagation is by seeds gathered in fall and sown immediately, or stratified and sown in spring. Cover with 1 inch of soil. Also transplants well when young.
Red Alder	Easily grown from fresh seed following 30 day cold stratification. Can be transplanted from donor sites as pull-ups collected in the late winter and early spring before buds break (uproot 2-4' tall plants, transport them to the restoration site with their roots covered and moist, plant immediately).
Snowberry	Cuttings, seeds or suckers. Cuttings from July to September.
Red Elderberry	Cuttings from June to July or clean seed in fall.
Oregon Grape	Cuttings from June to August seeds or suckers.
Huckleberry	Cuttings from July to October, seeds or layering.
Salmonberry	From seed sown in the spring following acid scarification and 60 day cold stratification or from fresh seed sown in the fall. Soft and hardwood cuttings planted on 4 foot plus centers.
Red Elderberry	By seed following 6 months cold stratification, also from hardwood and softwood cuttings taken soon after leaf drop in the fall.

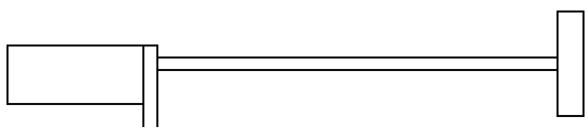
Procedures for Planting Bare Root Tree Seedlings

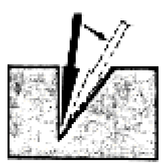
Bare-root seedlings (quality, care and handling)

Bare-root tree seedlings can be inexpensively produced and distributed and generally planted successfully. Seedlings should be dormant, and roots should be moist and fibrous. Seedlings over 12 inches in height above the root collar should have roots about 10 - 12 inches long. Proper storage is necessary to prevent drying (especially of roots), and planting must be completed before dormancy ends.

Bare-root seedlings can be quickly and easily planted into a planting slot (deeper than the length of the roots) which is made using a specially designed planting tool such as a "dibble" bar (Figure 1), mattock (Figure 2), spade or planting shovel (Figure 3). Better results, especially in heavier (clay) soils, may be obtained by digging and preparing a planting hole with a shovel, but considerably more time and effort is required. The following web site also provides important planting tips http://forestry.about.com/library/weekly/aa121299.htm

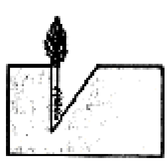
Figure 1. Planting with a dibble "Planting" bar.





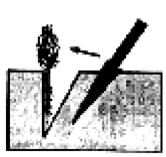
Step 1

Insert dibble as shown and pull handle towards planter



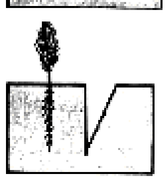
Step 2

Remove dibble and place seedling at correct depth.



Step 3

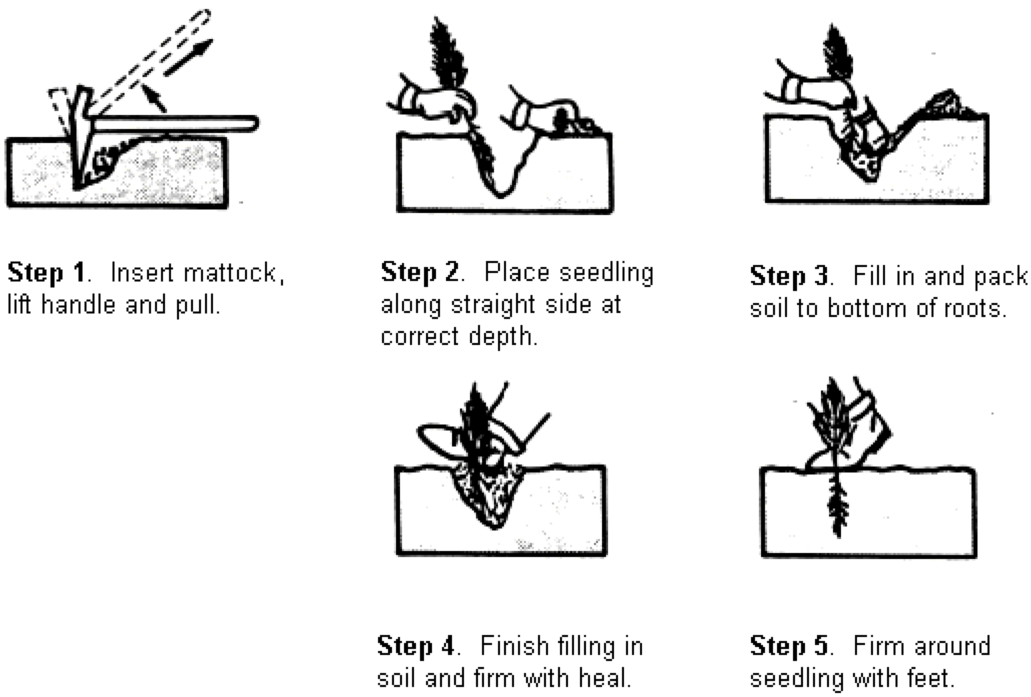
Insert dibble at an angle 3-4 inches toward planter from seedling. Push handle of dibble forward from planter.



Step 4

Soil at this point must be firmly packed around the seedling that the seedling doesn't move when given a firm tug. Leave the second hole.

Figure 2. Planting with a Mattock (hodad).



Planting bare-root seedlings using a shovel:

- Soak roots overnight
- Cut broken roots back to healthy tissue
- Dig a hole large enough to accommodate full root length
- Spread roots outward and downward
- Back-fill soil; work in and tamp around roots
- Water, and let the soil settle
- Re-adjust the tree so that the root crown is at grade level
- Fill the rest of the hole, and tamp soil
- Soak with water
- Mulch

Planting Bare Root or Containerized Shrubs

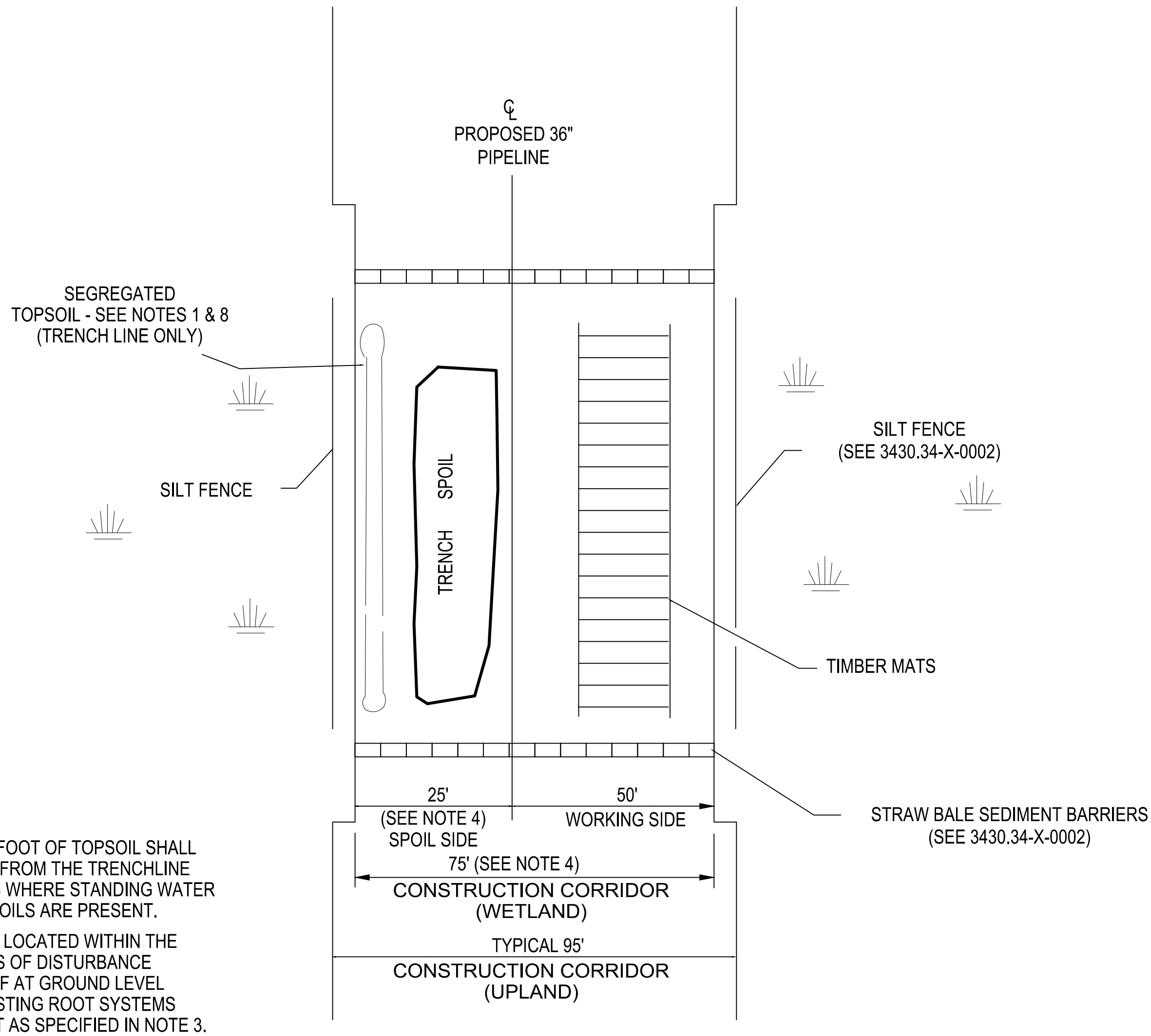
Deciduous bare root shrubs require a hole twice as wide as the root diameter and no deeper that the depth of the roots. Firmly pack the soil around the roots to eliminate air pockets.

Never transplant any seedling deeper than it was originally planted. Bare root trees and shrubs should have roots spread out in the hole. Shovels are the preferred tool for planting deciduous trees and shrubs. A dibble bar or hodad used in the usual fashion does not provide a hole large enough to accommodate the extensive root systems of deciduous trees or shrubs. Insert either of these tools several times to increase the size of the hole; also loosen soil with the tool to avoid soil compaction. Soil compaction will interfere with root growth and available moisture. Typical figures for installing bare-root shrubs, and containerized plants can be found at http://www.wa.gov/wdfw/hab/ahg/ispgapph.pdf

ATTACHMENT 4

WETLAND CONSTRUCTION/RESTORATION FIGURES AND LWD FIGURE

WETLAND CROSSING DETAIL



PLAN VIEW

NOTES:

1. THE TOP ONE (1) FOOT OF TOPSOIL SHALL BE SEGREGATED FROM THE TRENCHLINE EXCEPT IN AREAS WHERE STANDING WATER OR SATURATED SOILS ARE PRESENT.
2. THE VEGETATION LOCATED WITHIN THE PROPOSED LIMITS OF DISTURBANCE SHALL BE CUT OFF AT GROUND LEVEL LEAVING THE EXISTING ROOT SYSTEMS IN PLACE, EXCEPT AS SPECIFIED IN NOTE 3.
3. PULLING OF TREE STUMPS AND GRADING ACTIVITIES SHALL BE LIMITED TO THE AREA DIRECTLY OVER THE TRENCHLINE UNLESS SAFETY CONDITIONS REQUIRE THE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE WORK CORRIDOR.
4. CONSTRUCTION CORRIDOR THROUGH WETLANDS WILL BE 75 FEET WIDE UNLESS A MODIFICATION IS GRANTED. CONFIGURATION OF RIGHT-OF-WAY MAY VARY.

DRAWING NO.	REFERENCE TITLE

PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP

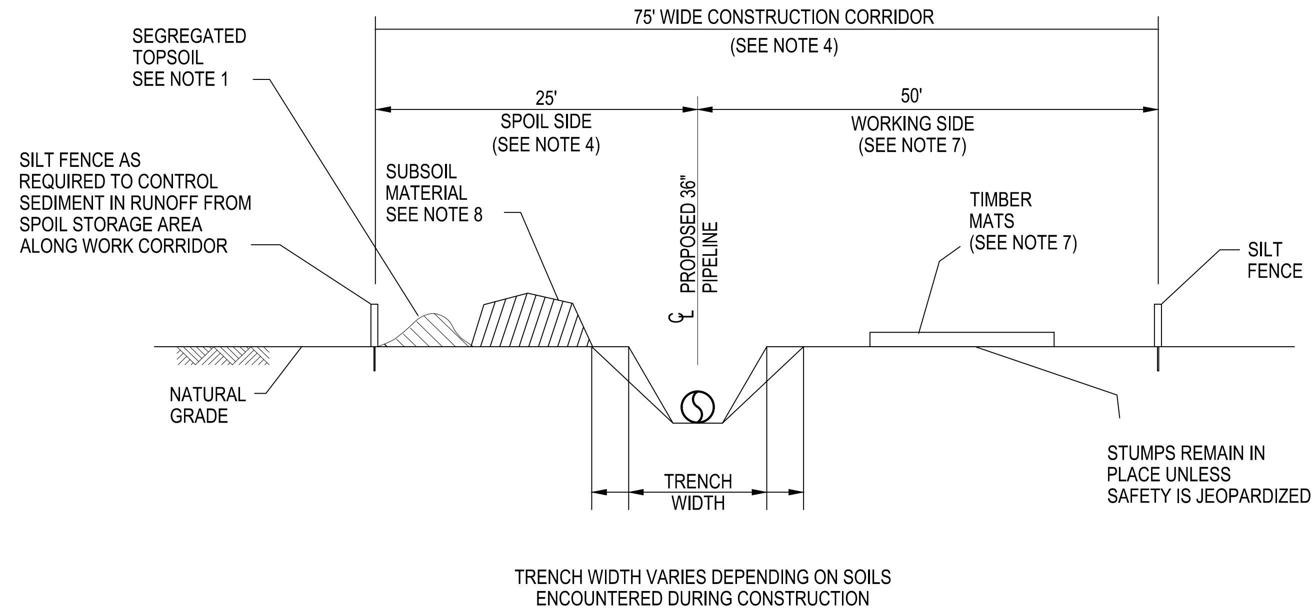
CROSSING DETAIL FOR WETLANDS

WC

Pacific Connector GAS PIPELINE SM

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

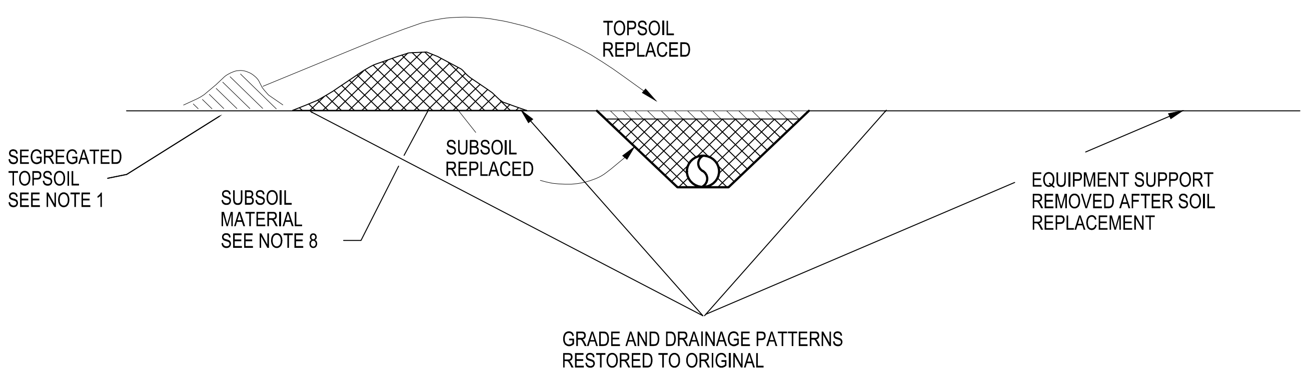
DRAWN BY: KLL	DATE: 02-02-2001	
CHECKED BY:	DATE:	
APPROVED BY:	DATE:	DRAWING NUMBER: 3430.34-X-0005 SHEET 1 OF 2



CROSS SECTION

NOTES CONTINUED:

5. SILT FENCE OR STRAW BALES WILL BE USED WHERE APPROPRIATE TO PREVENT SILTATION INTO WATER BODIES OR WETLANDS.
6. SILT FENCES OR STRAW BALES WILL ALSO BE USED TO PREVENT STOCKPILED SOIL OR SPOIL FROM LEAVING THE CONSTRUCTION RIGHT-OF-WAY OR WORKSPACES.
7. TIMBER MATS MAY BE USED OVER SPOIL STORAGE WHERE STANDING WATER OR SATURATED SOILS ARE PRESENT.
8. IF STANDING WATER OR SATURATED SOILS ARE PRESENT, OR IF CONSTRUCTION EQUIPMENT CAUSES RUTS OR MIXING OF TOPSOIL AND SUBSOIL IN WETLANDS, USE LOW-GROUND WEIGHT EQUIPMENT, OR OPERATE NORMAL EQUIPMENT ON TIMBER RIPRAP, PREFABRICATED EQUIPMENT MATS OR TERRA MATS.



WETLAND RESTORATION

DRAWING NO.	REFERENCE TITLE

PACIFIC CONNECTOR GAS OPERATOR, LP
PACIFIC CONNECTOR GAS PIPELINE PROJECT
CROSSING DETAIL FOR WETLANDS

Pacific Connector GAS PIPELINE SM

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001
CHECKED BY:	DATE:
APPROVED BY:	DATE:

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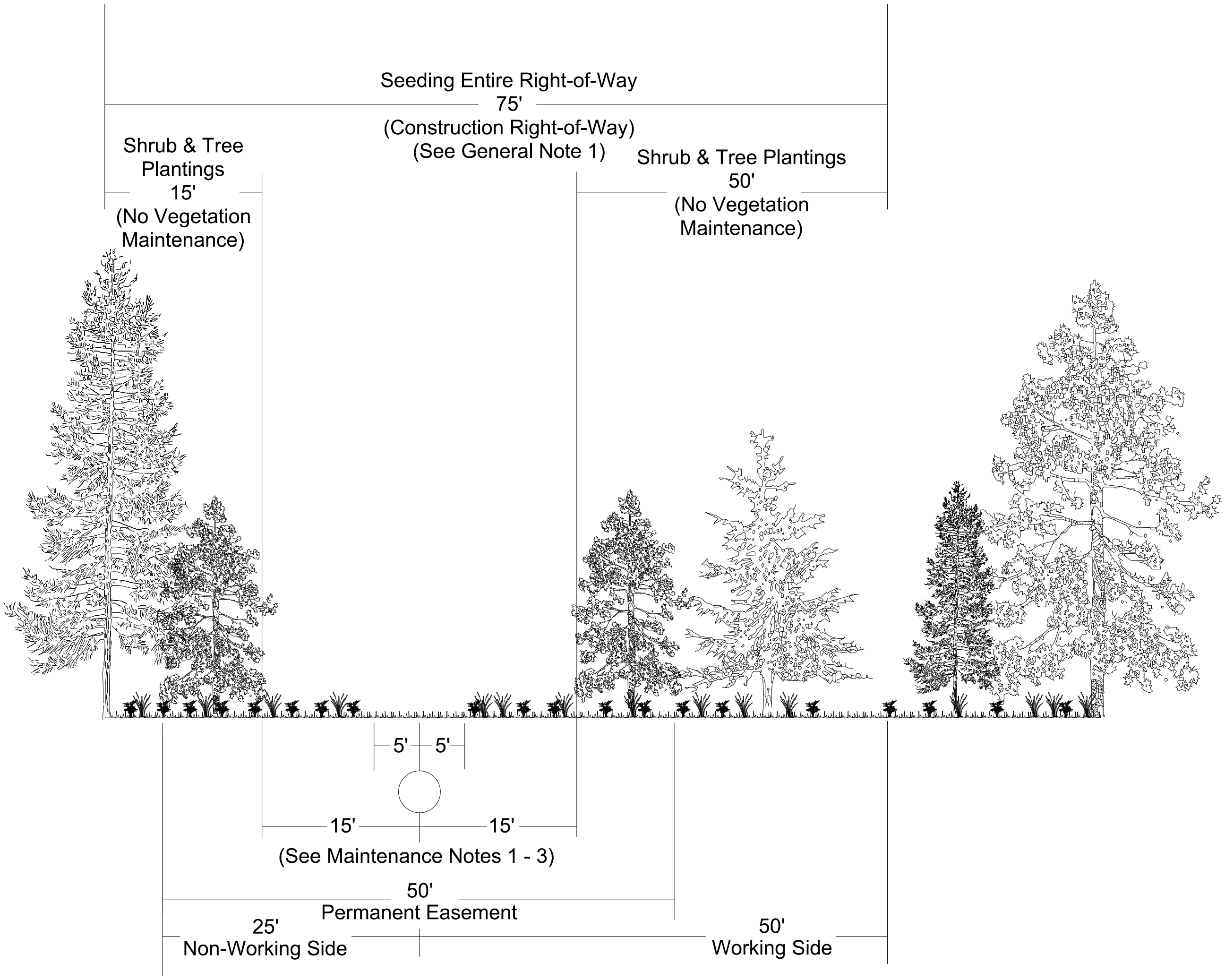

General Notes:

1. Construction right-of-way through wetlands will be 75 feet wide unless a modification is granted.\
   Configuration of Right-of-Way may vary.

Planting Notes:

1. Entire right-of-way to be seeded with appropriate wetland seed mixture (see Section 10.9).
2. Shrubs not to be planted within 5' of the pipeline centerline.
3. Trees not to be planted within 15' of the pipeline.
4. Trees and shrubs will be planted in all disturbed forested and shrub wetland areas beyond 15' of pipeline centerline (see Table 10.12-1).

Maintenance Notes:

1. Maintenance of right-of-way in herbaceous state permitted in a 10' corridor centered on the pipeline.
2. Selective cutting of trees within 15' of the pipeline.
3. No vegetation maintenance proposed beyond 15' of the pipeline centerline.

Shrubs

Herbaceous vegetation/ seed mixture

DRAWING NO.	REFERENCE TITLE

PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP

FOREST & SHRUB WETLAND
REVEGETATION & MAINTENANCE PLAN

Pacific Connector GAS PIPELINE SM

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL	DATE: 02-02-2001	ISSUED FOR BID:	SCALE: NOT TO SCALE
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	
APPROVED BY:	DATE:	DRAWING NUMBER: 3430.34-X-0015	SHEET 1 OF 1

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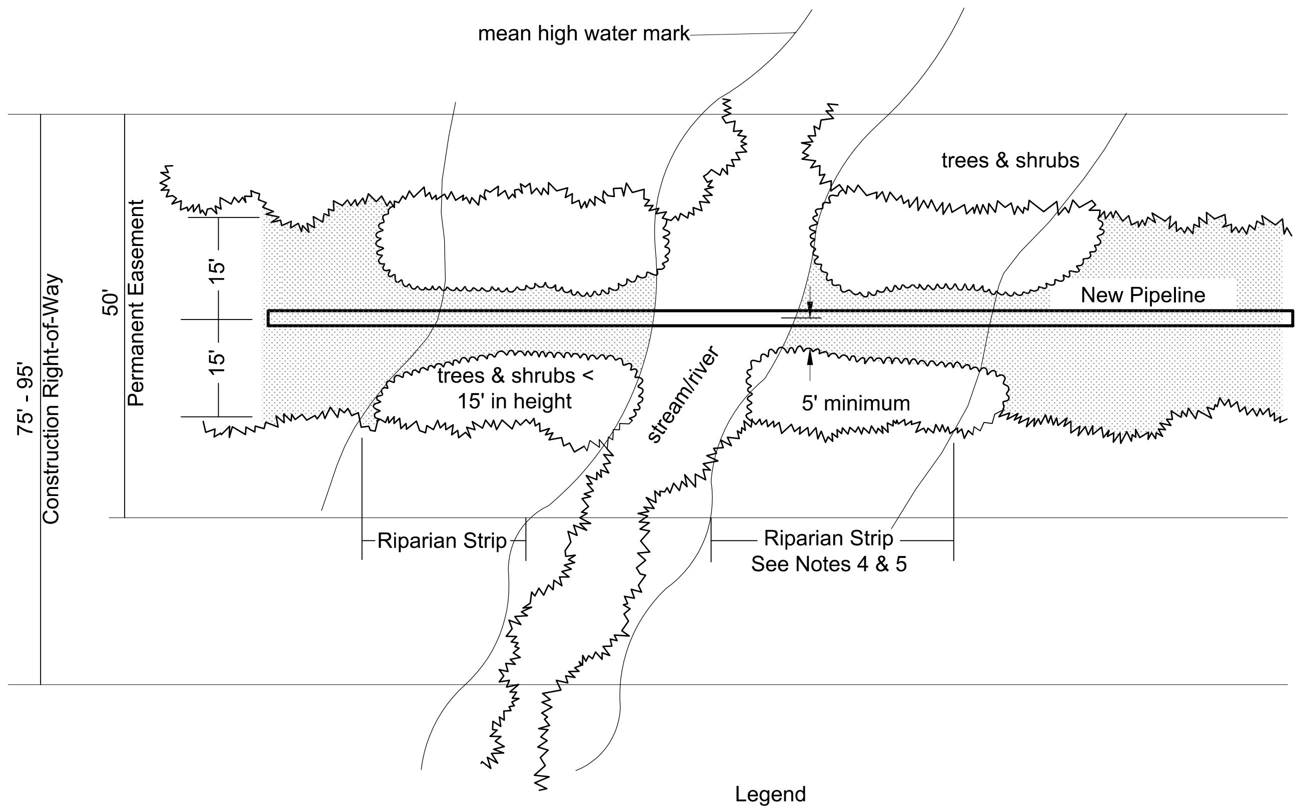


Legend

Herbaceous seeding & periodic maintenance

Shrub planting & selective cutting
(trees <15' in height permitted within 15' of pipeline)

No vegetative maintenance

Notes:
1. Maintenance of right-of-way in herbaceous state permitted in a 10' corridor centered on the pipeline.
2. Selective hand cutting of trees within 15' of the pipeline.
3. No vegetation maintenance permitted beyond 15' of the pipeline centerline.
4. On private lands riparian planting will occur across the ROW based on ODF RMA buffer widths (see ECRP), subject to the 15-foot (trees) restriction on either side of centerline. The riparian planting area will occur to the RMA buffer width, or to the limit of existing riparian vegetation where the riparian vegetation does not exceed the RMA buffer width.
5. On federal lands extend riparian strip planting along all perennial & intermittent streams within federally-designated riparian reserves to 100' or to limit of existing riparian vegetation.

DRAWING NO.	REFERENCE TITLE

PACIFIC CONNECTOR GAS PIPELINE PROJECT
PACIFIC CONNECTOR GAS PIPELINE, LP

WATERBODY / RIPARIAN
REVEGETATION & MAINTENANCE PLAN

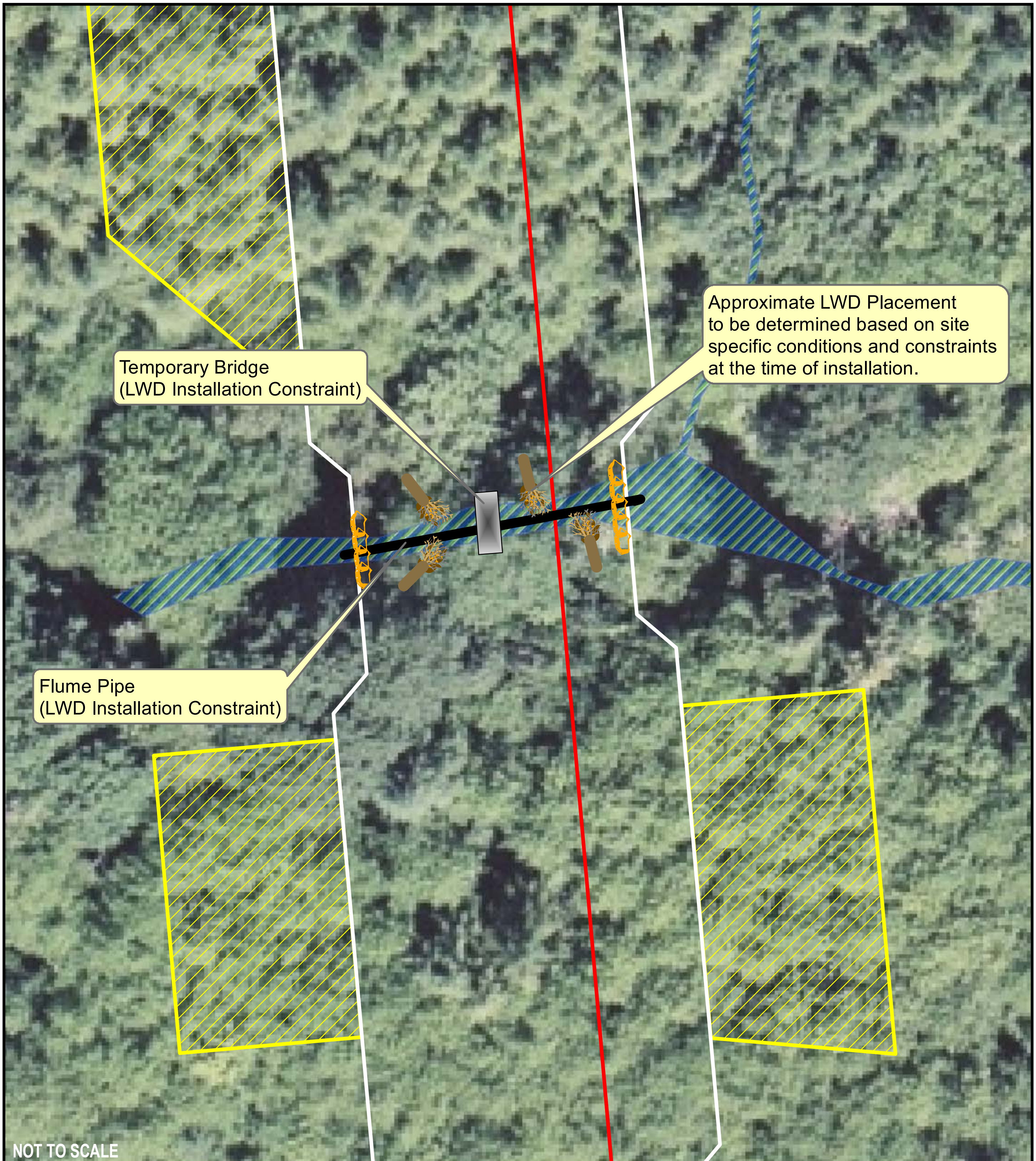
Pacific Connector GAS PIPELINE SM

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

DRAWN BY: KLL | DATE: 02-02-2001 | ISSUED FOR BID: | SCALE: NOT TO SCALE

CHECKED BY: | DATE: | ISSUED FOR CONSTRUCTION:

APPROVED BY: | DATE: | DRAWING NUMBER: 3430.34-X-0016 | SHEET 1 OF 1



Proposed schedule for applying LWD based on waterbody types, subject to landowner approval:

- 4 pieces for each perennial stream crossed with riparian forest removed (2 pieces instream, 2 pieces within riparian zone on the bank);
- 2 pieces for each intermittent stream and unknown stream crossed with riparian forest removed (one or both pieces placed instream or on bank);
- 2 pieces for each perennial, intermittent, and unknown stream crossed but with no riparian forest removed (one or both pieces paced instream or on bank).
- 1 piece each for perennial, intermittent, and unknown stream not crossed but adjacent to ROW with or without riparian forest removed (piece placed on bank).

Pacific Connector Gas Pipeline Project
Pacific Connector Gas Pipeline, LP

Pacific Connector GAS PIPELINE

Typical LWD Placement During Restoration

ATTACHMENT 5
LONG-TERM MONITORING PLAN

Pacific Connector
GAS PIPELINE

Pacific Connector Gas Pipeline, LP

Long-term Monitoring Plan for Wetland and Riparian Areas

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October 2017

Table of Contents

List of Tables

List of Figures

List of Appendices

List of Abbreviations and Acronyms

BLM	Bureau of Land Management
DSL	Oregon Department of State Lands
FERC	Federal Energy Regulatory Commission
JCEP	Jordan Cove Energy Project, L.P.
LNG	liquefied natural gas
PCGP	Pacific Connector Gas Pipeline, LP
Plan	Long-Term Monitoring Plan
SMP	standard monitoring procedure
USACE	United States Army Corps of Engineers
USFS	United States Forest Service

1 Introduction

This long-term monitoring plan (Plan) presents approaches for monitoring of wetlands and riparian areas associated with Pacific Connector Gas Pipeline, LP's (PCGP's) proposed 229-mile, 36-inch-diameter intrastate natural gas transmission pipeline (Pipeline) (see Figure 1). The Pipeline, which would connect with two interstate natural gas pipelines near Malin, Oregon, would facilitate transportation of natural gas to the proposed liquefied natural gas (LNG) export facility (LNG Terminal) being developed by Jordan Cove Energy Project, L.P. (JCEP).

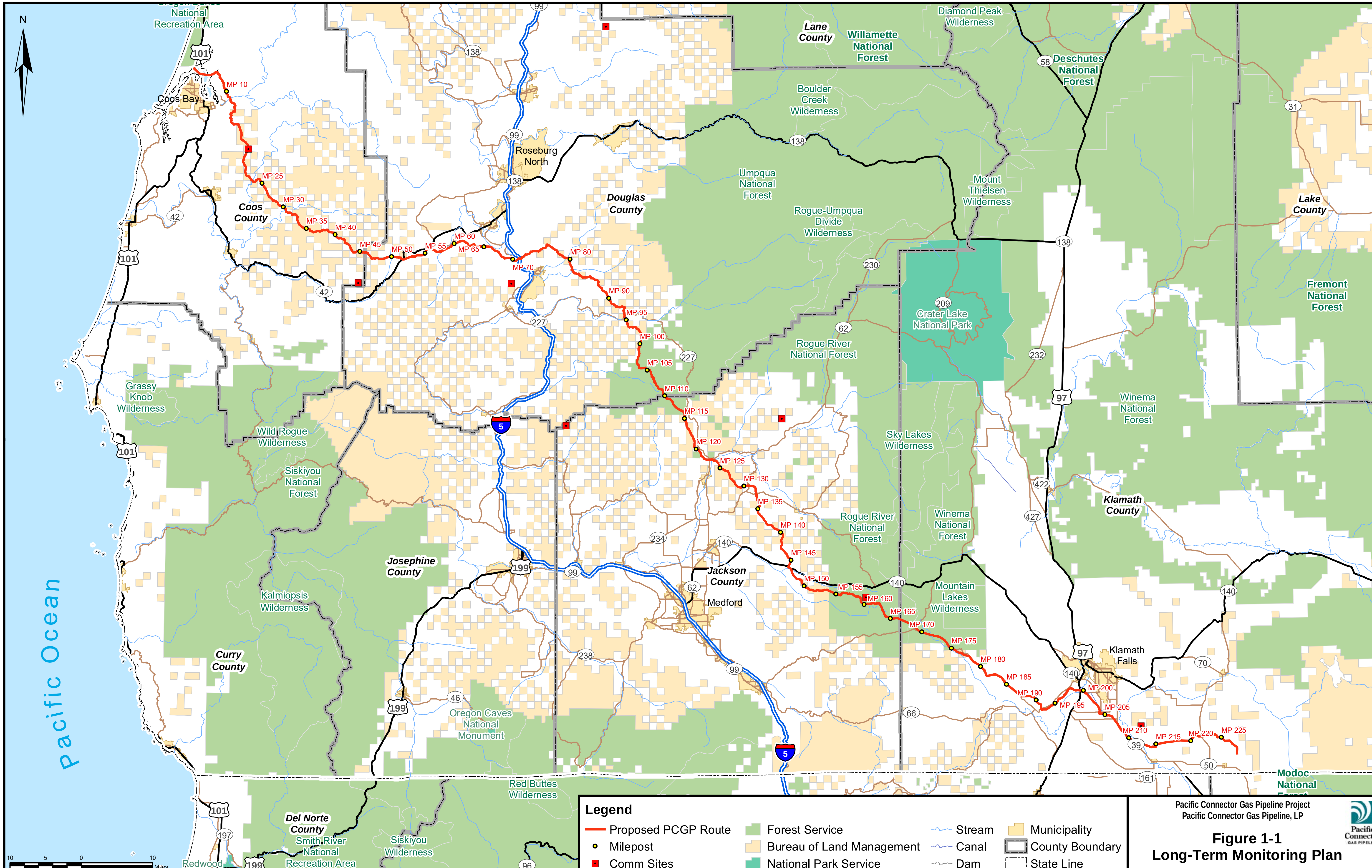
This Plan describes the goals of the restoration and revegetation efforts that would be used to establish perennial vegetation cover within the Pipeline right-of-way in accordance with federal and state agencies involved in permitting. The Federal Energy Regulatory Commission (FERC) is the lead federal agency for permitting the Pipeline. If FERC approves the application, a certificate of public convenience and necessity will be issued. In addition to the certificate, the Oregon Department of State Lands (DSL) and United States Army Corps of Engineers (USACE) would issue a joint permit for wetland and waterbody impacted by the Pipeline.

This Plan describes the standard monitoring procedures (SMPs) for the monitoring metrics to satisfy federal and state agency requirements. Section 5.1 outlines the DSL performance criteria. The development of the Plan's SMPs, including goals and objectives, has incorporated lessons learned on other pipeline projects permitted by FERC, USACE, and DSL, such as the Ruby Pipeline Project.

A separate monitoring plan will apply to the Kentuck Mitigation Project. The Kentuck Project consolidates both the JCEP and PCGP compensatory mitigation requirements at a single location in Coos Bay, Oregon. The monitoring plan for the Kentuck Project will be the responsibility of JCEP.

The following agencies will receive the annual monitoring reports detailing restoration progress:

1. FERC
2. DSL
3. USACE
4. Bureau of Land Management (BLM) Coos Bay District Office
5. BLM Roseburg District Office
6. BLM Medford District Office
7. BLM Klamath Falls Resource Area (Lakeview District) Office
8. Umpqua National Forest
9. Rogue River-Siskiyou National Forest
10. Fremont-Winema National Forest



Pacific Connector Gas Pipeline Project
Pacific Connector Gas Pipeline, LP

Figure 1-1
Long-Term Monitoring Plan

2 Purpose of Plan

The goals of the restoration and revegetation efforts for the Pipeline will be to establish a perennial vegetation cover within the right-of-way in accordance with FERC's Upland Erosion Control, Revegetation and Maintenance Plan and Wetland and Waterbody Procedures. Disturbed wetland and riparian areas will be seeded and replanted with tree and shrubs according to Section V.C.6. and V.D.1 in FERC's Wetland and Waterbody Procedures and in accordance with the Oregon Forest Practice Act (Oregon Administrative Rule 629-635-310). For Waters of the U.S., restoration will comply with the Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act and Oregon Administrative Rules 141-085-500 for those waters under permit authorization of DSL.

Vegetation monitoring will occur annually during the growing season for three years after the seeding and planting is completed or until sites are released by permitting agencies. Annual monitoring will continue until FERC and the appropriate land managing agencies agree that restoration goals have been achieved for a given wetland or riparian area. Desirable plant cover would be permanent plant cover, which would include seeded and planted species and species that naturally become established. Noxious and invasive weeds are not desirable species. Monitoring would be conducted beyond the third year, as agreed upon by FERC, DSL, and the land management agencies, if performance criteria have not been met (see Section 5/Performance Criteria).

Monitoring efforts will cease with successful establishment of a perennial plant cover as defined in Section 5/Performance Criteria. PCGP expects that the affected wetlands, the majority of which are disturbed emergent agricultural pasture and hayfields, will be successfully restored within one to two growing seasons. However, PCGP anticipates that successful restoration and revegetation efforts will vary for a given wetland or riparian area because of differences in soil, vegetation type, terrain, grazing, and precipitation. Therefore, it is likely that various wetlands and riparian areas could be released from monitoring efforts at different times. Monitoring locations not meeting performance criteria will require additional evaluation and development of contingency plans to ensure successful establishment of native plant cover.

As described in the Wetland, Waterbody and Riparian Mitigation Plan, once installation of the pipeline is completed, restoration of the wetland and riparian areas will consist of backfilling excavated subsoils, replacing the topsoil, restoring the approximate original contours and drainage patterns, installing erosion control devices, and preparing the topsoil for seeding and planting. Revegetation of the wetlands and riparian areas will be accomplished by using bare-root or container-grown plants and seed mixes that have been developed with input from federal and state agencies. The bare-root/container-grown plants will consist of shrubs, trees, and willow stakes that will be planted at waterbodies that had a woody plant component prior to pipeline construction. Table 2-1 (see Attachment 2 to the Wetland, Waterbody and Riparian Mitigation Plan) summarizes the wetland and waterbody treatments for each of the wetlands and waterbodies affected by the Pipeline. Attachment 2 also lists the various seed mixtures and tree and shrub species proposed for restoration. These native trees and shrubs would be planted during appropriate planting periods (during the winter and late spring). To complete the restoration plantings, PCGP will select a local restoration contractor that is knowledgeable regarding wetland and riparian ecosystems as well as with the species' characteristics and site growth requirements. The shrubs and trees planted at each site will be determined at the time of planting based on the moisture regimes and site-specific conditions at each planting location and on the plant spacing shown in Table 2-4 in Attachment 2. Shrubs will be planted according to FERC's Wetland and Waterbody Procedures, which allows them to grow within 5 feet of the pipeline centerline. Trees will not be planted within 15 feet of either side of the pipeline centerline to facilitate corrosion and leak surveys and to prevent roots from damaging pipe coatings.

2.1 Establishing the Wetland and Riparian Baseline

PCGP will complete pre-construction and post-construction surveys of wetlands and waterbodies within the right-of-way. The purpose of the pre-construction surveys will be to document wetland and waterbody conditions prior to construction and to establish baseline conditions for future monitoring performance criteria. The following information will be collected for the pre-construction surveys for wetlands: 1) existing hydrology, 2) significant topographic features contributing to site hydrology, 3) vegetation cover, 4) vegetation disturbance, 5) invasive species presence, 6) site alteration, and 7) other site-specific conditions. Documentation for waterbody conditions within the right-of-way will include: 1) surrounding land use; 2) riparian vegetation type (forested, scrub-shrub, etc.); 3) riparian vegetation cover; 4) riparian vegetation condition; and 5) presence of woody debris. Other preconstruction waterbody conditions will be documented according to the Stream Crossing Risk Analysis Addendum (GeoEngineers 2017), which was developed at the request of the Oregon Department of Environmental Quality through their authority under the Clean Water Act and Oregon Administrative Rules. The Stream Crossing Risk Analysis Addendum is provided in Appendix O.2 to Attachment C/Affected Water Resources.

The post-construction monitoring efforts will be initiated within the first growing season after restoration. The post-construction report will be as described in Table 4-1 in Section 4.1.1 of this Plan.

The proposed monitoring methodology will differ according to whether the site is a wetland or waterbody and whether the crossing is located in the construction right-of-way or an access road. All monitoring will include the collection of photographs from fixed photo points and the collection of wetland or waterbody data as described above. The datasheets included in Appendix A will be utilized to document pre-construction conditions and future monitoring efforts. Photographs, representative of conditions, will be collected at all wetlands and waterbodies within the right-of-way and access roads. All photograph locations will be documented with a global positioning system location with sub-meter accuracy. Three photographs will be taken of all wetlands. If a wetland is greater than 100 feet in length, a photograph will be taken every 100 feet along the centerline of the trench, or at an appropriate distance as determined by conditions in the field. For wetlands associated with Pipeline-related access roads that were temporarily disturbed, at least three photographs will be taken. One overview photograph and one photograph at each wetland boundary. Up to six photographs will be taken of waterbodies: one upstream view, one downstream view, an across bank view from each bank (left and right), within the construction right-of-way, if accessible,[1] one upstream view from the downstream extent of the construction right-of-way, and one downstream view from the upstream extent of the construction right-of-way.

1) If flow conditions are unsafe to cross a waterbody at the time of the monitoring efforts and access to the opposite bank is restricted by remoteness/travel distance, the photo for the opposite bank will not be taken.

3 Monitoring Goals and Objectives

The goals of the monitoring program are to document that the federal and state performance criteria are being achieved and to identify right-of-way segments where additional restoration work may be necessary. During the monitoring effort, PCGP will submit monitoring reports to FERC, DSL, BLM, and U.S. Forest Service (USFS) on an annual basis to report restoration and revegetation success. The annual report will list sites that have achieved performance criteria standards that will be requested for release from future monitoring efforts, as well as sites that have not met performance criteria where ongoing monitoring will occur.

The monitoring goals will be achieved by the following objectives:

- Establish monitoring plots for all wetlands and riparian areas impacted by construction;
- Develop detailed SMPs for the various monitoring metrics;
- Train field crews in applying the SMPs;
- Annually survey the monitoring plots to obtain data for the metrics being examined;
- Identify the cause of failed revegetation efforts and take action to correct the situation as necessary;
- Analyze and compare acquired monitoring data to the established performance criteria defined in Section 6;
- Conduct right-of-way restoration monitoring for three years or until performance criteria have been met; and
- Prepare annual monitoring reports for submittal to FERC, BLM, USFS, USACE, and DSL after survey completion.

4 Monitoring Approach

Monitoring will take place on all wetland and riparian areas crossed by the Pipeline for a minimum of three years or until performance criteria have been met. If a wetland or riparian site becomes unavailable for continued monitoring because of an event such as flooding or wildfire, then a new plot or set of plots may be established. In that event, a plot relocation discussion would be held with FERC, DSL, and the appropriate land management agencies to determine suitable action. Appropriate action may include relocating the monitoring site or abandoning it. The decision will be based on the number of years the plot has been monitored and the status of vegetation and soil to meet the performance criteria.

4.1.1 Monitoring Approach

Wetlands and waterway riparian areas will be monitored according to DSL stipulations and the DSL (2009) guidelines for monitoring vegetation. Table 4-1 lists the DSL monitoring and report requirements for wetlands and waterway riparian areas, which are the same as those used to develop and implement the Ruby Pipeline Project Removal-Fill Permit issued by DSL.

Table 4-1 Oregon Department of State Lands Monitoring Requirements

Monitoring Reports	Report Requirements
First year	• Establish permanent monitoring transects and photo locations; document locations with global positioning system and photos. • Assess vegetation performance standards. • Brief narrative that describes maintenance activities and contingency measure to meet rectification within a 24-month period from the date wetland or waterway impacts occur.
Second year	• Monitor permanent transects and photo locations. • Assess vegetation performance standards. • Determine if impacts to each wetland or waterway were rectified within a 24-month period from the date the impact occurred. • Brief narrative that describes maintenance activities.
Third and subsequent years until performance standards are met	• Monitor permanent transects and photo locations • Assess vegetation performance standards (if DSL determines temporary impacts were not rectified within a 24-month period from the date wetland or waterway impacts occurred) • Additional information required by DSL if temporary impacts were not rectified within a 24-month period from the date wetland or waterway impacts occurred

The wetland and waterway riparian areas will be stratified by herbaceous, shrub, and forest habitat types based on pre-disturbance maps, and/or the alignment of habitats as they occur in control plots located in the 400-foot study corridor. However, some of these wetlands and areas within the right-of-way may be less than 0.25 acre and thus would not need habitat stratification.

Permanent sampling locations in each of the wetland habitat types will be randomly selected. Permanent photo locations will be established to visually document revegetation success. Metrics will be measured using a 1 to 2 meter sample plot and will include species occurrence, their indicator status, native status, vegetation strata, species foliar cover, and bare substrate. Species foliar cover will be aggregated to total plant foliar cover, herbaceous plant foliar cover, woody foliar cover, and invasive plant foliar cover. Species diversity and the moisture prevalence index will be calculated from the plot data. Woody plant density will be measured using two 1.0 x 1.0 square meter plots placed randomly. The Vegetation Manager relational database (available at www.nwhi.org/index/publications) or other method that follows requirements outlined in the routine monitoring guidance will be used for data analyses and report preparation (DSL 2009). The number of sampling plots and points will be modified as necessary to achieve data reporting requirements of 80% confidence level and ±10 units for all average cover calculations including native plant, invasive plant, and bare-ground cover.

5 Performance Criteria

Performance criteria describe the benchmarks by which successful vegetation establishment can be determined. Performance criteria must accommodate the inherent variability of restoring native vegetation and be applicable to the several different kinds of wetland and riparian plant communities across the length of the Pipeline. Monitoring needs to document that progress is being made towards obtaining the end results of desirable plant community establishment, wildlife habitat restoration, and soil surface stability.

5.1 Oregon Wetland and Riparian Performance Criteria

The DSL has specified performance standards for the revegetation of all herbaceous and herbaceous/shrub wetlands and riparian areas crossed by the right-of-way (Table 5-1). A combination of pre-disturbance and post-construction criteria will be used for evaluating plant establishment success.

Table 5-1 Oregon Revegetation Performance Criteria for Wetlands and Riparian Areas

Performance Criteria	Wetland and Riparian Type	
	Herbaceous	Herbaceous/Shrub
Native herbaceous plant cover [1]	100% of pre disturbance cover or ≥ 80% of adjacent, undisturbed wetland habitat.[2]	Herbaceous stratum will meet 100% of pre disturbance cover or ≥ 80% of adjacent, undisturbed wetland habitat.[2]
Invasive species cover [3]	The cover of invasive species is the lesser of pre-disturbance percent cover or ≤ 10% cover.	The cover of invasive species is the lesser of pre-disturbance percent cover or ≤ 10% cover.
Bare substrate cover	Bare substrate will not exceed either pre-disturbance percent cover or 20% cover.	Bare substrate will not exceed either pre-disturbance percent cover or 20% cover.
Species diversity	Dominant native species[4] in the herbaceous layer will meet pre-disturbance diversity or 80% of control plot located in adjacent, undisturbed wetland.	Dominant native species[5] in the herbaceous layer will meet pre-disturbance diversity or 80% of control plot located in adjacent, undisturbed wetland. Woody vegetation will have an 80% stem density of woody plants in the control plot.
Moisture Prevalence Index[4]	< 3.0 for all strata	< 3.0 for all strata
Riparian composition	Composition, density[6], and distribution will be the same as pre-disturbance	Composition, density, and distribution will be the same as pre-disturbance

Table 5-1 Oregon Revegetation Performance Criteria for Wetlands and Riparian Areas

Notes:

[1] Native plants as defined by the USDA Plants Database (http://plants.usda.gov).

[2] Control plots will be established within the 400-foot study area referenced in the removal-fill application.

[3] A plant species will be labeled as invasive if it appears on the current Oregon Department of Agriculture noxious weed list or if it is a known problem species, including, but not limited to, *Phalaris arundinacea, Mentha pulegium, Holcus lanatus, Anthoxanthum odoratum*, and, in the case of agricultural fields, the last crop planted if it is non-native. Non-native plants will be labeled as such if they are listed as non-native on the USDA Plants Database.

[4] As defined and calculated in Oregon Department of State Lands (2009).

[5] Dominant species are native, represent at least 5% cover, and have a 10% frequency within the habitat class (DSL 2009).

[6] In order to count plant density, plants have to be alive. In shrub-dominated systems, the number of live plants for shrubs and the number of live stems for trees are counted.

6 Monitoring Reports and Release from Monitoring Obligation

6.1 Annual Monitoring Reports

PCGP will monitor plant establishment for a minimum of three years after revegetation is completed or until sites meet performance criteria. Annual monitoring reports will be submitted to FERC, BLM, USFS, and DSL after the annual monitoring is completed (reports to DSL are due by December 31 of the year the survey was completed or as agreed to by the agency).

An “As-Built” Report documenting the final design of the restoration areas will be prepared when site construction and planting are completed. The report will include the following:

- Site vicinity map;
- Drawings that identify the boundaries of the restoration areas;
- The installed planting scheme providing quantities, densities, sizes, and approximate locations of plants, as well as plant sources and the time of planting; and
- General notes indicating site conditions, concerns, or other issues that might affect site planting success.

A copy of the “As-Built” Report will be provided along with other specified data as required by these agencies within the year when planting has been completed. In addition, PCGP will report to FERC and the appropriate land management agency any emergency corrective action that might be taken separately from the data provided in the annual report.

6.2 Right-of-Way Release from Monitoring Obligation

PCGP will request formal release from monitoring when a particular wetland or riparian area complies with the performance criteria presented in Section 5. Once monitoring plots are determined to meet performance criteria, they will no longer be included in the annual monitoring. Determination of restoration and revegetation compliance would rest with FERC, DSL, USACE, and the appropriate land management agencies.

7 References

Geier-Hayes, Kathleen, Mark A. Hayes, and Douglas D. Basford. 1995. *Determining Individual Tree Shade Length: A Guide for Silviculturists.* United States Department of Agriculture Forest Service, Intermountain Research Station, General Technical Report INT-GTR-324. September 1995.

GeoEngineers, 2017. Stream Crossing Risk Analysis Addendum. Pacific Connector Gas Pipeline Coos, Douglas, Jackson and Klamath Counties, Oregon. File No. 22708-001-00 August 28, 2017.

Oregon Department of State Land. 2009. Routine monitoring guidance for Vegetation: A companion document to the compensatory mitigation for non-tidal wetlands and tidal waters and compensatory non-wetland mitigation. Salem, Oregon. http://www.oregon.gov/DSL/PERMITS/docs/dsl_routine_monitoring_guidance.pdf?ga=t.

A Wetland and Riparian Monitoring Datasheets

Waterbody ID: ______________ **Date:** ________ **Observers:** ______________________________________

Waterbody Annual Monitoring Data Sheet

Feature association:
☐ ROW
☐ AR
☐ Other: ____________________________________

Channel Dimensions at centerline (feet):
Width at OHW___________
Depth at OHW___________

Bed Material Substrate	Bank Material Left	Bank Material Right
☐ Bedrock	☐	☐
☐ Gravel	☐	☐
☐ Sand	☐	☐
☐ Silt	☐	☐
☐ Cobbles	☐	☐
☐ Clay	☐	☐
☐ Concrete	☐	☐
☐ Other__________ __________	☐	☐ ___________

Hydrology Conditions:
water present: ☐ yes ☐ no

significant topographic features that contribute to site hydrology (describe):
☐ pools
☐ riffles
☐ cascade
☐ step

Hydrologic Roughness:
☐ Boulders
☐ Large wood
☐ Shrubs_________
☐ Other _________

Mass Wasting
☐ Landslide
☐ Debris flow

Bank Condition:
Bank disturbance/erosion: ☐ yes (if yes, describe) ☐ no
☐ Sloughing ________________________________
☐ Impact from cattle ____________________________
☐ Undercutting ______________________________
☐ Other ___________________________________

Bank Height and Slope:

Left Bank*	Right Bank*
Height (ft):___________	Height (ft):_____________
Slope: ☐ 0-30º (4:1)	Slope: ☐ 0-30º (4:1)
☐ 31-45º (3:1)	☐ 31-45º (3:1)
☐ 46-60º (2:1)	☐ 46-60º (2:1)
☐ 61-90º (1:1)	☐ 61-90º (1:1)

Height (ft) (OHWM from stream bed):______________
*Direction when facing downstream

Riparian vegetation present: ☐ yes ☐ no (***if yes, use Monitoring Plot data sheet***)

Mandatory Photos - List IDs (list w/direction):
*On Centerline Facing Upstream –
ID ________________DIR_________
*On Centerline Facing Downstream –
ID ________________DIR_________
*On Centerline Facing Right Bank –
ID ________________DIR_________
*On Centerline Facing Left Bank –
ID ________________DIR_________
*Facing Upstream from ROW boundary –
ID ________________DIR_________
*Facing Downstream from ROW boundary –
ID ________________DIR_________

Reference Points:
Aquatic Habitat Unit – TYPE_________ID __________DIR_____
Aquatic Habitat Unit – TYPE_________ID __________DIR_____
Aquatic Habitat Unit– TYPE_________ ID __________DIR_____
Hydraulic Roughness– TYPE_________ID __________DIR_____
Mass Wasting – ID___________ DIR_____
MISC PHOTO - ID _________DIR_____, ID _________DIR_____

Waterbody meets performance criteria: ☐ yes (if yes, describe)
☐ no (if no, describe suggested maintenance)

Native herbaceous plant cover ☐ yes ☐ no
Percent native cover_________%

Noxious species cover ☐ yes ☐ no
Percent noxious species cover_________%

Bare substrate cover same (or less) as pre-disturbance, or ≤20% of total bare cover? ☐ yes ☐ no
Percent bare substrate cover_________%

Species diversity ☐ yes ☐ no
Percent species diversity compared to adjacent area________%

Moisture Prevalence Index < 3.0 for all strata ☐ yes ☐ no

Riparian composition, density, and distribution is the same as pre-disturbance ☐ yes ☐ no

Suggested Maintenance:

WETLAND ID: ____________________ **Date:** _______________**Observers:** ______________________________

Wetland Annual Monitoring Data Sheet

Feature association:
☐ ROW
☐ AR
☐ Other: ____

Reference Points and Photos (list w/direction):

***Mandatory Photos - List IDs (list w/direction):**

***On Overview – HP:**______________________
Photo ID __________________**DIR**__________

***On Boundary Cross View – HP:**______________________
Photo ID __________________**DIR**__________

***On Boundary Cross View – HP:**______________________
Photo ID __________________**DIR**__________

Not Mandatory, but if taken in past years, take again

Cross View – HP:______________________
Photo ID __________________**DIR**__________

Cross View – HP:______________________
Photo ID __________________**DIR**__________

Access Road Overview – HP:______________________
Photo ID __________________**DIR**__________

Other – HP:______________________
Photo ID __________________**DIR**__________

Other – HP:______________________
Photo ID __________________**DIR**__________

Other – HP:______________________
Photo ID __________________**DIR**__________

Other – HP:______________________
Photo ID __________________**DIR**__________

Notes:

Annual Monitoring Conditions:

Wetland Disturbance: ☐ **yes (if yes, describe)** ☐ **no**

☐ **Grazing** ____
☐ **Trampling** ____
☐ **Rutting (OHV)**____
☐ **Ag Use** ____
☐ **Other** ____

Wetland meets performance criteria: ☐ **yes (if yes, describe)**
☐ **no (if no, describe suggested maintenance)**

Native herbaceous plant cover ☐ **yes** ☐ **no**
Percent native cover__________**%**

Noxious species cover ☐ **yes** ☐ **no**
Percent noxious species cover__________**%**

Bare substrate cover same (or less) as pre-disturbance, or ≤20% of total bare cover? ☐ **yes** ☐ **no**
Percent bare substrate cover__________**%**

Species diversity ☐ **yes** ☐ **no**
Percent species diversity compared to adjacent area________**%**

Moisture Prevalence Index < 3.0 for all strata: ☐ **yes** ☐ **no**

Riparian composition, density, and distribution is the same as pre-disturbance ☐ **yes** ☐ **no**

Suggested Maintenance:

DSL Monitoring Plot Field Sampling Form

Date: _________________ Feature ID: _____________________ Field Team: ______________

Monitoring Unit
Habitat class: _______ Sample Unit:_______ Area: __________Plot:___________
Dimensions (ft) 5 ft radius
(Habitat classes are: E= Emergent/Herbaceous; S = Shrub-dominated; F = Forested)

X:________________________________ **Monitoring Plot ID:** ___________________

Y:________________________________ **MP:** ___________________

Prevalence Index worksheet:

Total % Cover of:		Multiply by:		
OBL species		x 1 =		
FACW species		x 2 =		
FAC species		x 3 =		
FACU species		x 4 =		
UPL species		x 5 =		
Column Totals:		(A)		(B)

Prevalence Index = B/A = ________

Plant Species (Latin name) Or Bare Ground Type	Indicator Status	Native Status N / NN / I[1]	Strata: T - tree S - shrub H - herbaceous	Percent Cover	Shrub/Tree Live Plant Count[2]

[1]N = native; NN = non-native; and I = invasive / [2]Plant Density- in shrub dominated systems, count the # of live plants for shrubs and the # of live stems for trees.

APPENDIX O.3

Pacific Connector's Large Woody Debris Plan

Large Woody Debris Plan

In consultation with landowners, PCGP would place LWD at appropriate areas in the riparian zone and in the waterbody within the construction right-of-way to mitigate for potential short-term impacts that may occur to aquatic species from a dry open cut crossing and instream construction. LWD placement would occur after the pipe has been installed across the waterbody, during ODFW instream construction windows and during the time when the flume or dam and pump controls are in place to minimize turbidity associated with the installation of the LWD. Other possibilities include placing LWD immediately downstream from the lower flume dam (to create a depositional rather than potential scouring environment at the pipeline crossing) either during or after the flume has been removed. LWD could be placed across a stream channel with minimal or no generation of sediment after construction, as well. Such decisions will be made on a site-by-site basis. Installation of the LWD without the flume or dam and pump control measures in place would only occur with the approval of the appropriate permitting agencies.

The LWD quantities provided in Table 1 and Table 2 represent PCGP's restoration, enhancement and compensatory mitigation commitment for the project's potential waterbody crossing impacts. During construction, LWD will be installed at each waterbody crossing based on the site-specific waterbody crossing conditions, landowner requirements and potential construction constraints. PCGP would target LWD installation at each waterbody crossing according to the following schedule:

- 4 pieces for each perennial stream crossed with riparian forest removed (2 pieces instream, 2 pieces within riparian zone on the bank);
- 2 pieces for each intermittent stream and unknown stream crossed with riparian forest removed (one or both pieces placed instream or on bank);
- 2 pieces for each perennial, intermittent, and unknown stream crossed but with no riparian forest removed (one or both pieces placed instream or on bank).
- 1 piece each for perennial, intermittent, and unknown stream not crossed but adjacent to ROW with or without riparian forest removed (placed on bank).

Baseline watershed conditions crossed by the project are lacking in LWD from historic disturbance and are typically below benchmark thresholds to be properly functioning. LWD is an important habitat feature providing instream structure, channel and habitat complexity among other benefits and that which promote salmonid productivity. Therefore, PCGP considers installing LWD on site during construction as an appropriate habitat enhancement feature to rectify potential project impacts and which would benefit watershed conditions which are generally lacking. The LWD placement would be in addition to the project conservation measures that have been designed to minimize the potential project effects, such as utilizing dry open cut crossing methods, applying instream construction timing restrictions, and implementing erosion control measures and revegetation methods. Because of the overall lack of LWD in the affected watersheds, LWD also provides an appropriate compensatory mitigation model for the project's potential waterbody crossing impacts that are temporary, short-term, and unavoidable. The LWD would also serve to mitigate for the minor potential long-term project impacts, such as the loss of forested riparian vegetation within the pipeline's 30-foot operational corridor.

PCGP anticipates that during construction, in some cases, the waterbody size, landowner restrictions, or construction constraints will limit LWD placement according to the targeted LWD schedule provided in Table 1 and Table 2. Further, the overall benefit of installation of LWD at some project waterbody crossings (i.e., intermittent headwater streams) may not warrant LWD placement. In these situations, PCGP's Environmental Inspector would record the uninstalled LWD as a deficit during construction. After construction is completed, the deficit or undersupplied LWD would be used as the compensatory LWD credit that would be provided to local watershed conservation organizations or agencies for use in local enhancement projects within the affected watersheds. The LWD credits could be either LWD donations or funds. In watersheds where there is a deficit of LWD installation during construction, PCGP would provide LWD with a minimum diameter of 10 inches and an average length of 20 feet. At least half of the LWD would be provided with attached root wads. Alternatively, PCGP would provide in-lieu funds equivalent to $800 for each piece of LWD, which the watershed organizations could utilize to purchase LWD or implement enhancement projects

Table 1
Proposed Application of Large Woody Debris to Waterbodies and Riparian Zones Affected by Construction of the Proposed Action within the Range of Oregon Coast Coho Salmon

Fifth Field Watershed	Watershed Parameter	Waterbody Type						Total in Watershed	Pieces of LWD Applied to Fifth Field Watershed [1]		
		Perennial		Intermittent		Unknown					
		Crossed	Adjacent	Crossed	Adjacent	Crossed	Adjacent		Crossed	Adjacent	Total
Coos Bay Frontal Pacific Ocean (HUC 1710030403)	Area (acres) of Riparian Forest	0.42	0.20	3.33	19.18	0	0	23.13			
	Total Number of Waterbodies	5	2	5	17	0	0	29			
	With Riparian Forest	2	1	4	16	0	0	23	16	17	33
	No Riparian Forest	3	1	1	1	0	0	6	8	2	10
North Fork Coquille River (HUC 1710030504)	Area (acres) of Riparian Forest	4.00	0	0.24	3.25	0	0	7.48			
	Total Number of Waterbodies	4	0	1	5	0	0	10			
	With Riparian Forest	4	0	1	5	0	0	10	18	5	23
	No Riparian Forest	0	0	0	0	0	0	0	0	0	0
East Fork Coquille River (HUC 1710030503)	Area (acres) of Riparian Forest	7.18	0.66	8.03	3.51	0	0	19.38			
	Total Number of Waterbodies	8	1	6	7	0	0	22			
	With Riparian Forest	8	1	6	7	0	0	22	44	8	52
	No Riparian Forest	0	0	0	0	0	0	0	0	0	0
Middle Fork Coquille River (HUC 1710030501)	Area (acres) of Riparian Forest	6.76	0.54	8.03	2.61	0	0	17.93			
	Total Number of Waterbodies	6	1	8	5	0	0	20			
	With Riparian Forest	6	1	8	4	0	0	19	40	5	45
	No Riparian Forest	0	0	0	1	0	0	1	0	1	1
Olalla Creek-Lookingglass Creek (HUC 1710030212)	Area (acres) of Riparian Forest	2.90	0.06	2.36	0.00	0	0	5.32			
	Total Number of Waterbodies	4	1	11	1	0	0	17			
	With Riparian Forest	4	1	8	0	0	0	13	32	1	33
	No Riparian Forest	0	0	3	1	0	0	4	6	1	7
Clark Branch-South Umpqua River (HUC 1710030211)	Area (acres) of Riparian Forest	2.06	0	1.17	3.96	0	0	7.20			
	Total Number of Waterbodies	7	0	6	12	0	0	25			
	With Riparian Forest	4	0	6	7	0	0	17	28	7	35
	No Riparian Forest	3	0	0	5	0	0	8	6	5	11
Myrtle Creek (HUC 1710030210)	Area (acres) of Riparian Forest	7.29	0	6.98	1.54	0	0	15.81			
	Total Number of Waterbodies	7	0	7	2	0	0	16			
	With Riparian Forest	6	0	6	2	0	0	14	36	2	38
	No Riparian Forest	1	0	1	0	0	0	2	4	0	4
Days Creek-South Umpqua River (HUC 1710030205)	Area (acres) of Riparian Forest	5.13	0	18.76	0	0	0	23.89			
	Total Number of Waterbodies	5	0	10	0	0	0	15			
	With Riparian Forest	5	0	10	0	0	0	15	40	0	40
	No Riparian Forest	0	0	0	0	0	0	0	0	0	0
Upper Cow Creek (HUC 1710030206)	Area (acres) of Riparian Forest	2.98	0.39	2.06	1.54	0	0	6.97			
	Total Number of Waterbodies	3	1	2	2	0	0	8			
	With Riparian Forest	3	1	2	2	0	0	8	16	3	19
	No Riparian Forest	0	0	0	0	0	0	0	0	0	0
Total Fifth Field Watersheds For Coho Oregon Coast ESU	Area (acres) of Riparian Forest	38.73	1.85	50.95	35.58	0	0	127.11			
	Total Number of Waterbodies	49	6	56	51	0	0	162			
	With Riparian Forest	42	5	51	43	0	0	141	270	48	318
	No Riparian Forest	7	1	5	8	0	0	21	24	9	33
								Total LWD	**294**	**57**	**351**

[1] Proposed schedule for applying LWD to different waterbody types, subject to landowner approval:

〈 4 pieces for each perennial stream crossed with riparian forest removed (2 pieces instream, 2 pieces within riparian zone on the bank);

〈 2 pieces for each intermittent stream and unknown stream crossed with riparian forest removed (one or both pieces placed instream or on bank);

〈 2 pieces for each perennial, intermittent, and unknown stream crossed but with no riparian forest removed (one or both pieces paced instream or on bank).

〈 1 piece each for perennial, intermittent, and unknown stream not crossed but adjacent to ROW with or without riparian forest removed (piece placed on bank).

Table 2
Proposed Application of Large Woody Debris to Waterbodies and Riparian Zones Affected by Construction of the Proposed Action within the Range of Southern Oregon/Northern California Coast Coho Salmon

Fifth Field Watershed	Watershed Parameter [1]	Waterbody Type						Total in Watershed	Pieces of LWD Applied to Fifth Field Watershed [2]		
		Perennial		Intermittent		Unknown					
		Crossed	Adjacent	Crossed	Adjacent	Crossed	Adjacent		Crossed	Adjacent	Total
Trail Creek (HUC 1710030706)	Area (acres) of Riparian Forest	1.32	0	4.40	1.47	0	0	7.186682			
	Total Number of Waterbodies	2	0	4	1	0	0	7			
	With Riparian Forest	2	0	4	1	0	0	7	16	1	17
	No Riparian Forest	0	0	0	0	0	0	0	0	0	0
Shady Cove-Rogue River (HUC 1710030707)	Area (acres) of Riparian Forest	1.07	0	4.55	3.72	0	0	9.34			
	Total Number of Waterbodies	4	0	6	9	0	0	19			
	With Riparian Forest	3	0	6	5	0	0	14	24	5	29
	No Riparian Forest	1	0	0	4	0	0	5	2	4	6
Big Butte Creek (HUC 1710030704)	Area (acres) of Riparian Forest	3.19	0	1.49	1.24	0	0	5.92			
	Total Number of Waterbodies	3	0	6	3	0	0	12			
	With Riparian Forest	3	0	6	3	0	0	12	24	3	27
	No Riparian Forest	0	0	0	0	0	0	0	0	0	0
Little Butte Creek (HUC 1710030708)	Area (acres) of Riparian Forest	1.71	0	18.67	2.60	0	0	22.97			
	Total Number of Waterbodies	4	0	37	6	0	0	47			
	With Riparian Forest	3	0	29	6	0	0	38	70	6	76
	No Riparian Forest	1	0	8	0	0	0	9	18	0	18
Total Fifth Field Watersheds For Coho SO/NCC ESU	Area (acres) of Riparian Forest	7.28	0	29.11	9.02	0	0	45.41			
	Total Number of Waterbodies	13	0	53	19	0	0	85			
	With Riparian Forest	11	0	45	15	0	0	71	134	15	149
	No Riparian Forest	2	0	8	4	0	0	14	20	4	24
								Total LWD	**154**	**19**	**173**

[1] Riparian Forest assumed to be coniferous, deciduous, or mixed forest 40 years old and older.

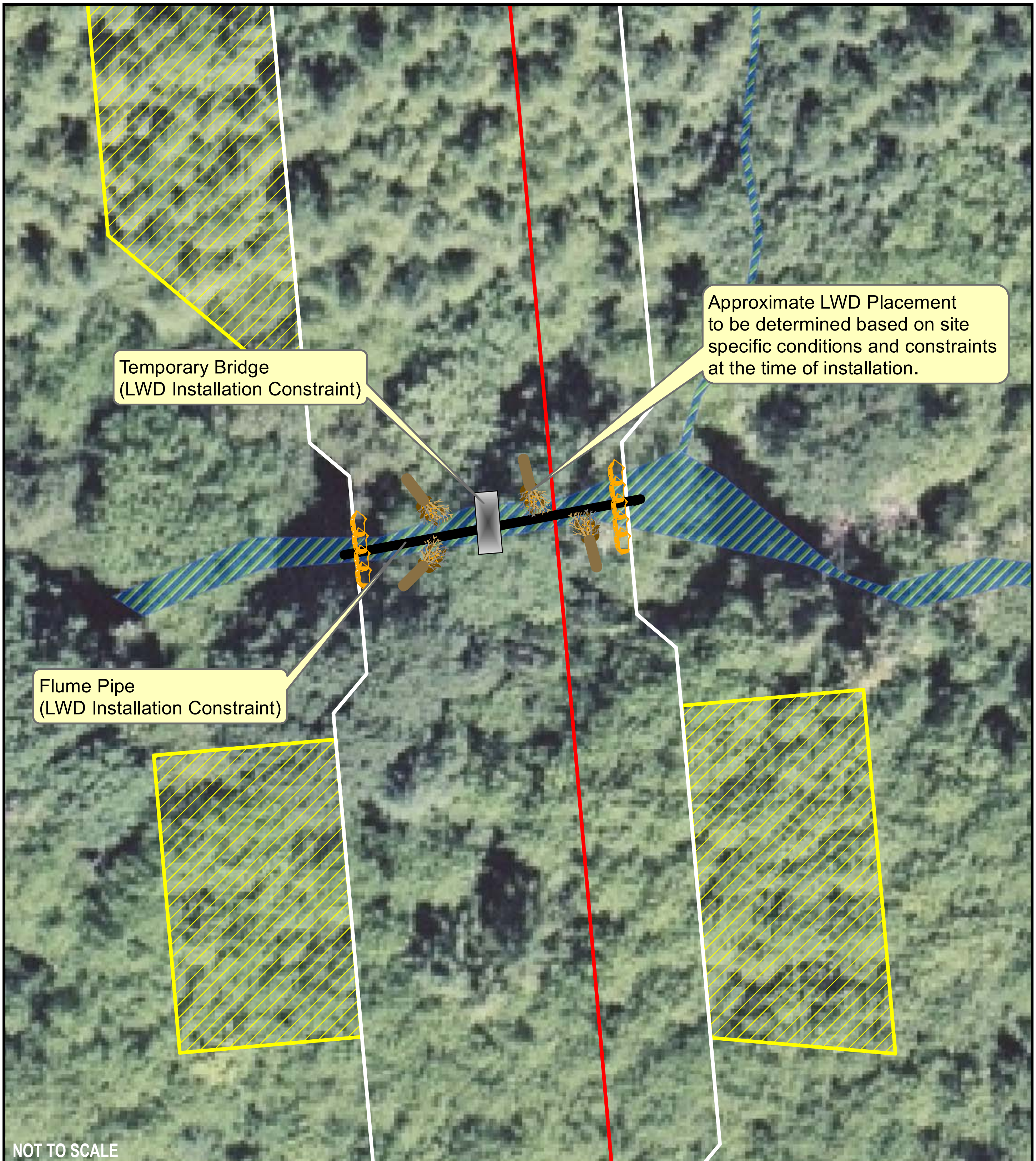
[2] Proposed schedule for applying LWD to different waterbody types, subject to landowner approval:

〈 4 pieces for each perennial stream crossed with riparian forest removed (2 pieces instream, 2 pieces within riparian zone on the bank);

〈 2 pieces for each intermittent stream and unknown stream crossed with riparian forest removed (one or both pieces placed instream or on bank);

〈 2 pieces for each perennial, intermittent, and unknown stream crossed but with no riparian forest removed (one or both pieces paced instream or on bank).

〈 1 piece each for perennial, intermittent, and unknown stream not crossed but adjacent to ROW with or without riparian forest removed (placed on bank).



Proposed schedule for applying LWD based on waterbody types, subject to landowner approval:

- 4 pieces for each perennial stream crossed with riparian forest removed (2 pieces instream, 2 pieces within riparian zone on the bank);
- 2 pieces for each intermittent stream and unknown stream crossed with riparian forest removed (one or both pieces placed instream or on bank);
- 2 pieces for each perennial, intermittent, and unknown stream crossed but with no riparian forest removed (one or both pieces paced instream or on bank).
- 1 piece each for perennial, intermittent, and unknown stream not crossed but adjacent to ROW with or without riparian forest removed (piece placed on bank).

Pacific Connector Gas Pipeline Project
Pacific Connector Gas Pipeline, LP

Typical LWD Placement During Restoration

Pacific Connector GAS PIPELINE

APPENDIX O.4

Forest Service Proposed Amendments and CMP

Jordan Cove Natural Gas Liquefaction and Pacific Connector Gas Pipeline Project
Draft EIS

Appendix F2

Forest Service Proposed Amendments and CMP

Pacific Connector Gas Pipeline

Prepared for:

USDI Bureau of Land Management

Prepared by:

Stantec Consulting Services Inc.

March 2019

Table of Contents

TABLES

FIGURES

1.0 INTRODUCTION

1.1 LAND AND RESOURCE MANAGEMENT PLAN AMENDMENTS

The Umpqua, Rogue River, and Winema National Forest are managed under a Land and Resource Management Plan (LRMP) or (Forest Plan) required by the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended by the National Forest Management Act of 1976 (NFMA) and incorporated into the agency planning regulations (36 CFR 219, [2012 version]). A land management plan provides a framework for integrated resource management and for guiding project and activity decision-making on a national forest, grassland, prairie, or other administrative unit. Consistent with the Multiple-Use Sustained-Yield Act of 1960 (MUSYA), the Forest Service manages National Forest System (NFS) lands to sustain the multiple use of its renewable resources in perpetuity while maintaining the long-term health and productivity of the land. Resources are managed through a combination of approaches and concepts for the benefit of human communities and natural resources. Land management plans guide sustainable, integrated resource management of the resources within the plan area in the context of the broader landscape, giving due consideration to the relative values of the various resources in particular areas. Plans guide management of NFS lands so that they are ecologically sustainable and contribute to social and economic sustainability; consist of ecosystems and watersheds with ecological integrity and diverse plant and animal communities; and have the capacity to provide people and communities with ecosystem services and multiple uses that provide a range of social, economic, and ecological benefits for the present and into the future. A Forest Plan does not authorize projects or activities or commit the Forest Service to take action. A plan may constrain the agency from authorizing or carrying out projects and activities, or the manner in which they may occur.

The NFMA requires that proposed projects, including third-party proposals subject to permits or rights-of-way grants, be consistent with the Forest Plan of the National Forest (NF) where the project would occur (36 CFR 219.15). When a project is not consistent with the Forest Plan where the project would occur, the Forest Service has the following options: (1) modify the proposed project to make it consistent with the Forest Plan; (2) reject the proposal; (3) amend the Forest Plan so that the project would be consistent with the plan as amended; or (4) amend the Forest Plan contemporaneously with the approval of the project so the project would be consistent with the plan as amended. The fourth option may be limited to apply only to the project (36 CFR 219.15(c)).

For the Pacific Connector pipeline project the Forest Service worked cooperatively with the Federal Energy Regulatory Commission (FERC) staff, other cooperating agencies, and the applicant to incorporate best management practices (BMPs), design features and project requirements which would avoid, minimize, rectify, reduce or eliminate environmental consequences (40 CFR 1502.14(f) and 1508.20(a-d)). The BMPs, design features, or requirements specific to national forest system lands are included as attachments to the project proponent's Plan of Development (POD). There are 28 appendices in the POD; they include draft monitoring elements to ensure that the actions are implemented. Collectively, the POD is incorporated into the project's description, and is summarized in section 2.6.3 of the DEIS.

The Pacific Connector pipeline project, which proposes the most up-to-date engineering and technological practices for pipeline construction and operation, cannot meet some of the standards in the Forest Plans for the Umpqua, Rogue River, and Winema NFs as amended by the Northwest Forest Plan (NWFP) (USDA USDI 1994) (see also DEIS Appendix F1). Standards are mandatory constraints on project and activity decision-making, established to help achieve or maintain desired conditions, to avoid or mitigate undesirable effects, or to meet applicable legal requirements (36 CFR 219.7(e)(1)(iii)).

Given the linear nature of the pipeline corridor and the topography of the Umpqua, Rogue River, and Winema NFs, it is difficult to avoid every circumstance that would be inconsistent with the management direction and standards and guidelines in the respective Forest Plans. Pacific Connector has cooperated with the Forest Service to make its proposal consistent with the Forest Plans as much as is feasible, but even with route adjustments, modified project design features, and BMPs, it has been determined that if the Right-of-Way Grant were approved for the proposed route crossing these national forests, the Forest Plans would require amendments.

In order to address these inconsistencies, the Forest Service is evaluating Forest Plan amendments to make provision for construction and operation of the Pacific Connector pipeline project. With the exception of boundary changes that add acres to Late Successional Reserves (LSRs) in the Umpqua and Rogue River NFs, the proposed amendments are project-specific and would apply only to the Pacific Connector pipeline project. With the amendments described below, the Pacific Connector pipeline would then be consistent with the Forest Plans.

Forest Plan amendments are guided by direction in the NFMA and its' corresponding regulations. In this appendix proposed amendments to Forest Plans are independently evaluated in the context of the provisions of the forest planning regulations at 36 CFR 219 (2012) as amended in 2016 (planning rule). On December 15, 2016 the Department of Agriculture Under Secretary for Natural Resources and Environment issued a final rule that amended the planning rule (81 FR 90723, 90737). The amendment to the planning rule clarified the Department's direction for amending Forest Plans. The Department also added a requirement for amending a plan for the responsible official to provide in the initial notice "which substantive requirements of §§ 219.8 through 219.11 are likely to be directly related to the amendment" (36 CFR 219.13(b)(2), 81 FR at 90738). This initial notice was provided in the June 26, 2018 Notice of Intent that was Filed by the FERC and the cooperating agencies. Whether a rule provision is directly related to an amendment is determined by any one of the following: the purpose for the amendment, a beneficial effect of the amendment, a substantial adverse effect of the amendment, or a lessening of plan protections by the amendment. If a proposed amendment is determined to be "directly related" to a substantive rule requirement, the Responsible Official must apply that requirement within the scope and scale of the proposed amendment and, if necessary, make adjustments to the proposed amendment to meet the requirement (36 CFR 219.13 (b)(5) and (6)). In other words, additional Forest Plan components may need to be added to the amendment. The proposed Forest Service plan amendments described in the following sections, include an evaluation of the "substantive requirements of §§ 219.8 through 219.11" that are directly related to each amendment.

1.2 COMPENSATORY MITIGATION PLANS

In this appendix Forest Service compensatory mitigation plans (CMPs) are also evaluated in relation to the proposed Forest Plan amendments. The CMPs are in addition to the BMPs, mitigation requirements, and project design requirements described above. Forest Service interdisciplinary teams have developed CMPs for the Pacific Connector pipeline project that are based on the respective Forest Plans, the recommendations of the (2011) northern spotted owl

(NSO) recovery plan, the recommendations of the final Southern Oregon and Northern California Coast Coho Salmon Recovery Plan (2014), applicable Late Successional Reserve (LSR) Assessments, and 5th field Watershed Analyses (WA) for watersheds where impacts of the Pacific Connector pipeline Project would occur. The CMPs are also informed by the NWFP monitoring reports and the Synthesis of Science to Inform Land Management within the Forest Plan Area (Spies et. al. 2018). Members of the interdisciplinary team used professional judgment and knowledge of the affected landscapes to develop the mitigation actions described in this appendix. Mitigation measures reduce or compensate for environmental consequences of an action. Offsite mitigation is a supplemental mitigation to address important Forest Plan management objectives that cannot be fully mitigated on-site. Proposed mitigation actions are intended to be responsive to:

- Compliance with the Aquatic Conservation Strategy of the NWFP
- Habitat for Threatened or Endangered (T&E) species including the northern spotted owl and Coho salmon
- Compliance with standards and guidelines for LSRs in the NWFP
- Direction in the National Forest Management Act 2012 planning rule's substantive requirements at 36 CFR §§ 219.8 through 219.11.
- Specific resource issues as they occur by watershed.

The CMPs discussed in this appendix are summarized in section 2.1.5 of the DEIS. They evolved from previous versions that were independently developed by the Forest Service. These previous versions are described in Appendix F of the 2015 Pacific Connector FEIS (FERC 2015). A central provision of the Forest Service CMPs is that they remain adaptable to new information and changed conditions.

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2.0 FOREST PLAN AMENDMENTS

Proposed amendments and related compensatory mitigation are evaluated in this section. Amendments and compensatory mitigation are unique for each forest and are addressed separately in the following sections.

2.1 UMPQUA NF

There are five proposed amendments to the Umpqua NF Land and Resource Management Plan (1990) (UNF LRMP) for the Pacific Connector pipeline project on the Umpqua NF. An evaluation of how the proposed amendments relate to the planning requirements in 36 CFR 219.8 – 219.11 is discussed in section 2.1.1 below. These proposed amendments are summarized in table 2.1.1-1 along with the project impacts and related project design features (PDF) and compensatory mitigation.[1] The proposed CMP projects are listed in table 2.1.1-2 and evaluated in table 2.1.1-3, table 2.1.1-4 and figure 2.1-5 below. Maps of the proposed CMP projects by watershed are displayed in figures 2.1-1 through 2.1-4.

2.1.1 Evaluation of Umpqua NF Proposed Forest Plan Amendments

The proposed Pacific Connector pipeline incorporates the most up-to-date engineering and technological practices for pipeline construction and operation. However, even with following these practices, it has been determined that one Forest Plan standard associated with rare and/or isolated species (Survey and Manage), and three Forest Plan standards associated with the soil, water, and riparian resources, would need to be modified so that the proposed construction and operation of the Pacific Connector pipeline can be in compliance with the Umpqua NF LRMP as amended by the NWFP and the January 2001 Record of Decision for Amendments to the Survey and Manage Protection Buffer, and Other Mitigation Measures Standards and Guidelines (Survey and Manage ROD).

2.1.1.1 Forest Plan Amendments Related to Rare Aquatic and Terrestrial Plant and Animal Communities (FS-1, UNF-4):

Amendment FS-1: Project-Specific Amendment to Exempt Management Recommendations for Survey and Manage Species on the Umpqua NF.

One Forest Plan standard associated with rare and/or isolated species (Survey and Manage) would need to be modified so that the proposed construction and operation of the Pacific Connector pipeline can be in compliance with the Umpqua NF LRMP as amended. This standard is:

- Management Direction: Manage All Known Sites (Survey and Manage ROD, Standards and Guidelines Page 8). Current and future known sites will be managed according to the Management Recommendation for the species. Professional judgment, Appendix J2 in the Northwest Forest Plan Final SEIS, and appropriate literature will be used to guide individual site management for those species that do not have Management Recommendations.

[1] The CMP for the Umpqua NF has been revised from previous versions due to changed conditions from the 2015 Stouts Creek Fire. Additional information is included in Appendix F3 which includes a Stouts Creek Fire Report that discusses the changed conditions and CMP revisions.

The proposed amendment to this standard is:

- Management Direction: Manage All Known Sites (Survey and Manage ROD, Standards and Guidelines Page 8). Current and future known sites will be managed according to the Management Recommendation for the species, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Professional judgment, Appendix J2 in the Northwest Forest Plan Final SEIS, and appropriate literature will be used to guide individual site management for those species that do not have Management Recommendations. (Proposed amendment FS-1 on the Umpqua NF)

While the amendment would provide an exception to meeting this standard, there would also be requirements to do what is appropriate, applicable and feasible to minimize, maintain or restore, maintain or restore any effects of the pipeline's construction and operation on Survey and Manage species within the area affected by the pipeline. Consequently, each amended standard includes the requirement that the "applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented".

The purpose of this project-level amendment is to make the proposed Pacific Connector pipeline project consistent with the Umpqua NF LRMP. Thus, the substantive planning rule requirements that are directly related to this amendment are:

- 36 CFR 219.9(a)(2)(ii) – [the plan must include plan components to maintain or restore] "Rare aquatic and terrestrial plant and animal communities."

- 36 CFR 219.9(b)(1) – "The responsible official shall determine whether or not the plan components required by paragraph (a) provide ecological conditions necessary to: …maintain viable populations of each species of conservation concern within the plan area."

Because the proposed amendment is "directly related" to these two substantive requirements, the Responsible Official must apply the requirements within the scope and scale of the proposed amendment (36 CFR 219.13 (b)(5)).

In considering the "scope and scale" of the amendment, it is important to recognize that the applicable sections of 36 CFR 219.9(a) and (b) that are described above, requires plan components to maintain or restore rare aquatic and terrestrial plant and animal communities, across the entire planning area (i.e., the Umpqua NF). This plan amendment does not alter these LRMP plan requirements for managing rare plant and animal communities across 99.98% of the Umpqua NF. The proposed pipeline construction corridor including the temporary extra work areas (TEWAs) and the uncleared storage areas (UCSAs) is approximately 205 acres of the 983,129 acre Umpqua NF. Within this 205 acre construction corridor surveys have identified 107 Survey and Manage sites that could be potentially impacted by construction activities. The proposed amendment does not waive the persistence objective for Survey and Manage species. The analysis that was conducted (see section 4.6.4.3 of the DEIS and Appendix F5) determined the Survey and Manage persistence objectives would be met. This means that for Umpqua NF lands within the project area, individual sites of Survey and Manage species may be impacted or lost to construction activities, but affected species are expected to persist within the range of the NSO despite the loss of these individual sites.

The amendment modifies this standard so that in the 205 acres of the project construction area the project need not be in compliance with this standard' specific requirements but instead, it is the "applicable mitigation measures identified in the POD and the Pacific Connector Project design requirements" that must be implemented. Or stated in another way, for the 205 acres of National Forest lands that would be within the operational right-of-way and construction zone for the Pacific Connector Pipeline, the management requirement described above would be replaced with the full set of management requirements that comprise the "applicable mitigation measures identified in the POD and Pacific Connector Project Design requirements". The inclusion of these management requirements as a part of the plan component language for the LRMP in this plan amendment, addresses the applicable 36 CFR 219.9(a) and (b) rule requirements within the "scope and scale" of the proposed plan amendments. The sections below describe in more detail how the applicable 36 CFR 219.9(a) and (b) requirements are being addressed.

How the Required Mitigation Measures would Maintain or Restore Effects to Rare Aquatic and Terrestrial Plant and Animal Communities and Meet the Applicable 36 CFR 219.9(a) and 36 CFR 219.9 (b) Requirements

The Forest Service has worked to inventory, analyze, and evaluate rare aquatic, terrestrial plant and animal communities that could be affected by this project. In addition, a third-party consultant for technical support was also utilized in reviewing the information gathered for the project. The POD is a document developed between the FS, BLM, FERC, and PCGP that contains the design features, mitigation measures, roles and responsibilities, monitoring, and procedures for the construction and operation of the pipeline on NFS lands. In addition, FERC's applicant prepared Plan and Procedures for construction and restoration enforceable, where applicable, for additional design features and mitigation. The design requirements and mitigation measures of the POD would be required by the modified standards and incorporated into BLM's ROW grant.

The mitigation measures incorporated into amendments for Survey and Manage species are designed to minimize, maintain or restore the potential for habitat fragmentation, edge effects, and loss of long-term habitats associated with effected species. To ensure adequate restoration and revegetation of the ROW, design features are identified in the *Erosion Control and Revegetation Plan* (POD I), *Right-of-Way Clearing Plan* (POD U), *Leave Tree Protection Plan* (POD P). In addition, routing considerations were identified during project development to ensure avoidance of known populations of rare plant and animal communities (See Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands). As well as, Appendix F.5, *Survey and Manage Persistence Evaluations*, and proposed amendment UNF-4 Reallocation of Matrix Lands to LSR.

As a basis for Survey and Manage determinations, Appendix F.5 provides background research on Survey and Manage species that could be affected by the PCGP Project; a review of survey reports prepared by others for the PCGP Project; and processing and analysis of spatial data obtained from the Bureau of Land Management (BLM), Forest Service, and other sources over the past 12 years. Background information was used in combination with new information available as a result of surveys for the PCGP Project and recent surveys in other portions of old growth forests to discuss the currently known distribution of the species in old growth forests within the NSO range. Impacts to sites as a result of the PCGP Project were analyzed to determine if the species would continue to have a reasonable assurance of persistence in the NSO range following implementation of the PCGP Project, taking into consideration the status and distribution of the species and general habitat in the NSO range.

Some of the required mitigation measures in the POD sections to protect rare plant and animal communities include: flagging existing snags on the edges of the construction right-of-way or TEWAs where feasible to save from clearing; snags would be saved as and used in LWD placement post-construction to benefit primary and secondary cavity nesting birds, mammals, reptiles, and amphibians; other large diameter trees on the edges of the construction right-of-way and TEWAs would also be flagged to save/protect as green recruitment or habitat/shade trees, where feasible; trees would be girdled to create snags to augment the number of snags along the right-of-way to benefit cavity nesting birds, mammals, reptiles, and amphibians. See POD's P & U and 4.7—*Land Use* of the DEIS for a complete list of applicable mitigation measures for pipeline construction. Additional measures include low ground weight (pressure) vehicles would be used; logging machinery would be restricted to the 30-foot permanent right-of-way wherever possible to prevent soil compaction; the removal of soil duff layers would be avoided in order to maintain a cushion between the soil and the logs and the logging equipment; designed skid trails would be used to restrict detrimental soil disturbance (compaction and displacement) to a smaller area of the right-of-way over the pipeline trenching area; and the temporary construction area would be restored and revegetated using native seeds, to the extent possible, and saplings (POD I).

In an effort to minimize, maintain or restore the impacts to Survey and Manage species, PCGP adopted route variations to avoid certain species identified in the Survey and Manage Persistence Evaluations by co-locating the proposed construction corridor adjacent to existing roads, through managed timber stands or otherwise avoid unique LSOG habitats to the maximum extent practicable (See Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands).

During construction of the Project, Compliance Monitors representing FERC are present on a full-time basis to inspect construction procedures and mitigation measures and provide regular feedback on compliance issues to FERC and the Forest Service. Objectives of the Compliance Monitoring program are to facilitate the timely resolution of compliance issues in the field; provide continuous information to FERC regarding noncompliance issues and their resolution; and review, process, and track construction-related variance requests. Changes to previously approved mitigation measures, construction procedures, and construction work areas due to unforeseen or unavoidable site conditions would require various levels of regulatory approval from the applicable land management agencies. FERC would have the authority to stop any activity that violates an environmental condition of the FERC authorization issued to PCGP.

Additionally, environmental compliance oversight responsibilities for PCGP, FERC, FS and BLM are described in the POD (Environmental Briefings and Compliance Plan, POD G) that would apply to the construction, operation, and maintenance of the project specifically on NFS lands. The FS Authorized Officer would coordinate with the BLM in administering and enforcing ROW grant provisions and would have stop-work authority. The FS Authorized Officer's designated representatives would ensure that the stipulations and mitigation measures included in the POD that are designed to minimize, maintain or restore the effects to soil, water and riparian resources, are adhered to during project construction, operation, and maintenance. The BLM Authorized

Officer would coordinate with the FS to ensure the work is being conducted in accordance with the ROW grant and agreed upon conditions. BLM and the FS would have stop-work authority. Field variance requests would be coordinated with the Authorized Officers.

Amendment UNF-4: Reallocation of Matrix Lands to LSR

The other proposed Forest Plan amendment related to rare aquatic and terrestrial plant and animal communities on the Umpqua NF is UNF-4. This proposed amendment would change the designation of approximately 585 acres from the Matrix land allocation to the LSR land allocation in Sections 7, 18, and 19, T.32S., R.2W.; and Sections 13 and 24, T.32S., R.3W., W.M., OR. (see figure 2.1-4). This change in land allocation is proposed as mitigation for the potential adverse impact of the Pacific Connector Pipeline project on LSR 223 on the Umpqua NF. This is a plan level amendment that would change future management direction for the lands reallocated from Matrix to LSR (for additional information on consistency with LSR Standards and Guidelines see section 4.7.3.6. and Appendix F.3 of the DEIS).

The purpose of this amendment is to make the proposed Pacific Connector pipeline project consistent with the Umpqua NF LRMP. Thus, the substantive planning rule requirements that are directly related to this amendment are:

- 36 CFR 219.8(a)(1)(i) – [the plan must include plan components to maintain or restore] "Interdependence of terrestrial and aquatic ecosystems in the plan area."
- 36 CFR 219.8(b)(1) – [the plan must include plan components to guide the plan area's contribution to social and economic sustainability] "Social, cultural and economic conditions relevant to the area influenced by the plan."
- 36 CFR219.9(b)(1) "The responsible official shall determine whether or not the plan components required by paragraph (a) of this section provide the ecological conditions necessary to: contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern within the plan area,"
- 36 CFR 219.9(a)(2)(ii) – [the plan must include plan components to maintain or restore] "Rare aquatic and terrestrial plant and animal communities."

Because the proposed amendment is "directly related" to these four substantive requirements, the Responsible Official must apply the requirements within the scope and scale of the proposed amendment (36 CFR 219.13 (b)(5)). However, because this proposed amendment would simply modify the area to which existing direction applies, the existing formatting for the planning requirements listed above would be retained (36 CFR 219.13(b)(4)).

In considering the "scope and scale" of the amendment, it is important to recognize that the applicable sections of 36 CFR 219.8 and 219.9 that are described above, requires plan components to maintain or restore rare aquatic and terrestrial plant and animal communities, and provide for social and economic sustainability across the entire planning area (i.e., the Umpqua NF). This plan amendment does not alter these LRMP plan requirements across 99.94% of the Umpqua NF. The proposed land reallocation is approximately 585 acres of the 983,129 acre Umpqua NF. The proposed amendment would benefit rare aquatic and terrestrial plant and animal communities by placing these acres in a late successional reserve where providing habitat for these species is the primary goal.

The timber probable sale quantity (directly related to economic conditions) would not be affected before the Umpqua NF LRMP is revised because the Forest has the capacity to maintain probable sale quantity without the acres of matrix lands that would be reallocated to LSR. If a linear relationship between acres and outputs is assumed, the potential effect would be less than two-tenths of one percent of the Forest's probable sale quantity since this proposed amendment would affect less than two-tenths of one percent of the Forest's matrix land base. This proposed amendment would not prevent future vegetation management activities such as thinning that would benefit LSR habitat and could also contribute to the local forest products industry.

How the Compensatory Mitigation Actions would help to Maintain or Restore Rare Aquatic and Terrestrial Plant and Animal Communities in the Plan Area (36 CFR 219.9(a), 36 CFR 219.9 (b)).

In addition to reallocation of 585 acres of Matrix to LSR, the CMP on the Umpqua NF includes proposals for stand density fuel breaks on 3,105 acres, stand density management on 816 acres, terrestrial habitat improvements on 478 acres and decommissioning approximately 5 miles of roads that would benefit rare plant and animal communities. The CMP on the Umpqua NF also includes proposals to improve aquatic and riparian habitat that would benefit rare aquatic plant and animal communities (see the discussion of *How the Compensatory Mitigation Actions would help to Maintain or Restore the Ecological Integrity of Riparian Areas, Soils, and Soil productivity in the Plan Area (36 CFR 219.8(a)(3)(i), (36 CFR 219.8(a)(2)(ii))* below for a discussion of benefits to aquatic habitats).

Stand density fuel breaks would reduce the threat of losing late-successional habitat to fire. High intensity fire has been identified as the single factor most impacting late successional and old growth forest habitats on federal lands in the area of the NWFP. Construction of the pipeline and associated activities removes both mature and developing stands and would increase fire suppression complexity; however the corridor also provides a fuel break. Fuels reduction adjacent to the corridor would increase the effectiveness of the corridor as a fuel break. Density management would increase longevity of existing mature stands by reducing losses from disease, insects and fire. Stand density management and fuels reduction would lower the risk of loss of developing and existing mature stands and other valuable habitats to high-intensity fire.

Stand density management would enhance LSOG habitat by increasing the growth, health, and vigor of the trees remaining in the stands, and restoring species and structural diversity to those considered characteristic under a natural disturbance regime. Thinning of young stands is a recognized treatment within LSR if designed to accelerate development of late-successional habitat characteristics. The proposed treatments include 228 acres of pre-commercial thinning, 288 acres of commercial thinning and 300 acres of off-site pine removal. The Pacific Connector pipeline would result in additional fragmentation and preclude the recovery of fragmented habitat for those stands adjacent to the pipeline corridor. Both mature stands and developing stands would be removed during pipeline construction. Density management of forested stands would assist in the recovery of late-seral habitat, impact from fragmentation, reduction in edge effects and enhance resilience of mature stands over time. Accelerating development of mature forest characteristics would shorten the impacts of those biological services loss due to pipeline construction.

Terrestrial habitat improvements include proposals for large woody debris placement on 164 acres, snag creation on 324 acres, noxious weed treatments on 6.7 miles of road and 124 acres of Lupine meadow restoration. Large wood replacement would partially mitigate for the barrier effect of the corridor by creating structure across the corridor for use by small wildlife species. Placement in wood deficient areas adjacent to the corridor allows for scattering of stockpiled wood, reducing localized fuel loads while improving habitat in deficient stands. Larger logs maintain moisture longer and are less likely to be fully consumed by fire. Managing for the proposed levels provide for a greater assurance of species abundance. The objective of snag creation is to mitigate for the immediate and future impacts to snag habitat from the clearing of the pipeline right-of-way. The construction and operation of the pipeline project has the potential to create vectors for noxious weeds. The proposed noxious weed treatments are intended to reduce populations of noxious weeds that are in close proximity to the pipeline project right-of-way. The long-term benefits of meadow restoration would include the restoring of native plant populations and species diversity. Restoring native plant communities and increasing vegetation diversity generally contributes to restoring habitat for a broad group of plant and animal species.

Although the Pacific Connector project has been routed to avoid LSOG habitat as much as possible, the project would cause habitat fragmentation within LSR 223. Road decommissioning reduces the edge effects over time by revegetating road surfaces and eliminating road corridors. Revegetating selected roads in conjunction with the density management proposed for adjacent plantations would create larger blocks of late successional habitat in the future.

These projects have been designed by an interdisciplinary team of resource professionals on the Umpqua NF with input and coordination with the U.S. Fish and Wildlife Service, NOAA Fisheries, and State agencies. They were planned within the watersheds that would be affected by the Pacific Connector pipeline project. They are a component of the PCGP application and would be a requirement of the Right-of-Way grant. Overall, these projects would help maintain and restore rare aquatic and terrestrial plant and animal communities on the Umpqua NF (see tables 2.1.1-3 and 2.1.1-4 and figures 2.1-1 through 2.1-5 for additional information).

2.1.1.2 Forest Plan Amendments Related to Soil, Water and Riparian Areas (UNF-1, UNF-2, and UNF-3):

Three Forest Plan standards associated with the soil, water, and riparian resources would need to be modified so that the proposed construction and operation of the Pacific Connector pipeline can be in compliance with the Umpqua NF LRMP. These standards are:

- Standard & Guideline 1 (UNF LRMP IV-33). Maintain all effective shading vegetation on perennial streams. Utilize silvicultural practices to establish shade on perennial streams where currently lacking.
- Prescriptions C2-II (LRMP IV-173 par.1, 1st sentence) and C2-IV (LRMP IV-177 last par. last sentence) Utility/transportation corridors, roads or transmission lines may cross but must not parallel streams and lake shores within the riparian unit.
- Standard & Guideline 1 (UNF LRMP IV-67). The combined total amount of unacceptable soil condition (detrimental compaction, displacement, puddling or severely burned) within an activity area (e g., cutting unit, range allotment, site preparation area) should not exceed

20 percent. All roads and landings, unless rehabilitated to natural conditions, are considered to be in detrimental condition, and are included as part of this 20 percent.

The proposed amendments to these standards are:

- Standard & Guideline 1 (UNF LRMP IV-33). Maintain all effective shading vegetation on perennial streams, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Utilize silvicultural practices to establish shade on perennial streams where currently lacking. (proposed amendment UNF-1)

- Prescriptions C2-II (LRMP IV-173 par.1, 1st sentence) and C2-IV (LRMP IV-177 last par. last sentence) Utility/transportation corridors, roads or transmission lines may cross but must not parallel streams and lake shores within the riparian unit, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** (proposed amendment UNF-2)

- Standard and Guideline 1 (UNF LRMP IV-67). The combined total amount of unacceptable soil condition (detrimental compaction, displacement, puddling or severely burned) within an activity area (e g., cutting unit, range allotment, site preparation area) should not exceed 20 percent. All roads and landings, unless rehabilitated to natural conditions, are considered to be in detrimental condition, and are included as part of this 20 percent, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** (proposed amendment UNF-3)

While the amendments would provide an exception to meeting these standards, there would also be requirements to do what is appropriate, applicable and feasible to minimize, maintain or restore any effects of the pipeline's construction and operation on the soil, water and riparian resources within the area affected by the pipeline. Consequently, each amended standard includes the requirement that the "applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented".

The purpose of these three project-level amendments is to make the proposed Pacific Connector pipeline project consistent with the Umpqua NF LRMP. Thus, the substantive planning rule requirements that are directly related to these three amendments are:

- 36 CFR 219.8(a)(3)(i) – The plan must include plan components "to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity.

- 36 CFR 219.8(a)(2)(ii) – [The plan must include plan components to maintain or restore] "soils and soil productivity, including guidance to reduce soil erosion and sedimentation."

Because the three proposed amendments are "directly related" to these two substantive requirements, the Responsible Official must apply the requirements within the scope and scale of the proposed amendments (36 CFR 219.13 (b)(5)).

In considering the "scope and scale" of the three amendments, it is important to recognize that the applicable sections of 36 CFR 219.8(a) that are described above, requires plan components to "maintain or restore" the soil, water and riparian resources across the entire planning area (i.e., the Umpqua NF). These plan amendments do not alter these LRMP plan requirements for managing the soil, water, and riparian resources across 99.98% of the Umpqua NF. The proposed pipeline construction corridor including the TEWAs and the UCSAs is approximately 205 acres of the 983,129 acre Umpqua NF. Of the 205 acres of pipeline corridor construction it is estimated that approximately 4 of these acres would not meet the standards for riparian area management described above and approximately 54 to 127 acres would not meet standards for soils described above.

The amendments modify three standards so that in the 205 acres of the project construction area the project need not be in compliance with these standards' specific requirements but instead, it is the "applicable mitigation measures identified in the POD and the Pacific Connector Project design requirements" that must be implemented. Or stated in another way, for the 205 acres of National Forest lands that would be within the operational right-of-way and construction zone for the Pacific Connector Pipeline, the three management requirements described above would be replaced with the full set of management requirements that comprise the "applicable mitigation measures identified in the POD and Pacific Connector Project Design requirements". The inclusion of these management requirements as a part of the plan component language for the LRMP in this plan amendment, addresses the applicable 36 CFR 219.8(a) rule requirements within the "scope and scale" of these proposed plan amendments. The sections below describe in more detail how the applicable 36 CFR 219.8(a) requirements are being addressed.

How the Required Mitigation Measures would Maintain or Restore Effects to Soil, Water, and Riparian Resources and Meet the Applicable 36 CFR 219.8(a) Requirements

The Forest Service has worked with Pacific Connector Gas Pipeline (PCGP) to inventory, analyze, and evaluate the geologic, soil, and hydrologic resources that could be affected by this project. In addition, a third-party consultant for technical support was also utilized in reviewing the information gathered for the project. The POD is a document developed between the FS, BLM, FERC, and PCGP that contains the design features, mitigation measures, roles and responsibilities, monitoring, and procedures for the construction and operation of the pipeline on NFS lands. In addition, FERC's applicant prepared Plan and Procedures for construction and restoration are enforceable, where applicable, for additional design features and mitigation. The design requirements and mitigation measures of the POD would be required by the modified standards and incorporated into BLM's ROW grant.

The mitigation measures, incorporated into amendments for soil, water, and riparian resources are designed to minimize, maintain or restore the potential for soil movement, slope stability, water quality, and to ensure adequate restoration and revegetation. These measures are identified in: the *Erosion Control and Revegetation Plan* (POD I); *Right-of-Way Clearing Plan* (POD U); *Wetland and Waterbody Crossing Plan* (POD BB); the *Forest Service Site Specific Stream Crossing Prescriptions* (NSR 2014); the *Stream Crossing Risk Analysis*; and *Stream Crossing Risk Analysis*

Addendum (GeoEngineers2017d, 2018a). PCGP would also follow the FERC's applicant prepared Wetland Procedures and the Best Management Practices for the State of Oregon. To further reduce potential for landslides on steep slopes, the Forest Service, BLM, and FERC are also recommending additional industry best management practices and measures identified from the *Technical Report on Soil Risk and Sensitivity Assessment* (NSR 2014) be incorporated into PCGP's terms and conditions of the Right-of-Way Grant as described in the POD's identified above. See 4.2.3.3 of the DEIS for a description of soil risk and sensitivity assessment.

Areas with soils rated moderate to very high for risk or sensitivity (39 acres total) would be recommended for more site-specific validation of the risk criteria used in the *Technical Report on Soil Risk and Sensitivity Assessment* (NSR 2014) to confirm that specific locations merit consideration of the more aggressive soil remediation measures, such as: a 2- to 3-inch organic mulch surface application (80 percent coverage) of woodchips, logging slash, and/or straw; adaptive seed mixes and vegetation to better fit site conditions; deep subsoil decompaction with hydraulic excavators that leave constructed corridor mounded and rough with maximum water infiltration so that water cannot flow downhill for any appreciable distance; more aggressive use of constructed surface water runoff dispersion structures such as closely placed and more pronounced slope dips and water bars, etc.; more aggressive use of constructed surface runoff entrapments such as silt fencing, sediment settling basins, or straw bale structures, etc.; more aggressive placement (100 percent coverage) and depth (3 to 4 inches) of ground cover using woodchips, logging slash, straw bales, wattles (see POD's U and I). In efforts to protect soil productivity, topsoil segregation would be required for pipeline construction at wetland and waterbody crossings on NFS lands (POD U).

Some of the required mitigation measures in the POD BB and *Forest Service Site Specific Stream Crossing Prescriptions* (NSR 2014) to protect wetlands and minimize, maintain or restore compaction include: limiting the construction right-of-way width to 75 feet through wetlands; placing equipment on mats; using low-pressure ground equipment; limiting equipment operation and construction traffic along the right-of-way; locating temporary workspace (TEWAS) more than 50 feet away from wetland boundaries; cutting vegetation at ground level; limiting stump removal to the construction trench; segregating the top 12 inches of soil, or to the depth of the topsoil horizon; using "push-pull" techniques in saturated wetlands; limiting the amount of time that the trench is open by not trenching until the pipe is assembled and ready for installation; not using imported rock and soils for backfill; and not using fertilizer, lime, or mulch during restoration in wetlands. PCGP must also follow the FERC Waterbody and Wetland Construction and Mitigation Procedures. See 4.3.3.2 of the DEIS for a complete list of applicable mitigation measures for pipeline construction at specific waterbody and stream crossings.

In an effort to minimize, maintain or restore the impacts to streams and riparian areas, PCGP adopted route variations to co-locate the proposed construction corridor adjacent to existing roads and along dry ridge tops (See Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands). In addition, PCGP has committed to limit construction at waterbody crossings to times of dry weather or low water flow. PCGP would implement the required erosion control measures at the proposed stream crossings to minimize, maintain or restore potential erosion and sedimentation impacts. The applicable mitigation measures and monitoring requirements in the POD relating to water waterbody crossings are included in the *Site Specific Forest Service Stream Crossing Prescriptions, and Wetland and Waterbody Crossing Plan* (POD BB). In addition, applicable mitigation measures from the FERC approved applicant prepared Procedures for Wetland and Waterbody Crossings would be required.

During construction of the Project, Compliance Monitors representing FERC are present on a full-time basis to inspect construction procedures and mitigation measures and provide regular feedback on compliance issues to FERC and the Forest Service. Objectives of the Compliance Monitoring program are to: facilitate the timely resolution of compliance issues in the field; provide continuous information to FERC regarding noncompliance issues and their resolution; and review, process, and track construction-related variance requests. Changes to previously approved mitigation measures, construction procedures, and construction work areas due to unforeseen or unavoidable site conditions would require various levels of regulatory approval from the applicable land management agencies. FERC would have the authority to stop any activity that violates an environmental condition of the FERC authorization issued to PCGP.

Additionally, environmental compliance oversight responsibilities for PCGP, FERC, FS and BLM are described in the POD (Environmental Briefings and Compliance Plan, POD G) that would apply to the construction, operation, and maintenance of the project specifically on NFS lands. The FS Authorized Officer would coordinate with the BLM in administering and enforcing ROW grant provisions and would have stop-work authority. The FS Authorized Officer's designated representatives would ensure that the stipulations and mitigation measures included in the POD that are designed to minimize, maintain or restore the effects to soil, water and riparian resources, are adhered to during project construction, operation, and maintenance. The BLM Authorized Officer would coordinate with the FS to ensure the work is being conducted in accordance with the ROW grant and agreed upon conditions. BLM and the FS would have stop-work authority. Field variance requests would be coordinated with the Authorized Officers.

How the Compensatory Mitigation Actions would help to Maintain or Restore the Ecological Integrity of Riparian Areas, Soils, and Soil productivity in the Plan Area (36 CFR 219.8(a)(3)(i), (36 CFR 219.8(a)(2)(ii)).

Part of the CMP on the Umpqua NF includes proposals to remove eleven old culverts that may block fish passage either by poor design or by failure over time, decommission approximately 7.2 miles and storm proof approximately 11.4 miles of road.

Removing culverts that block fish passage and replacing them with fish-friendly designs can allow fish and other aquatic organisms to access previously unavailable habitat. Stream crossing replacement would directly improve stream connectivity and habitat for aquatic species by immediately restoring access to formerly inaccessible habitats. Indirectly, these projects would reduce potential sediment levels in the long term by decreasing the potential for road failure. Stream crossing projects also reduce stream velocities by increasing stream crossing sizes, eliminating flow restrictions and allowing passage to additional reaches of habitat by removing barriers to aquatic species which improves access to spawning and rearing habitat and allows unrestricted movement throughout stream reaches during seasonal changes in water levels (Hoffman 2007).

Decommissioning and storm proofing roads can substantially reduce sediment delivery to streams (Madej 2000; Keppeler et al. 2007). Proposed road decommissioning and storm proofing would increase infiltration of precipitation, reduce surface runoff, and reduce sediment production from road-related surface erosion in the watershed where the impacts from the Project would occur.

Decommissioning roads would restore natural drainage patterns and thereby avoid large volumes of added sediment to the stream network that would be likely to eventually occur. In addition limited road maintenance dollars could be focused on the remaining road systems resulting in more maintenance of culverts and ditchlines resulting in less potential for catastrophic failure. Madej (2000) concluded that by eliminating the risk of stream diversions and culvert failures, road removal treatments significantly reduce long-term sediment production from retired logging roads.

These projects have been designed by an interdisciplinary team of resource professionals on the Umpqua NF with input and coordination with the U.S. Fish and Wildlife Service, NOAA Fisheries, and State agencies. They were planned within the watersheds that would be affected by the Pacific Connector pipeline project. They are a component of the PCGP application and would be a requirement of the Right-of-Way grant. Overall, these projects would help maintain and restore riparian and soil resources on the Umpqua NF (see tables 2.1.1-3 and 2.1.1-4 and figures 2.1-1 through 2.1-5 for additional information).

TABLE 2.1.1-1 **Proposed LRMP Amendments on the Umpqua NF**						
Amendment	**Description**	**Text of Proposed Amendment**	**Related Planning Rule Requirements**	**Pacific Connector pipeline Impacts**	**Project Design Features**	**Compensatory Mitigation**[2]
FS-1: Project-Specific Amendment to Exempt Management Recommendations for Survey and Manage Species on the Umpqua NF.	The Umpqua NF LRMP (UNF LRMP 1990) would be amended to exempt certain known sites within the area of the proposed Pacific Connector right-of-way grant from the Management Recommendations required by the 2001 "Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (Survey and Manage ROD) (USDA USDI 2001). For known sites within the proposed right-of-way that cannot be avoided, the 2001 Management Recommendations for protection of known sites of Survey and Manage species would not apply. For known sites located outside the proposed right-of-way but with an overlapping protection buffer only that portion of the buffer within the right-of-way would be exempt from the protection requirements of the Management Recommendations. Those Management Recommendations would remain in effect for that portion of the protection buffer that is outside of the right of way. The proposed amendment would not exempt the Forest Service from the requirements of the Survey and Manage ROD, as modified, to maintain species persistence for affected Survey and Manage species within the range of the northern spotted owl. This is a project-specific plan amendment applicable only to the Pacific Connector Pipeline Project and would not change future management direction for any other project. The amendment would provide an exception from these standards for the Pacific Connector Project and include specific mitigation measures and project design requirements for the project.	Management Direction: Manage All Known Sites (Survey and Manage ROD, Standards and Guidelines Page 8). Current and future known sites will be managed according to the Management Recommendation for the species, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Professional judgment, Appendix J2 in the Northwest Forest Plan Final SEIS, and appropriate literature will be used to guide individual site management for those species that do not have Management Recommendations.	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.9(a)(2)(ii) – [the plan must include plan components to maintain or restore] "Rare aquatic and terrestrial plant and animal communities." § 219.9(b)(1) – "The responsible official shall determine whether or not the plan components required by paragraph (a) provide ecological conditions necessary to: …maintain viable populations of each species of conservation concern within the plan area."	68 acres of late successional and old growth (LSOG) habitat directly impacted from construction activity[3] 205 total acres directly impacted from construction activity 107 survey and manage sites potentially impacted This amendment would affect less than 0.02% of the Umpqua NF	POD (I) Erosion Control and Revegetation Plan POD (J) Plant Conservation Plan POD (P) Leave Tree Protection Plan POD (U) Right-of-Way Clearing Plan Chapter 3, DEIS Route Design and Modifications on NFS lands Appendix K, Survey and Manage Persistence Evaluations	Reallocation of Matrix Lands to LSR – 585 Acres Stand Density Fuel Break - 3,105 acres Stand Density Management – 816 acres Terrestrial Habitat Improvements – 478 acres Road Decommissioning in LSR – 5 miles
UNF-1: Project-Specific Amendment to Allow Removal of Effective Shade on Perennial Streams.	The Umpqua NF LRMP would be amended to exempt the Standards and Guidelines for Fisheries (Umpqua NF LRMP, page IV-33, Forest-Wide) to allow the removal of effective shading vegetation where perennial streams are crossed by the Pacific Connector right-of-way. This change would potentially affect an estimated total of three acres of	Standard & Guideline 1 (UNF LRMP IV-33). Maintain all effective shading vegetation on perennial streams, **with the exception of the operational right-of-way**	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.8(a)(3)(i) – The plan must include plan components "to maintain or	3 acres of effective shading vegetation would be removed	POD (I) Erosion Control and Revegetation Plan POD (U) Right-of-Way Clearing Plan	Aquatic and Riparian Habitat – fish passage improvement - 11 sites Road Decommissioning – 7.2 miles Road Storm-proofing 11.4 miles

[2] The compensatory mitigation listed in this column reflects the mitigation most related to the proposed amendment. It should be noted that other actions in the CMP may also be beneficial.
[3] Direct Impacts include acres cleared for construction in the construction corridor and temporary extra work areas (TEWA), as well as acres modified from uncleared storage areas (UCSA)

TABLE 2.1.1-1 **Proposed LRMP Amendments on the Umpqua NF**						
Amendment	**Description**	**Text of Proposed Amendment**	**Related Planning Rule Requirements**	**Pacific Connector pipeline Impacts**	**Project Design Features**	**Compensatory Mitigation**[2]
	effective shading vegetation at approximately five perennial stream crossings in the East Fork of Cow Creek subwatershed from pipeline mileposts (MP) 109 to 110 in Sections 16 and 21, T.32S., R.2W., W.M., OR. The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements for the project. This is a project-specific plan amendment applicable only to the Pacific Connector Pipeline Project and would not change future management direction for any other project.	**and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Utilize silvicultural practices to establish shade on perennial streams where currently lacking.	restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity."	This amendment would affect less than 0.001% of the Umpqua NF	POD (BB) Wetland and Waterbody Crossing Plan Forest Service Site Specific Stream Crossing Prescriptions (NSR 2014) Stream Crossing Risk Analysis; and Stream Crossing Risk Analysis Addendum (GeoEngineers2017d, 2018a) Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands	
UNF-2: Project-Specific Amendment to Allow the Pacific Connector Pipeline Project in Riparian Areas.	The Umpqua NF LRMP would be amended to change prescriptions C2-II (LRMP IV-173) and C2-IV (LRMP IV-177) to allow the Pacific Connector pipeline route to run parallel to the East Fork of Cow Creek for approximately 0.1 mile between about pipeline MPs 109.5 and 109.6 in Section 21, T.32S., R.2W., W. M., OR. This change would potentially affect approximately one acre of riparian vegetation along the East Fork of Cow Creek. The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements for the project. This is a project-specific plan amendment applicable only to the Pacific Connector Pipeline Project and would not change future management direction for any other project.	Prescriptions C2-II (LRMP IV-173 par.1, 1st sentence) and C2-IV (LRMP IV-177 last par. last sentence) Utility/transportation corridors, roads or transmission lines may cross but must not parallel streams and lake shores within the riparian unit, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** (proposed amendment	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.8(a)(3)(i) – The plan must include plan components "to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity"	Approximately one acre of riparian vegetation along the East Fork of Cow Creek would be removed This amendment would affect less than 0.001% of the Umpqua NF and one acre of riparian reserves	POD (I) Erosion Control and Revegetation Plan POD (U) Right-of-Way Clearing Plan POD (BB) Wetland and Waterbody Crossing Plan Forest Service Site Specific Stream Crossing Prescriptions (NSR 2014) Stream Crossing Risk Analysis; and Stream Crossing Risk Analysis Addendum (GeoEngineers2017d, 2018a) Chapter 3, DEIS Route Design and Modifications	Aquatic and Riparian Habitat – fish habitat improvements - 11 sites Road Decommissioning – 7.2 miles Road Storm-proofing – 11.4 miles

TABLE 2.1.1-1 **Proposed LRMP Amendments on the Umpqua NF**						
Amendment	**Description**	**Text of Proposed Amendment**	**Related Planning Rule Requirements**	**Pacific Connector pipeline Impacts**	**Project Design Features**	**Compensatory Mitigation**[2]
					on Forest Service Managed Lands	
UNF-3: Project-Specific Amendment to Exempt Limitations on Detrimental Soil Conditions within the Pacific Connector Right-of-Way in All Management Areas.	The Umpqua NF LRMP would be amended to exempt limitations on the area affected by detrimental soil conditions from displacement and compaction within the Pacific Connector right-of-way. Standards and Guidelines for Soils (LRMP page IV-67) requires that not more than 20 percent of the project area have detrimental compaction, displacement, or puddling after completion of a project. The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements for the project. This is a project-specific plan amendment applicable only to the Pacific Connector Pipeline Project and would not change future management direction for any other project.	Standard and Guideline 1 (UNF LRMP IV-67). The combined total amount of unacceptable soil condition (detrimental compaction, displacement, puddling or severely burned) within an activity area (e g., cutting unit, range allotment, site preparation area) should not exceed 20 percent. All roads and landings, unless rehabilitated to natural conditions, are considered to be in detrimental condition, and are included as part of this 20 percent, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.**	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.8(a)(2)(ii) – [The plan must include plan components to maintain or restore] "soils and soil productivity, including guidance to reduce soil erosion and sedimentation."	Approximately between 54 and 127 acres of detrimental soil conditions could result from the pipeline construction This amendment would affect approximately 0.01% of the Umpqua NF	POD (I) Erosion Control and Revegetation Plan POD (U) Right-of-Way Clearing Plan Technical Report on Soil Risk and Sensitivity Assessment (NSR 2014)	Road Decommissioning – approximately 7.2 miles Road Storm-proofing approximately 11.4 miles
UNF-4: Reallocation of Matrix Lands to LSR	The Umpqua NF LRMP would be amended to change the designation of approximately 585 acres from Matrix land allocations to the LSR land allocation in Sections 7, 18, and 19, T.32S., R.2W.; and Sections 13 and 24, T.32S., R.3W., W.M., OR. This change in land allocation is proposed to partially mitigate the potential adverse impact of the Pacific Connector Pipeline Project on LSR 223 on the Umpqua NF. This is a plan level amendment that would change future management direction for the lands reallocated from Matrix to LSR.		The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.8(a)(1)(i) – [the plan must include plan components to maintain or restore] "Interdependence of terrestrial and aquatic ecosystems in the plan area." § 219.8(b)(1) – [the plan must include plan components to guide the plan area's contribution to social and economic	Approximately 20 acres of LSOG and 48 acres of Non-LSOG habitat would be cleared within LSR 223 This amendment would affect approximately 0.06% of the Umpqua NF	POD (I) Erosion Control and Revegetation Plan POD (U) Right-of-Way Clearing Plan	Reallocation of Matrix Lands to LSR – approximately 296 acres of LSOG and 289 acres of Non-LSOG habitat would be reallocated from matrix to LSR 223 Stand Density Fuel Break - 3,105 acres Stand Density Management – 816 acre Terrestrial Habitat Improvement – 478 acres Road Decommissioning in LSR – 5 miles

TABLE 2.1.1-1 **Proposed LRMP Amendments on the Umpqua NF**						
Amendment	**Description**	**Text of Proposed Amendment**	**Related Planning Rule Requirements**	**Pacific Connector pipeline Impacts**	**Project Design Features**	**Compensatory Mitigation**[2]
			sustainability] “Social, cultural and economic conditions relevant to the area influenced by the plan.” § 219.9(b)(1) “The responsible official shall determine whether or not the plan components required by paragraph (a) of this section provide the ecological conditions necessary to: contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern within the plan area,” and § 219.9(a)(2)(ii) – [the plan must include plan components to maintain or restore] “Rare aquatic and terrestrial plant and animal communities.”			

TABLE 2.1.1-2

Mitigation Projects to Address LRMP Objectives on the Umpqua NF

Unit	Watershed	Mitigation Group	Project Type	Project Name	Quantity a/	Unit
Umpqua NF	Days Creek - South Umpqua	Stand Density Fuel Break	Fuels Reduction	Days Creek - South Umpqua Matrix Integrated Fuels Reduction	194	acres
		Stand Density Fuel Break	Fuels Reduction	Days Creek - South Umpqua LSR Integrated Fuels Reduction	254	acres
		Terrestrial Habitat Improvement	Snag Creation	Days Creek - South Umpqua LSR Snag Creation	32	acres
		Terrestrial Habitat Improvement	Snag Creation	Days Creek - South Umpqua Matrix Snag Creation	14	acres
		Terrestrial Habitat Improvement	Lupine Meadow Restoration	Upper Cow Creek Lupine Meadow Restoration	23	acres
	Elk Creek - South Umpqua	Aquatic and Riparian Habitat	Fish Passage	Elk Creek Fish Passage Culverts	5	sites
		Road sediment reduction	Road Storm-proofing	Elk Creek Road Storm-proofing	9.2	miles
		Road sediment reduction	Road Decommissioning	Elk Cr. Road Decommissioning	5.9	miles
		Stand Density Fuel Break	Fuels Reduction	Elk Creek Matrix Integrated Fuels Reduction	176	acres
		Stand Density Management	Commercial Thinning	Elk Creek LSR Enhancement	91	acres
		Stand Density Management	Off-site Pine Removal	Elk Creek LSR Off-site Pine Removal	300	acres
		Terrestrial Habitat Improvement	LWD Upland Placement	Elk Creek LSR LWD Placement	99	acres
		Terrestrial Habitat Improvement	Lupine Meadow Restoration	Elk Creek LSR Lupine Meadow Restoration	101	acres
		Terrestrial Habitat Improvement	Noxious Weed Treatment	Elk Creek Roadside Noxious Weeds	6.7	miles
		Terrestrial Habitat Improvement	Snag Creation	Elk Creek LSR Snag Creation	68	acres
		Fire Suppression	Water Source Improvement	Elk Creek Pump Chance	2	sites
	Evans Creek	Stand Density Fuel Break	Road Shaded Fuel Break	Evans Cr LSR Road Shaded Fuel Break	63	acres
	Trail Creek	Road sediment reduction	Road Decommissioning	Trail Creek Road Decommissioning	0.3	miles
		Road sediment reduction	Road Storm-proofing	Trail Creek Storm-proofing	2.2	miles
		Stand Density Fuel Break	Fuels Reduction	Trail Creek Matrix Integrated Fuels Reduction	500	acres
		Stand Density Fuel Break	Road Shaded Fuel Break	Trail Creek LSR Road Shaded Fuel Break	175	acres
		Terrestrial Habitat Improvement	Snag Creation	Trail Creek Matrix Snag Creation	109	acres
		Stand Density Management	Pre-commercial Thinning	Trail Creek LSR PCT Enhancement	112	acres
	Upper Cow Creek	Aquatic and Riparian Habitat	Fish Passage	Upper Cow Creek Fish Passage Culverts	6	sites
		Fire Suppression	Water Source Improvement	Upper Cow Creek Pump Chance	1	site
		Road Sediment Reduction	Road Closure	Upper Cow Creek Road Closure	1.2	miles
		Road Sediment Reduction	Road Decommissioning	Upper Cow Creek Road Decommissioning	1.0	miles
		Stand Density Fuel Break	Fuels Reduction	Upper Cow Creek LSR Integrated Fuels Reduction	635	acres

TABLE 2.1.1-2 **Mitigation Projects to Address LRMP Objectives on the Umpqua NF**						
Unit	**Watershed**	**Mitigation Group**	**Project Type**	**Project Name**	**Quantity a/**	**Unit**
		Stand Density Fuel Break	Fuels Reduction	Upper Cow Creek Matrix Integrated Fuels Reduction	730	acres
		Stand Density Fuel Break	Road Shaded Fuel Break	Upper Cow Creek LSR Road Shaded Fuel Break	378	acres
		Stand Density Management	Commercial Thin	Upper Cow Creek LSR Enhancement	197	acres
		Stand Density Management	Pre-commercial Thinning	Elk Creek LSR PCT Enhancement	116	acres
		Terrestrial Habitat Improvement	LWD Upland Placement	Upper Cow Creek LSR LWD Placement	65	acres
		Terrestrial Habitat Improvement	Snag Creation	Upper Cow Creek LSR Snag Creation	90	acres
		Terrestrial Habitat Improvement	Snag Creation	Upper Cow Creek Matrix Snag Creation	11	acres
		Reallocation of Matrix Lands to LSR	Land Re-Allocation from Matrix to LSR	LRMP Amendment UNF 4 LSR 223 Reallocation	585	acres
a/ Acres are rounded to the nearest whole acre and miles to the nearest tenth of a mile.						

Figure 2.1-1. Map of CMP Projects in the Days Creek Watershed on the Umpqua NF

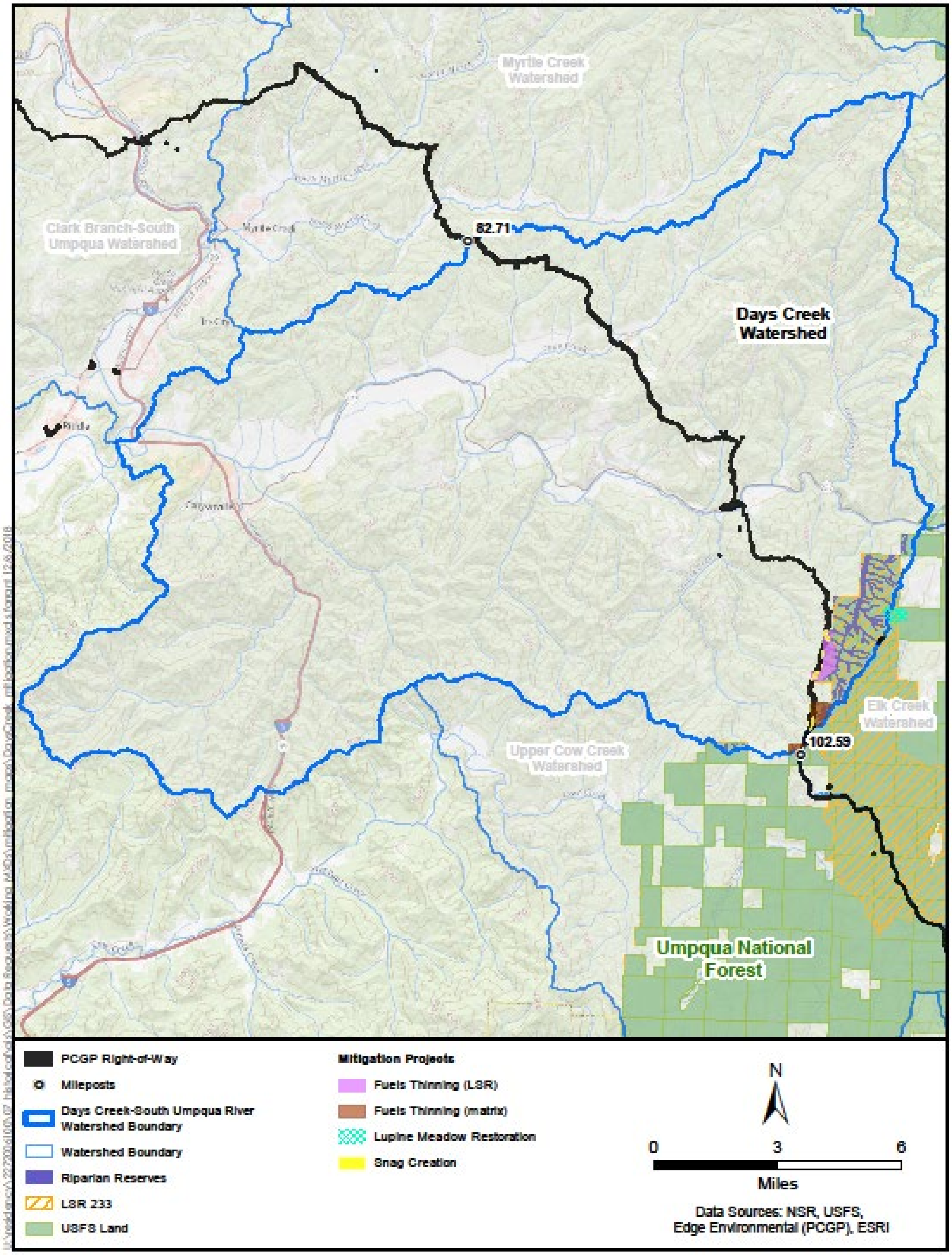


Figure 2.1-2. Map of CMP Projects in the ELK Creek Watershed on the Umpqua NF

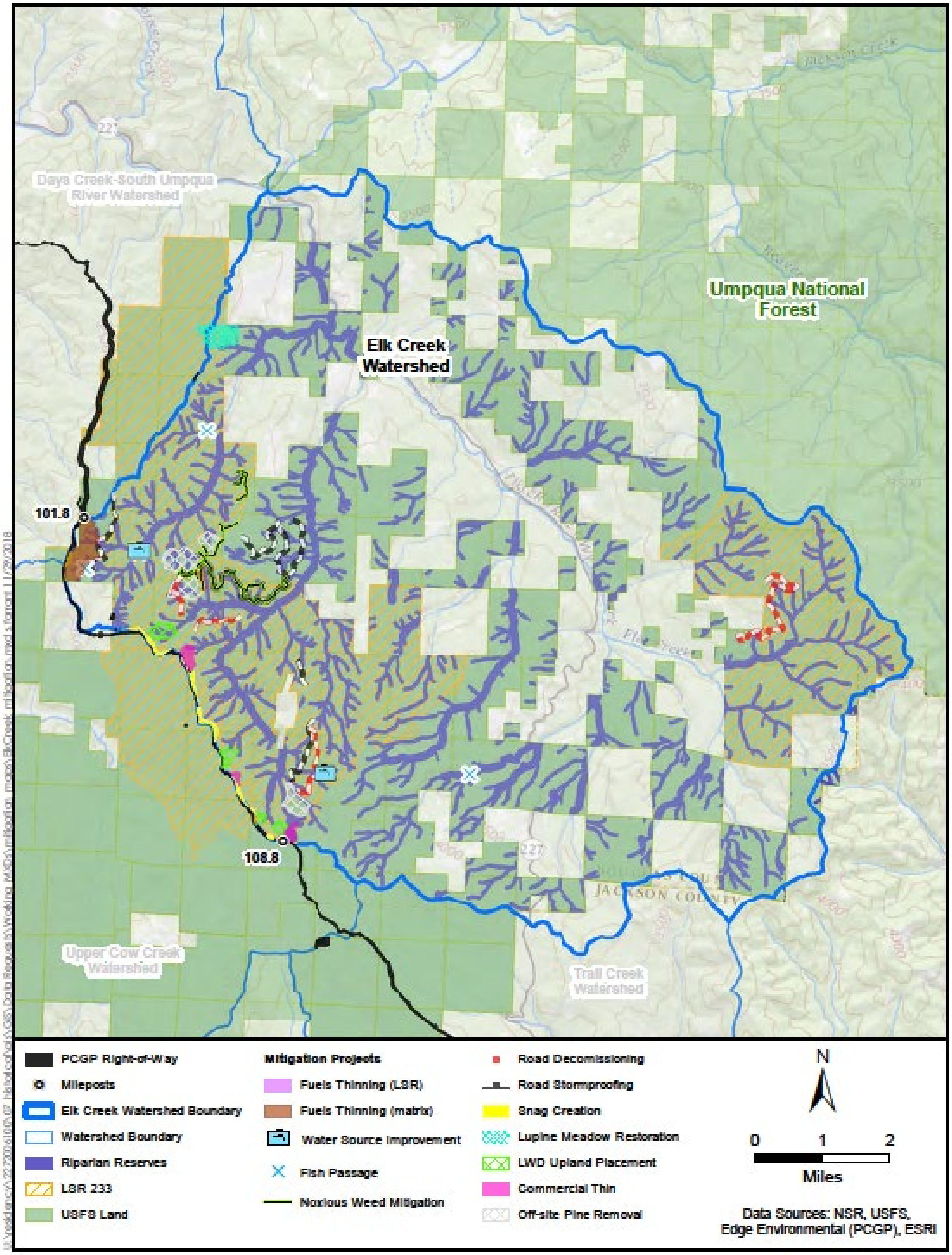


Figure 2.1-3. Map of CMP Projects in the Upper Cow Creek Watershed on the Umpqua NF

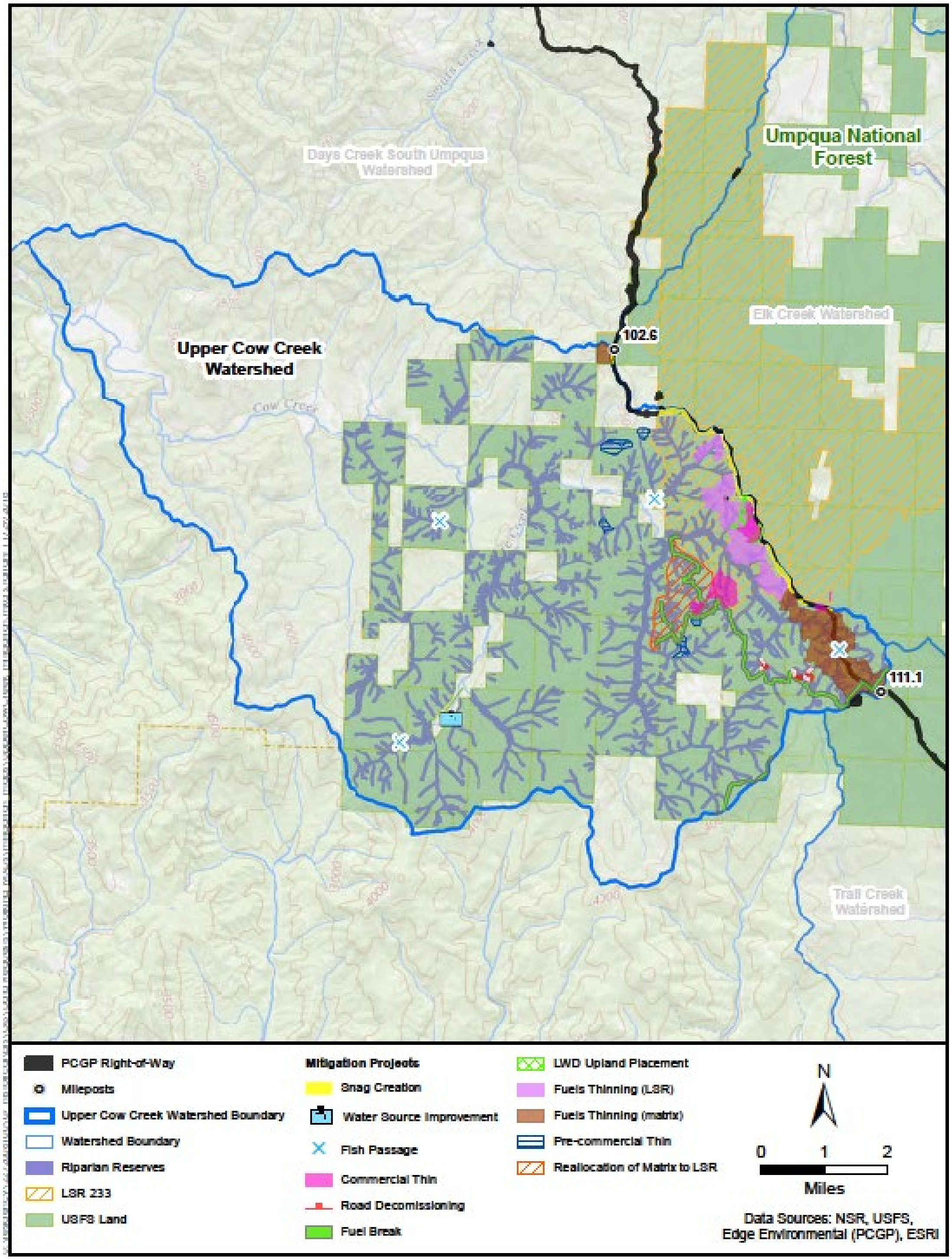


Figure 2.1-4. Map of CMP Projects in the Trail Creek Watershed on the Umpqua NF

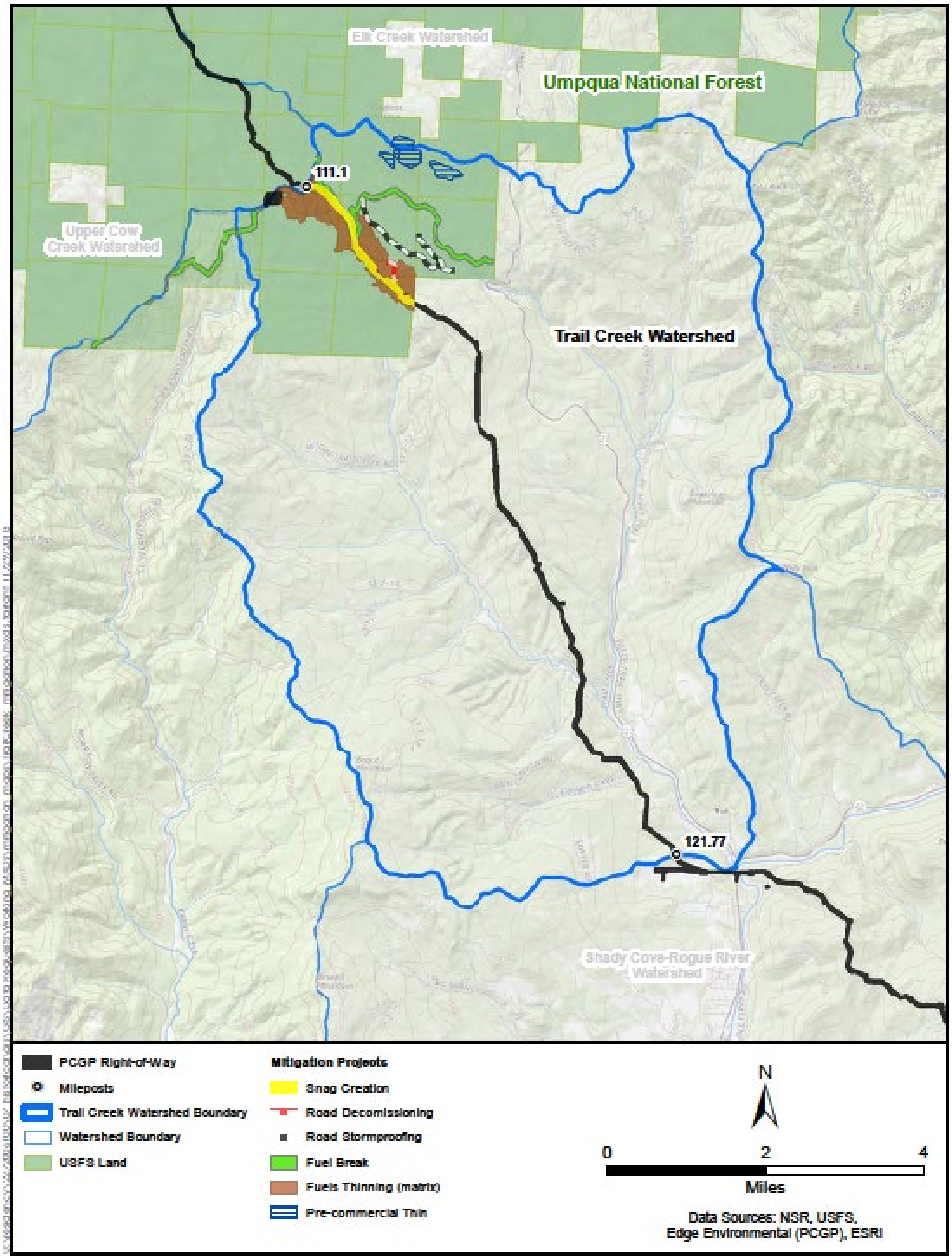


TABLE 2.1.1-3

Evaluation of Umpqua NF Mitigation Projects by Mitigation Group and Project Type

Mitigation Group	Project Type	Amount	Rationale	Environmental Consequences
Aquatic and Riparian Habitat	Fish Passage	11 Sites	Old culverts may block fish passage either by poor design or by failure over time. Removing these blockages and replacing them with fish-friendly designs can allow fish and other aquatic organisms to access previously unavailable habitat. This is responsive to ACS Objectives 1, 2, 3, and 9 (see appendix F4).	Short-term adverse effects: Removing old culverts and restoring stream/road crossings would result in short-term adverse effects since it involves the use of heavy equipment in and around the stream channel. The work would be done during low summer flow periods to minimize impacts to aquatic species and PDFs would be designed to minimize disturbance for Northern Spotted Owl (NSO). Long-term beneficial effects: Stream crossing replacement would directly improve stream connectivity and habitat for aquatic species by immediately restoring access to formerly inaccessible habitats. Indirectly, these projects would reduce potential sediment levels in the long term by decreasing the potential for road failure. Stream crossing projects also reduce stream velocities by increasing stream crossing sizes, eliminating flow restrictions and allowing passage to additional reaches of habitat by removing barriers to aquatic species which improves access to spawning and rearing habitat and allows unrestricted movement throughout stream reaches during seasonal changes in water levels (Hoffman 2007).
Road Sediment Reduction	Road Closure Road Decommissioning Road Stormproofing	1.2 Miles 7.2 Miles 11.4 Miles	Road closure reduces fine grained sediments by eliminating traffic impacts. Decommissioning roads can substantially reduce sediment delivery to streams (Madej 2000; Keppeler et al. 2007). Proposed road decommissioning would increase infiltration of precipitation, reduce surface runoff, and reduce sediment production from road-related surface erosion in the watershed where the impacts from the Project occur. Storm-proofing reduces sediment from roads by increasing the resistance of a road to failure during high intensity rainfall events. Storm-proofing strategies include improving drainage, reducing diversion potential at culverts, out-sloping road surfaces, and replacing culverts with hardened low water fords.	Short-term adverse effects: Road decommissioning methods generally include actions utilizing mechanized construction equipment to physically stabilize the road prism, restore natural drainage patterns, and allow for revegetation of the roadbed. Mechanized construction equipment might include excavators, backhoes and truck mounted loaders. Road closure is a method of preventing access to a road so that regular maintenance is no longer needed and future erosion is largely prevented by restoring drainage patterns if necessary and eliminating road traffic. Road decommissioning has the potential to cause short-term degradation of water quality by increasing sediment delivery to streams as roads are de-compacted by heavy equipment, culverts and cross drains are removed, and other restoration activities are implemented. The use of heavy mechanized equipment near streams could disturb the stream influence zone, deliver sediment, create turbidity, and cause stream bank erosion. There is also the potential of an accidental fuel/oil spill. These projects may cause a short-term degradation of water quality due to sediment input and chemical contamination. Stream bank condition and habitat substrate may also be adversely affected in the short term. However with careful project design and seasonal timing, these affects are expected to be of a limited extent and duration. Road decommissioning would create noise from heavy equipment that could disturb NSO. The potential for disturbance is mainly associated with breeding behavior at active nest sites. The PDFs would focus disturbance outside the critical nesting period and beyond critical distances for both NSO. These PDFs would reduce impacts from noise to acceptable levels. Long-term beneficial effects: Proposed road decommissioning and stormproofing would increase infiltration of precipitation, reduce surface runoff, and reduce sediment production from road-related surface erosion in the watershed where the impacts from the Project would occur. Decommissioning roads would restore natural drainage patterns and thereby avoid large volumes of added sediment to the stream network that would be likely to eventually occur. In addition limited road maintenance dollars could be focused on the remaining road systems resulting in more maintenance of culverts and ditchlines resulting in less potential for catastrophic failure. Madej (2000) concluded that by eliminating the risk of stream diversions and culvert failures, road removal treatments significantly reduce long-term sediment production from retired logging roads.
Fire Suppression	Water Source Improvement	3 Sites	The pipeline project would create fire suppression complexity by creation of a continuous corridor of early seral plant communities. High intensity stand-replacement fire has been identified as the single largest factor causing the loss of LSOG forests in the first	Short-term adverse effects: By employing appropriate BMPs and PDFs, the risk of erosion, sediment delivery, and detrimental soil damage within the treatment areas is expected to be minimal and within LMP standards and guidelines.

TABLE 2.1.1-3

Evaluation of Umpqua NF Mitigation Projects by Mitigation Group and Project Type

Mitigation Group	Project Type	Amount	Rationale	Environmental Consequences
			15 years of implementation of the Northwest Forest Plan (NWFP; Moeur et al. 2011). Pump chance developments and helicopter dipping ponds provide readily available water sources to support fire suppression efforts.	Long-term beneficial effects: Pump chance developments provide readily available water sources to support fire suppression efforts. These projects would help to reduce the threat of losing late-successional habitat to stand-replacement fire.
Stand Density Fuel Break	Fuels Reduction Road Shaded Fuel Break	2,489 Acres 616 acres	High intensity fire has been identified as the single factor most impacting late successional and old growth forest habitats on federal lands in the area of the NWFP. Construction of the pipeline and associated activities removes both mature and developing stands and will increase fire suppression complexity, however the corridor also provides a fuel break. Fuels reduction adjacent to the corridor will increase the effectiveness of the corridor as a fuel break. Density management will increase longevity of existing mature stands by reducing losses from disease, insects and fire. Stand density management and fuels reduction will lower the risk of loss of developing and existing mature stands and other valuable habitats to high-intensity fire.	Short-term adverse effects: Stand density management and fuels reduction activities include the use of heavy equipment for cutting, skidding, slash piling, and hauling forest vegetation. Soil erosion risk would increase with the proposed activities because bare soil would be exposed during implementation. As the amount of bare/compacted soil increases, so does the risk of soil movement. Impacts caused by heavy equipment would increase the amount of detrimental soil damage within the treatment areas. By maintaining proper amounts of protective groundcover along with appropriate BMPs and PDFs, the risk of erosion, sediment delivery, and detrimental soil damage within the treatment areas is expected to be minimal and within LMP standards and guidelines. Stand density fuels reduction treatments would not be expected to adversely affect nesting habitat for the NSO since the treatments would not remove constituent elements of their nesting habitat. The proposed treatments could temporarily impact acres of dispersal habitat. This habitat would be impacted by reduction of canopy cover as well as the loss of some down wood, shrubs and snags, which provide habitat for prey species. Integrated stand density treatments would create noise from heavy equipment that could disturb the NSO. The potential for disturbance is mainly associated with breeding behavior at active nest sites. The PDFs would focus disturbance outside the critical nesting period and beyond critical distances for NSO. These PDFs would reduce impacts from noise to acceptable levels. Long-term beneficial effects: By creating less dense stands with less tree competition, residual trees would benefit from the increased availability of sunlight, nutrients, and water. With the increase of available nutrients, trees should be more vigorous and less susceptible to large scale insect/disease outbreaks. The proposed treatments would move the vegetation towards conditions that would have occurred under a natural disturbance regime. This would lower flame lengths, reduce fire spread and lower the probability of tree mortality in the event of a wildfire, leading to more successful suppression efforts. Aerial delivered retardant or water would be more effective in lighter fuels and a more open canopy, making it safer for firefighters to successfully anchor and contain wildfires. These actions would reduce the threat of losing late-successional habitat to fire.
Stand Density Management	Pre-commercial Thinning LSR Commercial Thin LSR Off-site Pine Removal	228 Acres 288 Acres 300 Acres	Pacific Connector pipeline will cause direct impacts to existing interior, developing interior habitat. The project will result in additional fragmentation and preclude the recovery of fragmented habitat for those stands adjacent to the pipeline corridor. Both mature stands and developing stands will be removed during pipeline construction. Density management of forested stands will assist in the recovery of late-seral habitat, impact from fragmentation, reduction in edge effects and enhance resilience of mature stands. Accelerating development of mature forest characteristics will shorten the impacts of those biological services loss due to pipeline construction. Stand density management is intended to enhance LSOG habitat by increasing the growth, health, and vigor of the trees remaining in the stands; restoring stand density, species diversity, and structural diversity	Short-term adverse effects: Stand density management activities include the use of heavy equipment for cutting, skidding, slash piling, and hauling forest vegetation. Soil erosion risk would increase with the proposed activities because bare soil would be exposed during implementation. As the amount of bare/compacted soil increases, so does the risk of soil movement. Impacts caused by heavy equipment would increase the amount of detrimental soil damage within the treatment areas. By maintaining proper amounts of protective groundcover along with appropriate BMPs and PDFs, the risk of erosion, sediment delivery, and detrimental soil damage within the treatment areas is expected to be minimal and within LMP standards and guidelines. Stand treatments would not be expected to adversely affect nesting habitat for the NSO since the treatments would not remove constituent elements of their nesting habitat. The proposed treatments could temporarily impact acres of dispersal habitat. This habitat would be impacted by reduction of canopy cover as well as the loss of some down wood, shrubs and snags, which provide habitat for prey species. Integrated stand density treatments would create noise from heavy equipment that could disturb the NSO. The potential for disturbance is mainly associated

TABLE 2.1.1-3 **Evaluation of Umpqua NF Mitigation Projects by Mitigation Group and Project Type**				
Mitigation Group	**Project Type**	**Amount**	**Rationale**	**Environmental Consequences**
			to those considered characteristic under a natural disturbance regime. Thinning of young stands is a recognized treatment within LSR if designed to accelerate development of late-successional habitat characteristics.	with breeding behavior at active nest sites. The PDFs would focus disturbance outside the critical nesting period and beyond critical distances for NSO. These PDFs would reduce impacts from noise to acceptable levels. Long-term beneficial effects: By creating less dense stands with less tree competition, residual trees would benefit from the increased availability of sunlight, nutrients, and water. With the increase of available nutrients, trees should be more vigorous and less susceptible to large scale insect/disease outbreaks. The proposed treatments would enhance LSOG habitat by increasing the growth, health, and vigor of the trees remaining in the stands; restoring stand density, species diversity, and structural diversity to those considered characteristic under a natural disturbance regime.
Terrestrial Habitat Improvement	LWD Upland Placement LSR	164 Acres	The objective is to mitigate for the loss of recruitment of large down wood to adjacent stands and within the construction clearing zone. The project will forgo the development of large down wood for the life of the project and for decades after. Downed wood is a critical component of mature forest ecosystems. Large wood replacement will partially mitigate for the barrier effect of the corridor by creating structure across the corridor for use by small wildlife species. Placement in wood deficient areas adjacent to the corridor allows for scattering of stockpiled wood, reducing localized fuel loads while improving habitat in deficient stands. Larger logs maintain moisture longer and are less likely to be fully consumed by fire. Managing for the proposed levels provide for a greater assurance of species abundance.	Short-term adverse effects: Placement of LWD within and adjacent to the pipeline corridor would typically be done with heavy equipment that would drag the material into place. Heavy equipment use would increase the amount of detrimental soil damage within the treatment areas. By maintaining proper amounts of protective groundcover along with appropriate BMPs and PDFs, the risk of erosion, sediment delivery, and detrimental soil damage within the treatment areas is expected to be minimal and within LMP standards and guidelines. LWD placement would create noise from heavy equipment that could disturb the NSO. The potential for disturbance is mainly associated with breeding behavior at active nest sites. The PDFs would focus disturbance outside the critical nesting period and beyond critical distances for NSO. These PDFs would reduce impacts from noise to acceptable levels. Long-term beneficial effects: Beneficial effects include improving habitat for late-successional and other species and providing for long-term soil productivity.
Terrestrial Habitat Improvement	Snag Creation	324 Acres	Objective is to mitigate immediate and future impacts to snag habitat from the clearing of the pipeline right-of-way. The project prevents development of large snags during the life of the project and for decades after. Corridor construction will result in loss of snag habitat. As snags are a critical component of spotted owl habitat, replacement is needed. Replacement would be immediate though there would be a 10 year delay as snag decay develops.	Short-term adverse effects: Snag creation typically employs the use of chainsaws or inoculum to kill live trees. As such there is little if any ground disturbance and only minimal noise disturbance. The potential for noise disturbance is mainly associated with breeding behavior at active NSO nest sites. The PDFs would focus disturbance outside the critical nesting period and beyond critical distances for NSO. These PDFs would reduce impacts from noise to acceptable levels. Any adverse environmental impacts would be de minimus and very short term. Long-term beneficial effects: Beneficial impacts include the improvement of habitat for snag dependent species and in particular those species dependent on LSOG forests. Long-term benefits would also accrue as the created snags decay over time and eventually provide for LWD on the forest floor improving habitat for many other species and contributing to long-term soil productivity.
Terrestrial Habitat Improvement	Noxious Weed Treatments	6.7 Miles	The construction and operation of the pipeline project has the potential to create vectors for noxious weeds. These treatments are intended to reduce populations of noxious weeds that are in close proximity to the pipeline project right-of-way, as well as restore meadow habitats in the fifth-field watersheds that are currently impacted by noxious weeds	Short-term adverse effects: Treatments typically involve the cutting, pulling or spraying of noxious weeds. Since the work is typically done by hand there is minimal if any ground or noise disturbance. All activities would be conducted consistent with the most recent direction and plans for weed management and integrated vegetation management on BLM and Forest Service lands to minimize adverse impacts to plant and animal communities as well as water quality and aquatic habitats. Long-term beneficial effects: Long-term benefits would include the restoring of native plant populations and species diversity. Restoring native plant communities and increasing vegetation diversity generally contributes to restoring habitat for a broad group of plant and animal species.

TABLE 2.1.1-3

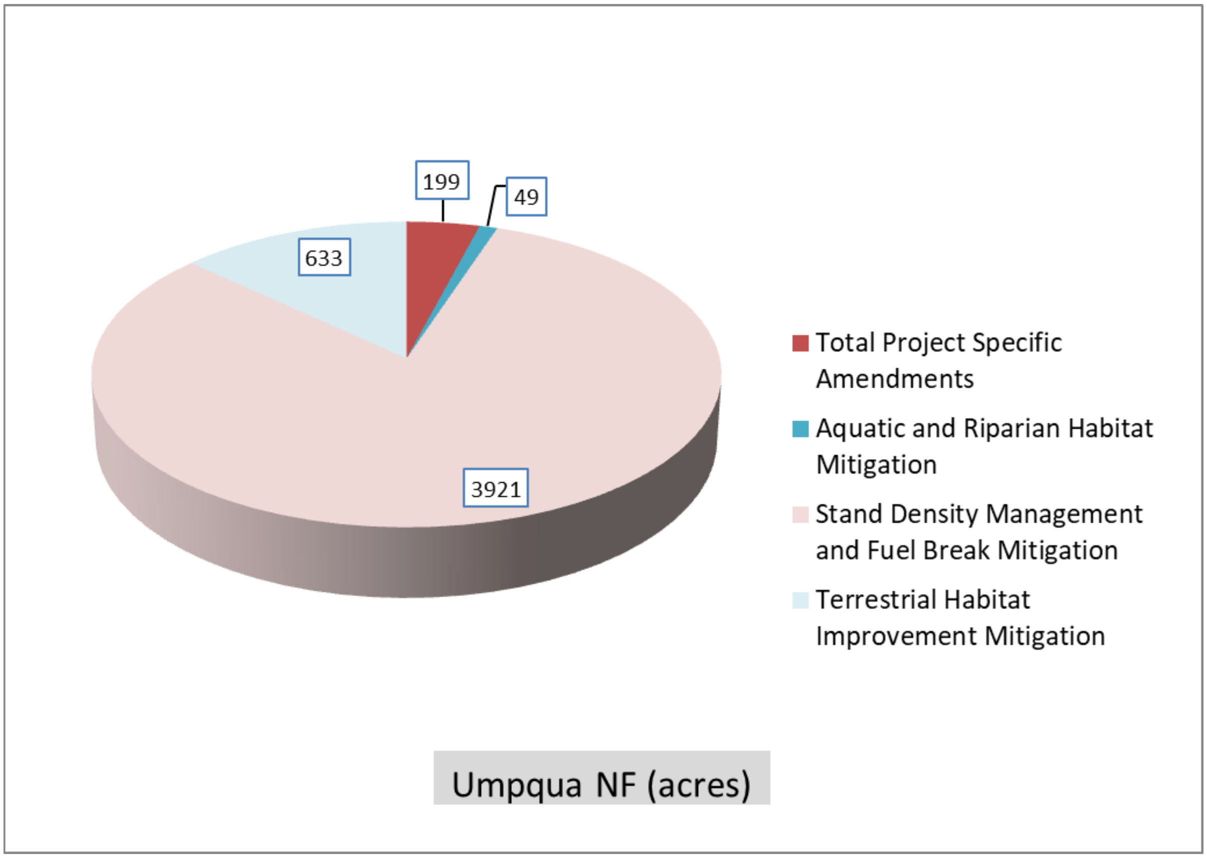
Evaluation of Umpqua NF Mitigation Projects by Mitigation Group and Project Type

Mitigation Group	Project Type	Amount	Rationale	Environmental Consequences
Terrestrial Habitat Improvement	Lupine Meadow Restoration	124 Acres	The Objective is to mitigate impacts to Unique habitats affected by the project. There will be loss of forest habitat buffering the unique habitats and disruption to soil horizons enhancing the opportunities for non -native plant species. These impacts cannot be fully mitigated on site; therefore, restoration activities such as burning, removal of encroaching conifers, and noxious weed control would be applied to a meadow located in LSR 223.	Short-term adverse effects: Treatments typically involve the cutting, pulling or spraying of noxious weeds and control burning. Since the work is typically done by hand there is minimal if any ground or noise disturbance. All activities would be conducted consistent with the most recent direction and plans for weed management and smoke management on Forest Service lands to minimize adverse impacts to plant and animal communities as well as water quality and aquatic habitats. Long-term beneficial effects: Long-term benefits would include the restoring of native plant populations and species diversity. Restoring native plant communities and increasing vegetation diversity generally contributes to restoring habitat for a broad group of plant and animal species.
Reallocation of Matrix Lands to LSR	Reallocation of Matrix to LSR	585 Acres	This mitigation group contributes to the "neutral to beneficial" standard for new developments in LSRs by adding acres to the LSR land allocation to offset the long-term loss of habitat due to the construction and operation of the pipeline project. It compensates for the removal of suitable nesting, roosting, and foraging NSO habitat by adding additional LSOG acres to the LSR land allocation. Reallocation of matrix lands to LSR also contributes to ACS objectives and may benefit Survey and Manage species by providing additional habitat that is managed to create LSOG stand conditions over time.	Short-term adverse effects: The reallocation of matrix lands to LSR is an administrative action that would not have any immediate environmental consequences on the ground. Long-term beneficial effects: The proposed reallocation would change the management direction of approximately 585 acres from one of multiple uses with an emphasis on timber management to a management emphasis focusing on the creation and maintenance of late-successional forest habitat. Over time, this reallocation would benefit species dependent on late-successional forests through management actions that would be designed to improve or maintain late-successional habitat conditions.

TABLE 2.1.1-4 **Comparison of Total Acres of Project-Specific Amendments and Compensatory Mitigation on the Umpqua NF**	
Amendments and Compensatory Mitigation	**Acres**
Total Project Specific Amendments[1]	199
Aquatic and Riparian Habitat Mitigation[2]	49
Stand Density Management and Fuel Break Mitigation	3921
Terrestrial Habitat Improvement Mitigation	633

Data Source: USFS GIS Data Layers
1) Includes amendments FS-1, UNF-1, UNF-2 and UNF-3
2) Includes road sediment reduction actions and assumes a 20 foot wide treatment area

Figure 2.1-5. Comparison of Total Acres of Proposed Project Specific Amendments and Compensatory Mitigation on the Umpqua NF



2.2 ROGUE RIVER NF

There are seven proposed forest plan amendments for the Pacific Connector pipeline project on the Rogue River NF. An evaluation of how the proposed amendments relate to the planning requirements in 36 CFR 219.8 – 219.11 is discussed in section 2.2.1 below. These proposed amendments are summarized in table 2.2.1-1 along with the project impacts and related project design features (PDF) and compensatory mitigation. The proposed CMP projects are listed in table 2.2.1-2 and evaluated in table 2.2.1-3, table 2.2.1-4, and figure 2.2-2 below. A map of the proposed CMP projects by watershed is displayed in figure 2.2-1.

2.2.1 Evaluation of Rogue River NF Proposed Forest Plan Amendments

The proposed Pacific Connector pipeline incorporates the most up-to-date engineering and technological practices for pipeline construction and operation. However, even with following these practices, it has been determined that one Forest Plan standard associated with rare and/or isolated species (Survey and Manage), two Forest Plan standards associated with the soil, water, and riparian resources, and four Forest Plan standards associated with visual resources would need to be modified so that the proposed construction and operation of the Pacific Connector pipeline can be in compliance with the Rogue River NF LRMP as amended by the NWFP and the January 2001 Survey and Manage ROD.

2.2.1.1 Forest Plan Amendments Related to Rare Aquatic and Terrestrial Plant and Animal Communities (FS-1, RRNF-7):

Amendment FS-1: Project-Specific Amendment to Exempt Management Recommendations for Survey and Manage Species on the Rogue River NF.

One Forest Plan standard associated with rare and/or isolated species (Survey and Manage) would need to be modified so that the proposed construction and operation of the Pacific Connector pipeline can be in compliance with the Rogue River NF LRMP as amended by the NWFP and the January 2001 Survey and Manage ROD. This standard is:

- Management Direction: Manage All Known Sites (Survey and Manage ROD, Standards and Guidelines Page 8). Current and future known sites will be managed according to the Management Recommendation for the species. Professional judgment, Appendix J2 in the Northwest Forest Plan Final SEIS, and appropriate literature will be used to guide individual site management for those species that do not have Management Recommendations.

The proposed amendment to this standard is:

- Management Direction: Manage All Known Sites (Survey and Manage ROD, Standards and Guidelines Page 8). Current and future known sites will be managed according to the Management Recommendation for the species, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Professional judgment, Appendix J2 in the Northwest Forest Plan Final SEIS, and appropriate literature will be used to guide individual site management for those species that do not have Management Recommendations. (Proposed amendment FS-1 on the Rogue River NF)

While the amendment would provide an exception to meeting this standard, there would also be requirements to do what is appropriate, applicable and feasible to minimize, maintain or restore any effects of the pipeline's construction and operation on Survey and Manage species within the area affected by the pipeline. Consequently, each amended standard includes the requirement that the "applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented".

The purpose of this project-level amendment is to make the proposed Pacific Connector pipeline project consistent with the Rogue River NF LRMP. Thus, the substantive planning rule requirements that are directly related to this amendment are:

- 36 CFR 219.9(a)(2)(ii) – [the plan must include plan components to maintain or restore] "Rare aquatic and terrestrial plant and animal communities."
- 36 CFR 219.9(b)(1) – "The responsible official shall determine whether or not the plan components required by paragraph (a) provide ecological conditions necessary to: …maintain viable populations of each species of conservation concern within the plan area."

Because the proposed amendment is "directly related" to these two substantive requirements, the Responsible Official must apply the requirements within the scope and scale of the proposed amendment (36 CFR 219.13 (b)(5)).

In considering the "scope and scale" of the amendment, it is important to recognize that the applicable sections of 36 CFR 219.9(a) and (b) that are described above, requires plan components to maintain or restore rare aquatic and terrestrial plant and animal communities, across the entire planning area (i.e., the Rogue River NF). This plan amendment does not alter these LRMP plan requirements for managing rare plant and animal communities across 99.97% of the Rogue River NF. The proposed pipeline construction corridor including the temporary extra work areas (TEWAs) and the uncleared storage areas (UCSAs) is approximately 206 acres of the 628,443 acre Rogue River NF. Within this 206 acre construction corridor surveys have identified 36 Survey and Manage sites that could be potentially impacted by construction activities. The proposed amendment does not waive the persistence objective for Survey and Manage species. The analysis that was conducted (see section 4.6.4.3 of the DEIS and Appendix F.5) determined the Survey and Manage persistence objectives would be met. This means that for Rogue River NF lands within the project area, individual sites of Survey and Manage species may be impacted or lost to construction activities, but affected species are expected to persist within the range of the NSO despite the loss of these individual sites.

The amendment modifies this standard so that in the 206 acres of the project construction area the project need not be in compliance with this standard' specific requirements but instead, it is the "applicable mitigation measures identified in the POD and the Pacific Connector Project design requirements" that must be implemented. Or stated in another way, for the 206 acres of National Forest lands that would be within the operational right-of-way and construction zone for the Pacific Connector Pipeline, the management requirement described above would be replaced with the full set of management requirements that comprise the "applicable mitigation measures identified in the POD and Pacific Connector Project Design requirements". The inclusion of these management requirements as a part of the plan component language for the LRMP in this plan amendment, addresses the applicable 36 CFR 219.9(a) and (b) rule requirements within the "scope and scale" of the proposed plan amendments. The sections below describe in more detail how the applicable 36 CFR 219.9(a) and (b) requirements are being addressed.

How the Required Mitigation Measures would Maintain or Restore Effects to Rare Aquatic and Terrestrial Plant and Animal Communities and Meet the Applicable 36 CFR 219.9(a) and 36 CFR 219.9 (b) Requirements

The Forest Service has worked to inventory, analyze, and evaluate rare aquatic, terrestrial plant and animal communities that could be affected by this project. In addition, a third-party consultant for technical support was also utilized in reviewing the information gathered for the project. The POD is a document developed between the FS, BLM, FERC, and PCGP that contains the design features, mitigation measures, roles and responsibilities, monitoring, and procedures for the construction and operation of the pipeline on NFS lands. In addition, FERC's applicant prepared Plan and Procedures for construction and restoration enforceable, where applicable, for additional design features and mitigation. The design requirements and mitigation measures of the POD would be required by the modified standards and incorporated into BLM's ROW grant.

The mitigation measures incorporated into amendments for Survey and Manage species are designed to minimize, maintain or restore the potential for habitat fragmentation, edge effects, and loss of long-term habitats associated with effected species. To ensure adequate restoration and revegetation of the ROW, design features are identified in the *Erosion Control and Revegetation Plan* (POD I), *Right-of-Way Clearing Plan* (POD U), *Leave Tree Protection Plan* (POD P). In addition, routing considerations were identified during project development to ensure avoidance of known populations of rare plant and animal communities (See Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands). As well as, Appendix F.5, *Survey and Manage Persistence Evaluations*, and proposed amendment RRNF-7 Reallocation of Matrix Lands to LSR.

As a basis for Survey and Manage determinations, Appendix F.5 provides background research on Survey and Manage species that could be affected by the PCGP Project; a review of survey reports prepared by others for the PCGP Project; and processing and analysis of spatial data obtained from the Bureau of Land Management (BLM), Forest Service, and other sources over the past 12 years. Background information was used in combination with new information available as a result of surveys for the PCGP Project and recent surveys in other portions of old growth forests to discuss the currently known distribution of the species in old growth forests within the NSO range. Impacts to sites as a result of the PCGP Project were analyzed to determine if the species would continue to have a reasonable assurance of persistence in the NSO range following implementation of the PCGP Project, taking into consideration the status and distribution of the species and general habitat in the NSO range.

Some of the required mitigation measures in the POD sections to protect rare plant and animal communities include: flagging existing snags on the edges of the construction right-of-way or TEWAs where feasible to save from clearing; snags would be saved as and used in LWD placement post-construction to benefit primary and secondary cavity nesting birds, mammals, reptiles, and amphibians; other large diameter trees on the edges of the construction right-of-way and TEWAs would also be flagged to save/protect as green recruitment or habitat/shade trees, where feasible; trees would be girdled to create snags to augment the number of snags along the right-of-way to benefit cavity nesting birds, mammals, reptiles, and amphibians. See POD's P &

U and 4.7—*Land Use* of the DEIS for a complete list of applicable mitigation measures for pipeline construction. Additional measures include low ground weight (pressure) vehicles would be used; logging machinery would be restricted to the 30-foot permanent right-of-way wherever possible to prevent soil compaction; the removal of soil duff layers would be avoided in order to maintain a cushion between the soil and the logs and the logging equipment; designed skid trails would be used to restrict detrimental soil disturbance (compaction and displacement) to a smaller area of the right-of-way over the pipeline trenching area; and the temporary construction area would be restored and revegetated using native seeds, to the extent possible, and saplings (POD I).

In an effort to minimize, maintain or restore the impacts to Survey and Manage species, PCGP adopted route variations to avoid certain species identified in the Survey and Manage Persistence Evaluations by co-locating the proposed construction corridor adjacent to existing roads, through managed timber stands or otherwise avoid unique LSOG habitats to the maximum extent practicable (See Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands).

During construction of the Project, Compliance Monitors representing FERC are present on a full-time basis to inspect construction procedures and mitigation measures and provide regular feedback on compliance issues to FERC and the Forest Service. Objectives of the Compliance Monitoring program are to facilitate the timely resolution of compliance issues in the field; provide continuous information to FERC regarding noncompliance issues and their resolution; and review, process, and track construction-related variance requests. Changes to previously approved mitigation measures, construction procedures, and construction work areas due to unforeseen or unavoidable site conditions would require various levels of regulatory approval from the applicable land management agencies. FERC would have the authority to stop any activity that violates an environmental condition of the FERC authorization issued to PCGP.

Additionally, environmental compliance oversight responsibilities for PCGP, FERC, FS and BLM are described in the POD (Environmental Briefings and Compliance Plan, POD G) that would apply to the construction, operation, and maintenance of the project specifically on NFS lands. The FS Authorized Officer would coordinate with the BLM in administering and enforcing ROW grant provisions and would have stop-work authority. The FS Authorized Officer's designated representatives would ensure that the stipulations and mitigation measures included in the POD that are designed to minimize, maintain or restore the effects to soil, water and riparian resources, are adhered to during project construction, operation, and maintenance. The BLM Authorized Officer would coordinate with the FS to ensure the work is being conducted in accordance with the ROW grant and agreed upon conditions. BLM and the FS would have stop-work authority. Field variance requests would be coordinated with the Authorized Officers.

Amendment RRNF-7: Reallocation of Matrix Lands to LSR

The other proposed Forest Plan amendment related to rare aquatic and terrestrial plant and animal communities on the Rogue River NF is RRNF-7. This proposed amendment would change the designation of approximately 522 acres from the Matrix land allocation to the LSR land allocation in Section 32, T.36S., R.4E. W.M., OR. (see figure 2.2-1). This change in land allocation is proposed as mitigation for the potential adverse impact of the Pacific Connector Pipeline project on LSR 227 on the Rogue River NF. This is a plan level amendment that would change future management direction for the lands reallocated from Matrix to LSR (for additional information on consistency with LSR Standards and Guidelines see section 4.7.3.6. and Appendix F.3 of the DEIS).

The purpose of this amendment is to make the proposed Pacific Connector pipeline project consistent with the Rogue River NF LRMP. Thus, the substantive planning rule requirements that are directly related to this amendment are:

- 36 CFR 219.8(a)(1)(i) – [the plan must include plan components to maintain or restore] "Interdependence of terrestrial and aquatic ecosystems in the plan area."
- 36 CFR 219.8(b)(1) – [the plan must include plan components to guide the plan area's contribution to social and economic sustainability] "Social, cultural and economic conditions relevant to the area influenced by the plan."
- 36 CFR219.9(b)(1) "The responsible official shall determine whether or not the plan components required by paragraph (a) of this section provide the ecological conditions necessary to: contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern within the plan area,"
- 36 CFR 219.9(a)(2)(ii) – [the plan must include plan components to maintain or restore] "Rare aquatic and terrestrial plant and animal communities."

Because the proposed amendment is "directly related" to these four substantive requirements, the Responsible Official must apply the requirements within the scope and scale of the proposed amendment (36 CFR 219.13 (b)(5)). However, because this proposed amendment would simply modify the area to which existing direction applies, the existing formatting for the planning requirements listed above would be retained (36 CFR 219.13(b)(4)).

In considering the "scope and scale" of the amendment, it is important to recognize that the applicable sections of 36 CFR 219.8 and 219.9 that are described above, requires plan components to maintain or restore rare aquatic and terrestrial plant and animal communities, and provide for social and economic sustainability across the entire planning area (i.e., the Rogue River NF). This plan amendment does not alter these LRMP plan requirements across 99.92% of the Rogue River NF. The proposed land reallocation is approximately 522 acres of the 628,443 acre Rogue River NF. The proposed amendment would benefit rare aquatic and terrestrial plant and animal communities by placing these acres in a late successional reserve where providing habitat for these species is the primary goal.

The timber probable sale quantity (directly related to economic conditions) would not be affected before the Rogue River NF LRMP is revised because the Forest has the capacity to maintain probable sale quantity without the acres of matrix lands that would be reallocated to LSR. If a linear relationship between acres and outputs is assumed, the potential effect would be less than one-half of one percent of the Forest's probable sale quantity since this proposed amendment would affect less than one-half of one percent of the Forest's matrix land base. This proposed amendment would not prevent future vegetation management activities such as thinning that would benefit LSR habitat and could also contribute to the local forest products industry.

How the Compensatory Mitigation Actions would help to Maintain or Restore Rare Aquatic and Terrestrial Plant and Animal Communities in the Plan Area (36 CFR 219.9(a), 36 CFR 219.9 (b)).

In addition to the reallocation of 522 acres of Matrix to LSR, the CMP on the Rogue River NF includes proposals for stand density management on 618 acres, terrestrial habitat improvements on 1153 acres and decommissioning approximately 57.5 miles of roads that would benefit rare plant and animal communities. The CMP on the Rogue River NF also includes proposals to improve aquatic and riparian habitat that would benefit rare aquatic plant and animal communities (see the discussion of *How the Compensatory Mitigation Actions would help to Maintain or Restore the Ecological Integrity of Riparian Areas, Soils, and Soil productivity in the Plan Area (36 CFR 219.8(a)(3)(i), (36 CFR 219.8(a)(2)(ii))* below for a discussion of benefits to aquatic habitats).

Stand density management would enhance LSOG habitat by increasing the growth, health, and vigor of the trees remaining in the stands, and restoring species and structural diversity to those considered characteristic under a natural disturbance regime. Thinning of young stands is a recognized treatment within LSR if designed to accelerate development of late-successional habitat characteristics. The proposed treatments include 618 acres of pre-commercial thinning. The Pacific Connector pipeline would result in additional fragmentation and preclude the recovery of fragmented habitat for those stands adjacent to the pipeline corridor. Both mature stands and developing stands would be removed during pipeline construction. Density management of forested stands would assist in the recovery of late-seral habitat, impact from fragmentation, reduction in edge effects and enhance resilience of mature stands over time. Accelerating development of mature forest characteristics would shorten the impacts of those biological services loss due to pipeline construction.

Terrestrial habitat improvements include proposals for large woody debris placement on 511 acres, snag creation on 622 acres, and 20 acres of habitat planting for the Mardon Skipper butterfly. Large wood replacement would partially mitigate for the barrier effect of the corridor by creating structure across the corridor for use by small wildlife species. Placement in wood deficient areas adjacent to the corridor allows for scattering of stockpiled wood, reducing localized fuel loads while improving habitat in deficient stands. Larger logs maintain moisture longer and are less likely to be fully consumed by fire. Managing for the proposed levels provide for a greater assurance of species abundance. The objective of snag creation is to mitigate for the immediate and future impacts to snag habitat from the clearing of the pipeline right-of-way. The Dead Indian Plateau region is one of four known sites for Mardon Skipper butterflies in the world. It is also adjacent to a known site for Short-horned grasshoppers. Both of these species are on the Regional Forester's Sensitive Species list. As a long-term opening, the pipeline corridor would provide a unique opportunity to develop habitat for these two species. Planting the corridor with plants preferred by these species has the potential to increase the habitat and local range for both species. This action would provide both short-term and long-term habitat for the local population of Mardon Skipper butterflies and Short-horned grasshoppers.

Although the Pacific Connector project has been routed to avoid LSOG habitat as much as possible, the project would cause habitat fragmentation within LSR 227. Road decommissioning reduces the edge effects over time by revegetating road surfaces and eliminating road corridors. Revegetating selected roads in conjunction with the density management proposed for adjacent plantations would create larger blocks of late successional habitat in the future.

These projects have been designed by an interdisciplinary team of resource professionals on the Rogue River NF with input and coordination with the U.S. Fish and Wildlife Service, NOAA

Fisheries, and State agencies. They were planned within the watersheds that would be affected by the Pacific Connector pipeline project. They are a component of the PCGP application and would be a requirement of the Right-of-Way grant. Overall, these projects would help maintain and restore rare aquatic and terrestrial plant and animal communities on the Rogue River NF (see tables 2.2.1-3 and 2.2.1-4 and figures 2.2-1 and 2.2-2 for additional information).

2.2.1.2 Forest Plan Amendments Related to Soil, Water and Riparian Areas (RRNF -5, RRNF-6):

Two Forest Plan standards associated with the soil, water, and riparian resources would need to be modified so that the proposed construction and operation of the Pacific Connector pipeline can be in compliance with the Rogue River NF LRMP. These standards are:

- Management Prescription 26 Restricted Riparian Standard & Guidelines for Facilities (10), (RRNF LRMP 4-308). Helispots and transmission corridors should be located outside this management area.
- Standard & Guideline for Soils (3) (RRNF LRMP 4-41, 4-83, 4-97, 4-123, 4-177, 4-307). No more than 10 percent of an activity area should be compacted, puddled or displaced upon completion of project (not including permanent roads or landings). No more than 20 percent of the area should be displaced or compacted under circumstances resulting from previous management practices, including roads and landings. Permanent recreation facilities or other permanent facilities are exempt.

The proposed amendments to these standards are:

- Management Prescription 26 Restricted Riparian Standard & Guidelines for Facilities (10), (RRNF LRMP 4-308). Helispots and transmission corridors should be located outside this management area, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented**. (Proposed amendment RRNF-5)
- Standard & Guideline for Soils (3) (RRNF LRMP 4-41, 4-83, 4-97, 4-123, 4-177, 4-307). No more than 10 percent of an activity area should be compacted, puddled or displaced upon completion of project (not including permanent roads or landings). No more than 20 percent of the area should be displaced or compacted under circumstances resulting from previous management practices, including roads and landings, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Permanent recreation facilities or other permanent facilities are exempt. (Proposed amendment RRNF-6)

While the amendments would provide an exception to meeting these standards, there would also be requirements to do what is appropriate, applicable and feasible to minimize, maintain or restore any effects of the pipeline's construction and operation on the soil, water and riparian resources within the area affected by the pipeline. Consequently, each amended standard includes the requirement that the "applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented".

The purpose of these two project-level amendments is to make the proposed Pacific Connector pipeline project consistent with the Rogue River NF LRMP. Thus, the substantive planning rule requirements that are directly related to these three amendments are:

- 36 CFR 219.8(a)(3)(i) – The plan must include plan components "to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity
- 36 CFR 219.8(a)(2)(ii) – [The plan must include plan components to maintain or restore] "soils and soil productivity, including guidance to reduce soil erosion and sedimentation."

Because the two proposed amendments are "directly related" to these two substantive requirements, the Responsible Official must apply the requirements within the scope and scale of the proposed amendments (36 CFR 219.13 (b)(5)).

In considering the "scope and scale" of the two amendments, it is important to recognize that the applicable sections of 36 CFR 219.8(a) that are described above, requires plan components to "maintain or restore" the soil, water and riparian resources across the entire planning area (i.e., the Rogue River NF). These plan amendments do not alter these LRMP plan requirements for managing the soil, water, and riparian resources across 99.97% of the Rogue River NF. The proposed pipeline construction corridor including the TEWAs and the UCSAs is approximately 206 acres of the 628,443 acre Rogue River NF. Of the 206 acres of pipeline corridor construction it is estimated that approximately 2.5 of these acres would not meet the standards for riparian area management described above and approximately 62 to 144 acres would not meet standards for soils described above.

The amendments modify two standards so that in the 206 acres of the project construction area the project need not be in compliance with these standards' specific requirements but instead, it is the "applicable mitigation measures identified in the POD and the Pacific Connector Project design requirements" that must be implemented. Or stated in another way, for the 206 acres of National Forest lands that would be within the operational right-of-way and construction zone for the Pacific Connector Pipeline, the two management requirements described above would be replaced with the full set of management requirements that comprise the "applicable mitigation measures identified in the POD and Pacific Connector Project Design requirements". The inclusion of these management requirements as a part of the plan component language for the LRMP in this plan amendment, addresses the applicable 36 CFR 219.8(a) rule requirements within the "scope and scale" of these proposed plan amendments. The sections below describe in more detail how the applicable 36 CFR 219.8(a) requirements are being addressed.

How the Required Mitigation Measures would Maintain or Restore Effects to Soil, Water, and Riparian Resources and Meet the Applicable 36 CFR 219.8(a) Requirements.

The Forest Service has worked with Pacific Connector Gas Pipeline (PCGP) to inventory, analyze, and evaluate the geologic, soil, and hydrologic resources that could be affected by this project. In addition, a third-party consultant for technical support was also utilized in reviewing the information gathered for the project. The POD is a document developed between the FS, BLM, FERC, and PCGP that contains the design features, mitigation measures, roles and responsibilities, monitoring, and procedures for the construction and operation of the pipeline on NFS lands. In addition, FERC's applicant prepared Plan and Procedures for construction and restoration are enforceable, where applicable, for additional design features and mitigation. The design requirements and mitigation measures of the POD would be required by the modified standards and incorporated into BLM's ROW grant.

The mitigation measures, incorporated into amendments for soil, water, and riparian resources are designed to minimize, maintain or restore the potential for soil movement, slope stability, water quality, and to ensure adequate restoration and revegetation. These measures are identified in: the *Erosion Control and Revegetation Plan* (POD I); *Right-of-Way Clearing Plan* (POD U); *Wetland and Waterbody Crossing Plan* (POD BB); the *Forest Service Site Specific Stream Crossing Prescriptions* (NSR 2014); the *Stream Crossing Risk Analysis*; and *Stream Crossing Risk Analysis Addendum* (GeoEngineers2017d, 2018a). PCGP would also follow the FERC's applicant prepared Wetland Procedures and the Best Management Practices for the State of Oregon. To further reduce potential for landslides on steep slopes, the Forest Service, BLM, and FERC are also recommending additional industry best management practices and measures identified from the *Technical Report on Soil Risk and Sensitivity Assessment* (NSR 2014) be incorporated into PCGP's terms and conditions of the Right-of-Way Grant as described in the POD's identified above. See 4.2.3.3 of the DEIS for a description of soil risk and sensitivity assessment.

Areas with soils rated moderate to very high for risk or sensitivity (17 acres total) would be recommended for more site-specific validation of the risk criteria used in the *Technical Report on Soil Risk and Sensitivity Assessment* (NSR 2014) to confirm that specific locations merit consideration of the more aggressive soil remediation measures, such as: a 2- to 3-inch organic mulch surface application (80 percent coverage) of woodchips, logging slash, and/or straw; adaptive seed mixes and vegetation to better fit site conditions; deep subsoil decompaction with hydraulic excavators that leave constructed corridor mounded and rough with maximum water infiltration so that water cannot flow downhill for any appreciable distance; more aggressive use of constructed surface water runoff dispersion structures such as closely placed and more pronounced slope dips and water bars, etc.; more aggressive use of constructed surface runoff entrapments such as silt fencing, sediment settling basins, or straw bale structures, etc.; more aggressive placement (100 percent coverage) and depth (3 to 4 inches) of ground cover using woodchips, logging slash, straw bales, wattles (see POD's U and I). In efforts to protect soil productivity, topsoil segregation would be required for pipeline construction at wetland and waterbody crossings on NFS lands (POD U).

Some of the required mitigation measures in the POD BB and *Forest Service Site Specific Stream Crossing Prescriptions* (NSR 2014) to protect wetlands and minimize, maintain or restore compaction include: limiting the construction right-of-way width to 75 feet through wetlands; placing equipment on mats; using low-pressure ground equipment; limiting equipment operation and construction traffic along the right-of-way; locating temporary workspace (TEWAS) more than 50 feet away from wetland boundaries; cutting vegetation at ground level; limiting stump removal to the construction trench; segregating the top 12 inches of soil, or to the depth of the topsoil horizon; using "push-pull" techniques in saturated wetlands; limiting the amount of time that the trench is open by not trenching until the pipe is assembled and ready for installation; not using imported rock and soils for backfill; and not using fertilizer, lime, or mulch during restoration in wetlands. PCGP must also follow the FERC Waterbody and Wetland Construction and Mitigation Procedures. See 4.3.3.2 of the DEIS for a complete list of applicable mitigation measures for pipeline construction at specific waterbody and stream crossings.

In an effort to minimize, maintain or restore the impacts to streams and riparian areas, PCGP adopted route variations to co-locate the proposed construction corridor adjacent to existing roads and along dry ridge tops (See Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands). In addition, PCGP has committed to limit construction at waterbody crossings to times of dry weather or low water flow. PCGP would implement the required erosion control measures at the proposed stream crossings to minimize, maintain or restore potential erosion and sedimentation impacts. The applicable mitigation measures and monitoring requirements in the POD relating to water waterbody crossings are included in the *Site Specific Forest Service Stream Crossing Prescriptions, and Wetland and Waterbody Crossing Plan* (POD BB). In addition, applicable mitigation measures from the FERC approved applicant prepared Procedures for Wetland and Waterbody Crossings would be required.

During construction of the Project, Compliance Monitors representing FERC are present on a full-time basis to inspect construction procedures and mitigation measures and provide regular feedback on compliance issues to FERC and the Forest Service. Objectives of the Compliance Monitoring program are to: facilitate the timely resolution of compliance issues in the field; provide continuous information to FERC regarding noncompliance issues and their resolution; and review, process, and track construction-related variance requests. Changes to previously approved mitigation measures, construction procedures, and construction work areas due to unforeseen or unavoidable site conditions would require various levels of regulatory approval from the applicable land management agencies. FERC would have the authority to stop any activity that violates an environmental condition of the FERC authorization issued to PCGP.

Additionally, environmental compliance oversight responsibilities for PCGP, FERC, FS and BLM are described in the POD (Environmental Briefings and Compliance Plan, POD G) that would apply to the construction, operation, and maintenance of the project specifically on NFS lands. The FS Authorized Officer would coordinate with the BLM in administering and enforcing ROW grant provisions and would have stop-work authority. The FS Authorized Officer's designated representatives would ensure that the stipulations and mitigation measures included in the POD that are designed to minimize, maintain or restore the effects to soil, water and riparian resources, are adhered to during project construction, operation, and maintenance. The BLM Authorized Officer would coordinate with the FS to ensure the work is being conducted in accordance with the ROW grant and agreed upon conditions. BLM and the FS would have stop-work authority. Field variance requests would be coordinated with the Authorized Officers.

How the Compensatory Mitigation Actions would help to Maintain or Restore the Ecological Integrity of Riparian Areas, Soils, and Soil Productivity in the Plan Area (36 CFR 219.8(a)(3)(i), 36 CFR 219.8(a)(2)(ii)).

Part of the CMP on the Rogue River NF includes proposals to place large woody debris in-stream for 1.5 miles, repair stream crossings at 32 sites, and decommission approximately 57.5 miles of road.

Placement of LWD in streams adds structural complexity to aquatic systems by creating pools and riffles, trapping fine sediments and can contribute to reductions in stream temperatures over time (Tippery et al. 2010). Placing LWD in streams affects channel morphology, the routing and storage of water and sediment, and provides structure and complexity to stream systems. Complex pools and side channels created by instream wood provide overwintering habitat to stream salmonids and other aquatic organisms (Solazzi et. al. 2000). They also provide cover from predators during summer low flow periods when predation is at its highest. Providing more stream channel structure results in better over wintering habitat, improved summer pool habitat, and more abundant spawning gravels.

Restoring stream crossings reconnects aquatic habitats by allowing the passage of aquatic biota and restoring riparian vegetation. Stream crossing replacement would directly improve stream connectivity and habitat for aquatic species by immediately restoring access to formerly inaccessible habitats. Indirectly, these projects would reduce potential sediment levels in the long term by decreasing the potential for road failure. Stream crossing projects also reduce stream velocities by increasing stream crossing sizes, eliminating flow restrictions and allowing passage to additional reaches of habitat by removing barriers to aquatic species which improves access to spawning and rearing habitat and allows unrestricted movement throughout stream reaches during seasonal changes in water levels (Hoffman 2007).

Decommissioning roads can substantially reduce sediment delivery to streams (Madej 2000; Keppeler et al. 2007). Proposed road decommissioning and stormproofing would increase infiltration of precipitation, reduce surface runoff, and reduce sediment production from road-related surface erosion in the watershed where the impacts from the Project would occur. Decommissioning roads would restore natural drainage patterns and thereby avoid large volumes of added sediment to the stream network that would be likely to eventually occur. In addition limited road maintenance dollars could be focused on the remaining road systems resulting in more maintenance of culverts and ditchlines resulting in less potential for catastrophic failure. Madej (2000) concluded that by eliminating the risk of stream diversions and culvert failures, road removal treatments significantly reduce long-term sediment production from retired logging roads.

These projects have been designed by an interdisciplinary team of resource professionals on the Rogue River NF with input and coordination with the U.S. Fish and Wildlife Service, NOAA Fisheries, and State agencies. They were planned within the watersheds that would be affected by the Pacific Connector pipeline project. They are a component of the PCGP application and would be a requirement of the Right-of-Way grant. Overall, these projects would help maintain and restore riparian and soil resources on the Rogue River NF (see tables 2.2.1-3 and 2.2.1-4 and figures 2.2-1 and 2.2-2 for additional information).

2.2.1.3 Forest Plan Amendments Related Visual Resources (RRNF -2, RRNF-3, RRNF-4):

Four Forest Plan standards associated with visual resources would need to be modified so that the proposed construction and operation of the Pacific Connector pipeline can be in compliance with the Rogue River NF LRMP. These standards are:

- Management Strategy 6, Foreground Retention, Standard and Guideline (1), (RRNF LRMP 4-72). Manage the area for Retention Visual Quality Objective. Catastrophic occurrences may dictate a need for short term departure from Retention. Assess the impacts to visual resources in all project environmental analysis. Specifically address how the visual quality objective will be met.

- Management Strategy 7, Foreground Partial Retention, Standard and Guideline (4), (RRNF LRMP 4-86). Correct unacceptable form, line, color or texture as a result of management activities either during the operation or within two years after completion of the activity.

- Management Strategy 7, Foreground Partial Retention, Standard and Guideline (1), (RRNF LRMP, 4-86). Manage the area for Partial Retention Visual Quality Objective. Catastrophic occurrences may dictate a need for short-term departure from Partial Retention Visual Quality Objective. Blend and shape regeneration openings with the natural terrain to the extent possible. Assess the impacts to visual resources in all project environmental analysis. Specifically address how the visual quality objective will be met.

- Management Strategy 9, Middle Ground Partial Retention, Standard and Guideline (1), (RRNF LRMP, 4-112). Manage the area for Partial Retention Visual Quality Objective. Catastrophic occurrences may dictate a need for short-term departure from Partial Retention Visual Quality Objective. Blend and shape regeneration openings with the natural terrain to the extent possible. Assess the impacts to visual resources in all project environmental analysis. Specifically address how the visual quality objective will be met.

The proposed amendments to these standards are:

- Management Strategy 6, Foreground Retention, Standard and Guideline (1), (RRNF LRMP 4-72). Manage the area for Retention Visual Quality Objective **(VQO), with the exception of the Pacific Connector Pipeline right-of-way, where the VQO would be amended to Foreground Partial Retention where the pipeline would cross the Big Elk Road. The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Catastrophic occurrences may dictate a need for short term departure from Retention. Assess the impacts to visual resources in all project environmental analysis. Specifically address how the visual quality objective will be met. (Proposed amendment RRNF-2)

- Management Strategy 7, Foreground Partial Retention, Standard and Guideline (4), (RRNF LRMP 4-86). Correct unacceptable form, line, color or texture as a result of management activities either during the operation or within two years after completion of the activity, **with the exception of the Pacific Connector Pipeline right-of-way which shall attain the amended VQO within 10 - 15 years after completion of the construction phase of the project where the pipeline crosses the Big Elk Road. The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** (Proposed amendment RRNF-2)

- Management Strategy 7, Foreground Partial Retention, Standard and Guideline (1), (RRNF LRMP, 4-86). Manage the area for Partial Retention Visual Quality Objective. Catastrophic occurrences may dictate a need for short-term departure from Partial Retention Visual Quality Objective **(VQO), with the exception of the Pacific Connector Pipeline right-of-way, where the VQO would be amended to Modification where the pipeline would cross the Pacific Crest Trail. The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Blend and shape regeneration openings with the natural terrain to the extent possible. Assess the impacts to visual resources in all project environmental analysis. Specifically address how the visual quality objective will be met. (proposed amendment RRNF-3)

- Management Strategy 7, Foreground Partial Retention, Standard and Guideline (4), (RRNF LRMP 4-86). Correct unacceptable form, line, color or texture as a result of management activities either during the operation or within two years after completion of the activity, **with the exception of the Pacific Connector Pipeline right-of-way which shall attain the amended VQO within 15 - 20 years after completion of the construction phase of the project where the pipeline crosses the Pacific Crest Trail. The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** (Proposed amendment RRNF-3)

- Management Strategy 9, Middle Ground Partial Retention, Standard and Guideline (1), (RRNF LRMP, 4-112). Manage the area for Partial Retention Visual Quality Objective, **with the exception of the Pacific Connector Pipeline right-of-way which shall attain the VQO within 10 - 15 years after completion of the construction phase of the project where the pipeline is adjacent to Highway 140.[4] The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Catastrophic occurrences may dictate a need for short-term departure from Partial Retention Visual Quality Objective. Blend and shape regeneration openings with the natural terrain to the extent possible. Assess the impacts to visual resources in all project environmental analysis. Specifically address how the visual quality objective will be met. (Proposed amendment RRNF-4)

While the amendments would provide an exception to meeting these standards, there would also be requirements to do what is appropriate, applicable and feasible to minimize, maintain or restore any effects of the pipeline's construction and operation on the visual resources within the area affected by the pipeline. Consequently, each amended standard includes the requirement that the "applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented".

The purpose of these five project-level amendments is to make the proposed Pacific Connector pipeline project consistent with the Rogue River NF LRMP. Thus, the substantive planning rule requirements that are directly related to these five amendments are:

- 36 CFR 219.10(a)(1) – […the responsible official shall consider: …] "(1) Aesthetic values,… scenery,... viewsheds...".
- 36 CFR 219.10(b)(i) – [the responsible official shall consider] "Sustainable recreation; including recreation settings, opportunities,…and scenic character…"

Because the proposed amendments are "directly related" to these two substantive requirements, the Responsible Official must apply the requirements within the scope and scale of the proposed amendments (36 CFR 219.13 (b)(5)).

In considering the "scope and scale" of the five amendments, it is important to recognize that the applicable sections of 36 CFR 219.10 that are described above, requires plan components to provide for aesthetic values and scenic character across the entire planning area (i.e., the Rogue River NF). These plan amendments do not alter these LRMP plan requirements for managing visual resources across 99.99% of the Rogue River NF. The proposed pipeline construction corridor including the TEWAs and the UCSAs is approximately 206 acres of the 628,443 acre

[4] Duration of impact specifications are found in the National Forest Landscape Management Handbook 462 (USDA Forest Service 1974). The recommended duration to meet standards for Middleground Partial Retention is 3 years (see RRNF LRMP FEIS p. III-119).

Rogue River NF. Of the 206 acres of pipeline corridor construction it is estimated that approximately 19 of these acres would not meet the standards for visual resources described above.

The amendments modify four standards so that in the 206 acres of the project construction area the project need not be in compliance with these standards' specific requirements but instead, it is the "applicable mitigation measures identified in the POD and the Pacific Connector Project design requirements" that must be implemented. Or stated in another way, for the 206 acres of National Forest lands that would be within the operational right-of-way and construction zone for the Pacific Connector Pipeline, the four management requirements described above would be replaced with the full set of management requirements that comprise the "applicable mitigation measures identified in the POD and Pacific Connector Project Design requirements". The inclusion of these management requirements as a part of the plan component language for the LRMP in this plan amendment, addresses the applicable 36 CFR 219.10 rule requirements within the "scope and scale" of these proposed plan amendments. The sections below describe in more detail how the applicable 36 CFR 219.10 requirements are being addressed.

How the Required Mitigation Measures would Consider, Minimize, Maintain or Restore Effects to Aesthetic Values and Scenic Character and Meet the Applicable 36 CFR 219.10(a) and 36 CFR 219.10(b)Requirements.

The Forest Service has worked to inventory, analyze, and evaluate visual resources, view sheds, and aesthetics that could be affected by this project. Forest Service landscape architect provided technical support to FERC and Forest Service third-party contractors by reviewing the information gathered for the project. The POD is a document developed between the FS, BLM, FERC, and PCGP that contains the design features, mitigation measures, roles and responsibilities, monitoring, and procedures for the construction and operation of the pipeline on NFS lands. In addition, FERC's applicant prepared Plan and Procedures for construction and restoration enforceable, where applicable, for additional design features and mitigation. The design requirements and mitigation measures of the POD would be required by the modified standards and incorporated into BLM's ROW grant.

The mitigation measures incorporated into amendments for Visual Quality Objectives, are designed to minimize, maintain or restore the potential for long-term impacts to visually sensitive areas. To ensure adequate restoration and revegetation of the ROW, design features are identified in the *Erosion Control and Revegetation Plan* (POD I), *Right-of-Way Clearing Plan* (POD U), *Leave Tree Protection Plan* (POD P), *Aesthetics Management Plan* (POD A), and *Recreation Management Plan* (POD S). In addition, routing considerations were identified during project development to ensure reduced visual impacts at the Pacific Crest Trail crossing by modifying the route to include a 45 degree angle and avoiding straight line impacts to trail users. (See Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands)

A visual assessment was conducted to determine the potential effects on visual resources associated with the pipeline. Representative viewpoint points (also referred to as KOPs) were identified within the view shed for the pipeline, defined as the area from which the pipeline would be potentially visible. Photographs of existing visual conditions were used in preparing computerized visual simulations for each KOP. Because the appearance of the pipeline right-of-way would change with time, a series of simulations were prepared to illustrate how the pipeline right-of-way would look at different timeframes following construction. These KOPs would also serve as monitoring points for mitigation.

Pacific Connector produced POD A that outlined measures to reduce visual impacts along its pipeline route. To the extent feasible, PCGP would use revegetation efforts to shape and blend the pipeline easement, enhance the setting, and mimic the natural features of the landscape. These measures would consist of revegetating all disturbed areas and replanting trees in TEWAs and any other areas of the temporary construction right-of-way that were forested prior to construction (see POD I).

On Forest Service lands, PCGP would maintain a cleared 30-foot width centered over the pipe allowing the remainder of the permanent easement to be reforested. This allows trees to naturally reestablish along the edges of the permanent easement at a staggered, more natural-looking interval. Replacing slash in forested areas of the right-of-way during restoration activities would immediately affect the visual contrast in color and texture of the disturbed right-of-way areas. Over time, as the right-of-way revegetates and narrows in width and changes in form, texture and color, potential visual impacts would diminish.

Additionally, a row, or if necessary, clusters of trees and/or shrubs would be planted across the right-of-way to provide visual screens at key road and trail crossings in sensitive view sheds. For all revegetation practices, PCGP and/or its contractors would only use agency-approved tree and plant species, in compliance with management plan objectives and in consultation with agency specialists.

Site Specific Crossing Prescriptions:

Big Elk Road (MP 161.41). Within the Rogue River National Forest, the Pipeline crosses an area managed for Foreground Retention with high scenic integrity. PCGP would neck down to a width of 50 feet immediately adjacent to either side of the Big Elk Road crossing. The construction right-of-way would then expand from 50 feet to the full 95-foot construction right-of-way width at 100 feet from either side of the road. To ensure that the appropriate large trees are conserved on either side of Big Elk Road, PCGP's Environmental Inspectors would verify the limits of the staked construction limits in conjunction with a Forest Service representative (see POD P). PCGP would implement the mitigation recommendations detailed in Section 3.2 and 3.3 and further described in the POD I to minimize, maintain or restore potential visual effects at this road crossing, and a buffer of vegetation would mask the right-of-way on both sides of the road. PCGP would additionally revegetate the right-of-way using large native trees and shrubs to begin the mitigation process.

Pacific Crest National Scenic Trail Corridor. The area where the Pipeline intersects the PCT on the Rogue River National Forest supports a stand of old-growth forest and is managed for Foreground Partial Retention to maintain the aesthetic forest appeal for trail users. The typical construction right-of-way width is 95 feet, which could devalue this trail crossing segment during construction. To minimize, maintain or restore impacts to the scenic quality of the area, PCGP would "neck down" the construction right-of-way from 95 feet to 75 feet in width for a distance of more than 300 feet on either side of the trail. UCSAs (no tree clearing) have also been located behind these neck downs, outside of the immediate foreground visual area, to minimize, maintain or restore disturbance. These UCSAs would be used to store slash and stumps during construction that would be redistributed across the right-of-way during restoration. To further minimize, maintain or restore potential visual impacts at the PCT crossing, the route was realigned at the request of the Forest Service to shorten the potential visual corridor down the right-of-way. Additional impact minimization measures include:

- Identifying trees along the edge of the construction right-of-way that can be saved from clearing, based on hazard tree and construction safety.
- Scalloping adjacent edges of timber as directed by the Forest Service landscape architect.
- Salvaging topsoil (duff and A horizon) to a depth of 12-inches along the trench line, segregate from spoil material, and replace during restoration.
- Minimizing grading within the 75-foot construction right-of-way based on safety requirements. Stumps would be removed, or gridded as necessary to provide a safe equipment working plane.
- Replanting a 75-foot wide visual screen on either side of the trail with nursery trees and shrubs within 6 days of final grading, dependent on seasonal planting constraints (and not within the 30 foot-operational easement). Replanting would be with mixed conifer species of differing age class per the USFS landscape plan and would include hydro-mulch seeding.
- Revegetating the remaining right-of-way with nursery trees and shrubs planted along the edges of the right-of-way in scalloped arrangement.
- Hydro-mulch seeding all disturbed soils.
- Placing logs and LWD in the construction right-of-way as directed by the USFS landscape plan.
- Using a gravity drip irrigation system with a water source from the well at Brown Mountain Shelter, to improve replanting establishment.
- Replanting would occur if mortality exceeds 30 percent.

Construction of the trail crossing would also be completed as a “tie-in” so that trenching, pipe stringing, and installation activities do not interrupt trail users for extended periods. It is expected that construction of the trail tie-in would be completed within 48 hours or less to minimize, maintain or restore potential impacts to trail users and reduce the need for trail detours.

Upon completion of construction in the area, PCGP would revegetate the construction right-of-way using native trees (not within the 30 foot-operational easement), shrubs, and plants. Section 3.0 of the POD A describes additional measures to be used on federal lands for protecting and mitigating for visual resources. PCGP would coordinate with the Forest Service and the Pacific Crest Trail Association regarding the need for and location of trail detours.

During construction of the Project, Compliance Monitors representing FERC are present on a full-time basis to inspect construction procedures and mitigation measures and provide regular feedback on compliance issues to FERC and the Forest Service. Objectives of the Compliance Monitoring program are to: facilitate the timely resolution of compliance issues in the field; provide continuous information to FERC regarding noncompliance issues and their resolution; and review, process, and track construction-related variance requests. Changes to previously approved mitigation measures, construction procedures, and construction work areas due to unforeseen or unavoidable site conditions would require various levels of regulatory approval from the applicable land management agencies. FERC would have the authority to stop any activity that violates an environmental condition of the FERC authorization issued to PCGP.

Additionally, environmental compliance oversight responsibilities for PCGP, FERC, FS and BLM are described in the POD (*Environmental Briefings and Compliance Plan*, POD G) that would apply to the construction, operation, and maintenance of the project specifically on NFS lands. The FS Authorized Officer would coordinate with the BLM in administering and enforcing ROW grant provisions and would have stop-work authority. The FS Authorized Officer's designated representatives would ensure that the stipulations and mitigation measures included in the POD that are designed to minimize, maintain or restore the effects to visual resources and recreational resources are adhered to during project construction, operation, and maintenance. The BLM Authorized Officer would coordinate with the FS to ensure the work is being conducted in accordance with the ROW grant and agreed upon conditions. BLM and the FS would have stop-work authority. Field variance requests would be coordinated with the Authorized Officers.

TABLE 2.2.1-1

Proposed LRMP Amendments on the Rogue River NF

Amendment	**Description**	**Text of Proposed Amendment**	**Related Planning Rule Requirements**	**Pacific Connector pipeline Impacts**	**Project Design Features**	**Compensatory Mitigation**[5]
FS-1: Project-Specific Amendment to Exempt Management Recommendations for Survey and Manage Species on the Rogue River NF.	The Rogue River NF LRMP (RRNF LRMP 1990) would be amended to exempt certain known sites within the area of the proposed Pacific Connector right-of-way grant from the Management Recommendations required by the 2001 "Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (Survey and Manage ROD) For known sites within the proposed right-of-way that cannot be avoided, the 2001 Management Recommendations for protection of known sites of Survey and Manage species would not apply. For known sites located outside the proposed right-of-way but with an overlapping protection buffer only that portion of the buffer within the right-of-way would be exempt from the protection requirements of the Management Recommendations. Those Management Recommendations would remain in effect for that portion of the protection buffer that is outside of the right of way. The proposed amendment would not exempt the Forest Service from the requirements of the Survey and Manage ROD, as modified, to maintain species persistence for affected Survey and Manage species within the range of the northern spotted owl. This is a project-specific plan amendment applicable only to the Pacific Connector Pipeline Project and would not change future management direction for any other project. The amendment would provide an exception from these standards for the Pacific Connector Project and include specific mitigation measures and project design requirements for the project.	Management Direction: Manage All Known Sites (Survey and Manage ROD, Standards and Guidelines Page 8). Current and future known sites will be managed according to the Management Recommendation for the species, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Professional judgment, Appendix J2 in the Northwest Forest Plan Final SEIS, and appropriate literature will be used to guide individual site management for those species that do not have Management Recommendations.	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.9(a)(2)(ii) – [the plan must include plan components to maintain or restore] "Rare aquatic and terrestrial plant and animal communities." § 219.9(b)(1) – "The responsible official shall determine whether or not the plan components required by paragraph (a) provide ecological conditions necessary to: …maintain viable populations of each species of conservation concern within the plan area."	55 acres of late successional and old growth (LSOG) habitat directly impacted from construction activity[6] 206 total acres impacted from construction activity 36 survey and manage sites potentially impacted This amendment would affect approximately 0.03% of the Rogue River NF	POD (I) Erosion Control and Revegetation Plan POD (J) Plant Conservation Plan POD (P) Leave Tree Protection Plan POD (U) Right-of-Way Clearing Plan Chapter 3, DEIS Route Design and Modifications on NFS lands Appendix K, Survey and Manage Persistence Evaluations	Reallocation of Matrix Lands to LSR – 522 Acres Stand Density Management – 618 acres Terrestrial Habitat Improvements – 1,153 acres Road Decommissioning in LSR – 57.5 miles
RRNF-2: Project Specific Amendment of Visual Quality	The Rogue River NF LRMP would be amended to change the VQO where the Pacific Connector pipeline route crosses the Big Elk Road at about pipeline MP 161.4 in	Management Strategy 6, Foreground Retention, Standard and Guideline (1), (RRNF LRMP 4-72). Manage the area for	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: §	One crossing of the Big Elk Road that	POD (A) Aesthetics Management Plan for Federal Lands	

[5] The compensatory mitigation listed in this column reflects the mitigation most related to the proposed amendment. It should be noted that other actions in the CMP may also be beneficial.
[6] Direct Impacts include acres cleared for construction in the construction corridor and temporary extra work areas (TEWA), as well as acres modified from uncleared storage areas (UCSA)

TABLE 2.2.1-1 **Proposed LRMP Amendments on the Rogue River NF**						
Amendment	**Description**	**Text of Proposed Amendment**	**Related Planning Rule Requirements**	**Pacific Connector pipeline Impacts**	**Project Design Features**	**Compensatory Mitigation**[5]
Objectives (VQO) on the Big Elk Road:	Section 16, T.37S., R.4E., W.M., OR, from Foreground Retention (Management Strategy 6, LRMP page 4-72) to Foreground Partial Retention (Management Strategy 7, LRMP page 4-86) and allow 10-15 years for amended VQO to be attained. The existing Standards and Guidelines for VQO in Foreground Retention where the Pacific Connector pipeline route crosses the Big Elk Road require that VQOs be met within one year of completion of the project and that management activities not be visually evident. The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements for the project. This is a project-specific plan amendment that would apply only to the Pacific Connector Pipeline Project in the vicinity of Big Elk Road and would not change future management direction for any other project.	Retention Visual Quality Objective **(VQO), with the exception of the Pacific Connector Pipeline right-of-way, where the VQO would be amended to Foreground Partial Retention where the pipeline would cross the Big Elk Road. The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Catastrophic occurrences may dictate a need for short term departure from Retention. Assess the impacts to visual resources in all project environmental analysis. Specifically address how the visual quality objective will be met. Management Strategy 7, Foreground Partial Retention, Standard and Guideline (4), (RRNF LRMP 4-86). Correct unacceptable form, line, color or texture as a result of management activities either during the operation or within two years after completion of the activity, **with the exception of the Pacific Connector Pipeline right-of-way which shall attain the amended VQO within 10 - 15 years after completion of the construction phase of the project where the pipeline crosses the Big Elk Road. The applicable mitigation measures identified in the POD and Pacific Connector**	219.10(a)(1) – […the responsible official shall consider: …] "(1) Aesthetic values,… scenery,... viewsheds...". § 219.10(b)(i) – [the responsible official shall consider] "Sustainable recreation; including recreation settings, opportunities,…and scenic character…"	would exceed VQO standards. This amendment would only affect approximately 5 acres (less than 0.001%) of the Rogue River NF	POD (I) Erosion Control and Revegetation Plan POD (P) Leave Tree Protection Plan POD (U) Right-of-Way Clearing Plan	

TABLE 2.2.1-1

Proposed LRMP Amendments on the Rogue River NF

Amendment	Description	Text of Proposed Amendment	Related Planning Rule Requirements	Pacific Connector pipeline Impacts	Project Design Features	Compensatory Mitigation[5]
		project design requirements must be implemented.				
RRNF-3: Project - Specific Amendment of VQO on the Pacific Crest Trail:	The Rogue River NF LRMP would be amended to change the VQO where the Pacific Connector pipeline route crosses the Pacific Crest Trail at about pipeline MP 168 in Section 32, T.37S., R.5E., W.M., OR, from Foreground Partial Retention (Management Strategy 7, LRMP page 4-86) to Modification (USDA Forest Service Agricultural Handbook 478) and to allow 15-20 years for amended VQOs to be attained. The existing Standards and Guidelines for VQOs in Foreground Partial Retention in the area where the Pacific Connector pipeline route crosses the Pacific Crest Trail require that visual mitigation measures meet the stated VQO within three years of the completion of the project and that management activities be visually subordinate to the landscape. The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements for the project. This is a project-specific plan amendment that would apply only to the Pacific Connector Pipeline Project in the vicinity of the Pacific Crest Trail and would not change future management direction for any other project.	Management Strategy 7, Foreground Partial Retention, Standard and Guideline (1), (RRNF LRMP, 4-86). Manage the area for Partial Retention Visual Quality Objective. Catastrophic occurrences may dictate a need for short-term departure from Partial Retention Visual Quality Objective **(VQO), with the exception of the Pacific Connector Pipeline right-of-way, where the VQO would be amended to Modification where the pipeline would cross the Pacific Crest Trail. The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Blend and shape regeneration openings with the natural terrain to the extent possible. Assess the impacts to visual resources in all project environmental analysis. Specifically address how the visual quality objective will be met.	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.10(a)(1) – […the responsible official shall consider: …] "(1)Aesthetic values,… scenery,... viewsheds...". § 219.10(b)(i) – [the responsible official shall consider] "Sustainable recreation; including recreation settings, opportunities,…and scenic character…"	One crossing of the PCT that would exceed VQO standards This amendment would only affect approximately 5 acres (less than 0.001 %) of the Rogue River NF	POD (A) Aesthetics Management Plan for Federal Lands POD (I) Erosion Control and Revegetation Plan POD (P) Leave Tree Protection Plan POD (S) Recreation Management Plan POD (U) Right-of-Way Clearing Plan Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands	
RRNF-4: Project-Specific Amendment of Visual Quality Objectives Adjacent to Highway 140:	The Rogue River NF LRMP would be amended to allow 10-15 years to meet the VQO of Middleground Partial Retention between Pacific Connector pipeline MPs 156.3 to 156.8 and 157.2 to 157.5 in Sections 11 and 12, T.37S., R.3E., W.M., OR. Standards and Guidelines for Middleground Partial Retention (Management Strategy 9, LRMP Page 4-112) require that VQOs for a given location be achieved within three years of completion of the project. Approximately 0.8 miles or 9 acres of the Pacific Connector right-of-way in	Management Strategy 9, Middle Ground Partial Retention, Standard and Guideline (1), (RRNF LRMP, 4-112). Manage the area for Partial Retention Visual Quality Objective, **with the exception of the Pacific Connector Pipeline right-of-way which shall attain the VQO within 10 - 15 years after completion of the construction phase of the**	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.10(a)(1) – […the responsible official shall consider: …] "(1)Aesthetic values,… scenery,... viewsheds...". § 219.10(b)(i) – [the responsible official shall consider] "Sustainable recreation; including	Approximately 0.8 miles of VQO standards along Hwy 140 would be exceeded This amendment would only affect about 9 acres (0.001 %) of the Rogue River NF	POD (A) Aesthetics Management Plan for Federal Lands POD (I) Erosion Control and Revegetation Plan POD (P) Leave Tree Protection Plan	

TABLE 2.2.1-1

Proposed LRMP Amendments on the Rogue River NF

Amendment	**Description**	**Text of Proposed Amendment**	**Related Planning Rule Requirements**	**Pacific Connector pipeline Impacts**	**Project Design Features**	**Compensatory Mitigation**[5]
	the Middleground Partial Retention VQO visible at distances of 0.75 to 5 miles from State Highway 140 would be affected by this amendment. The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements for the project. This is a project-specific plan amendment that would apply only to the Pacific Connector Pipeline Project in Sections 11 and 12, T.37S., R.3E., W.M., OR, and would not change future management direction for any other project.	**project where the pipeline is adjacent to Highway 140.**[7] **The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Catastrophic occurrences may dictate a need for short-term departure from Partial Retention Visual Quality Objective. Blend and shape regeneration openings with the natural terrain to the extent possible. Assess the impacts to visual resources in all project environmental analysis. Specifically address how the visual quality objective will be met.	recreation settings, opportunities, . . . and scenic character...".		POD (U) Right-of-Way Clearing Plan	
RRNF-5: Project-Specific Amendment to Allow the Pacific Connector Pipeline Project in Management Strategy 26, Restricted Riparian Areas:	The Rogue River NF LRMP would be amended to allow the Pacific Connector right-of-way to cross the Restricted Riparian land allocation. This would potentially affect approximately 2.5 acres of the Restricted Riparian Management Strategy at one perennial stream crossing on the South Fork of Little Butte Creek at about pipeline MP 162.45 in Section 15, T.37S., R.4E., W.M., OR. Standards and Guidelines for the Restricted Riparian land allocation prescribe locating transmission corridors outside of this land allocation (Management Strategy 26, LRMP page 4-308,). The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements for the project. This is a site-specific amendment applicable only to the Pacific Connector Pipeline Project	Management Prescription 26 Restricted Riparian Standard & Guidelines for Facilities (10), (RRNF LRMP 4-308). Helispots and transmission corridors should be located outside this management area, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented**.	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.8(a)(3)(i) – The plan must include plan components "to maintain or restore the ecological integrity of riparian areas in the plan area, including plan components to maintain or restore structure, function, composition, and connectivity"	approximately 2.5 acres of the Restricted Riparian Management Strategy at one perennial stream crossing on the South Fork of Little Butte Creek would be affected This amendment would only affect approximately 2.5 acres (less than 0.001%) of the Rogue River NF	POD (I) Erosion Control and Revegetation Plan POD (U) Right-of-Way Clearing Plan POD (BB) Wetland and Waterbody Crossing Plan Forest Service Site Specific Stream Crossing Prescriptions (NSR 2014) Stream Crossing Risk Analysis; and Stream Crossing Risk Analysis Addendum (GeoEngineers2017d, 2018a)	Aquatic and Riparian Habitat – Large Woody Debris Instream - 1.5 miles Aquatic and Riparian Habitat Stream Crossing Repair - 32 Sites Road Decommissioning – 57.5 miles

[7] Duration of impact specifications are found in the National Forest Landscape Management Handbook 462 (USDA Forest Service 1974). The recommended duration to meet standards for Middleground Partial Retention is 3 years (see RRNF LRMP FEIS p. III-119).

TABLE 2.2.1-1

Proposed LRMP Amendments on the Rogue River NF

Amendment	**Description**	**Text of Proposed Amendment**	**Related Planning Rule Requirements**	**Pacific Connector pipeline Impacts**	**Project Design Features**	**Compensatory Mitigation**[5]
	and would not change future management direction for any other project.				Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands	
RRNF-6: Site-Specific Amendment to Exempt Limitations on Detrimental Soil Conditions within the Pacific Connector Right-of-Way in All Management Areas:	The Rogue River NF LRMP would be amended to exempt limitations on areas affected by detrimental soil conditions from displacement and compaction within the Pacific Connector right-of-way in all affected Management Strategies. Standards and Guidelines for detrimental soil impacts in affected Management Strategies require that no more than 10 percent of an activity area should be compacted, puddled or displaced upon completion of project (not including permanent roads or landings). No more than 20 percent of the area should be displaced or compacted under circumstances resulting from previous management practices including roads and landings. Permanent recreation facilities or other permanent facilities are exempt (RRNF LRMP 4-41, 4-83, 4-97, 4-123, 4-177, 4-307). The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements for the project. This is a project-specific plan amendment applicable only to the Pacific Connector Pipeline Project and would not change future management direction for any other project.	Standard & Guideline for Soils (3) (RRNF LRMP 4-41, 4-83, 4-97, 4-123, 4-177, 4-307). No more than 10 percent of an activity area should be compacted, puddled or displaced upon completion of project (not including permanent roads or landings). No more than 20 percent of the area should be displaced or compacted under circumstances resulting from previous management practices, including roads and landings, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Permanent recreation facilities or other permanent facilities are exempt.	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.8(a)(2)(ii) – [The plan must include plan components to maintain or restore] "soils and soil productivity, including guidance to reduce soil erosion and sedimentation."	Approximately between 62 and 144 acres of detrimental soil conditions could result from the pipeline construction This amendment would affect approximately 0.02% of the Rogue River NF	POD (I) Erosion Control and Revegetation Plan POD (U) Right-of-Way Clearing Plan Technical Report on Soil Risk and Sensitivity Assessment (NSR 2014)	Road Decommissioning – approximately 57.5 Miles
RRNF-7: Reallocation of Matrix Lands to LSR	The Rogue River NF LRMP would be amended to change the designation of approximately 522 acres from Matrix land allocations to the LSR land allocation in Section 32, T.36S., R.4E. W.M., OR. This change in land allocation is proposed to partially mitigate the potential adverse impact of the Pacific Connector Pipeline Project on LSR 227 on the Rogue River NF. This is a plan level amendment that would change future management direction for the lands reallocated from Matrix to LSR.		The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.8(a)(1)(i) – [the plan must include plan components to maintain or restore] "Interdependence of terrestrial and aquatic ecosystems in the plan area." § 219.8(b)(1) – [the plan must include plan components to guide the	Approximately 55 acres of LSOG and 142 acres of Non-LSOG habitat would be cleared within LSR 227 This amendment would affect approximately 0.08% of the Rogue River NF	POD (I) Erosion Control and Revegetation Plan POD (U) Right-of-Way Clearing Plan	Reallocation of Matrix Lands to LSR – approximately 237 acres of LSOG and 285 acres of Non-LSOG habitat would be reallocated from matrix to LSR 227 Stand Density Management – 618 acres Terrestrial Habitat Improvement – 1,153 acres Road Decommissioning in LSR – 57.5 miles

TABLE 2.2.1-1

Proposed LRMP Amendments on the Rogue River NF

Amendment	**Description**	**Text of Proposed Amendment**	**Related Planning Rule Requirements**	**Pacific Connector pipeline Impacts**	**Project Design Features**	**Compensatory Mitigation**[5]
			plan area's contribution to social and economic sustainability] "Social, cultural and economic conditions relevant to the area influenced by the plan." § 219.9(b)(1) "The responsible official shall determine whether or not the plan components required by paragraph (a) of this section provide the ecological conditions necessary to: contribute to the recovery of federally listed threatened and endangered species, conserve proposed and candidate species, and maintain a viable population of each species of conservation concern within the plan area", and § 219.9(a)(2)(ii)– [the plan must include plan components to maintain or restore: …] "(ii) Rare aquatic and terrestrial plant and animal communities".			

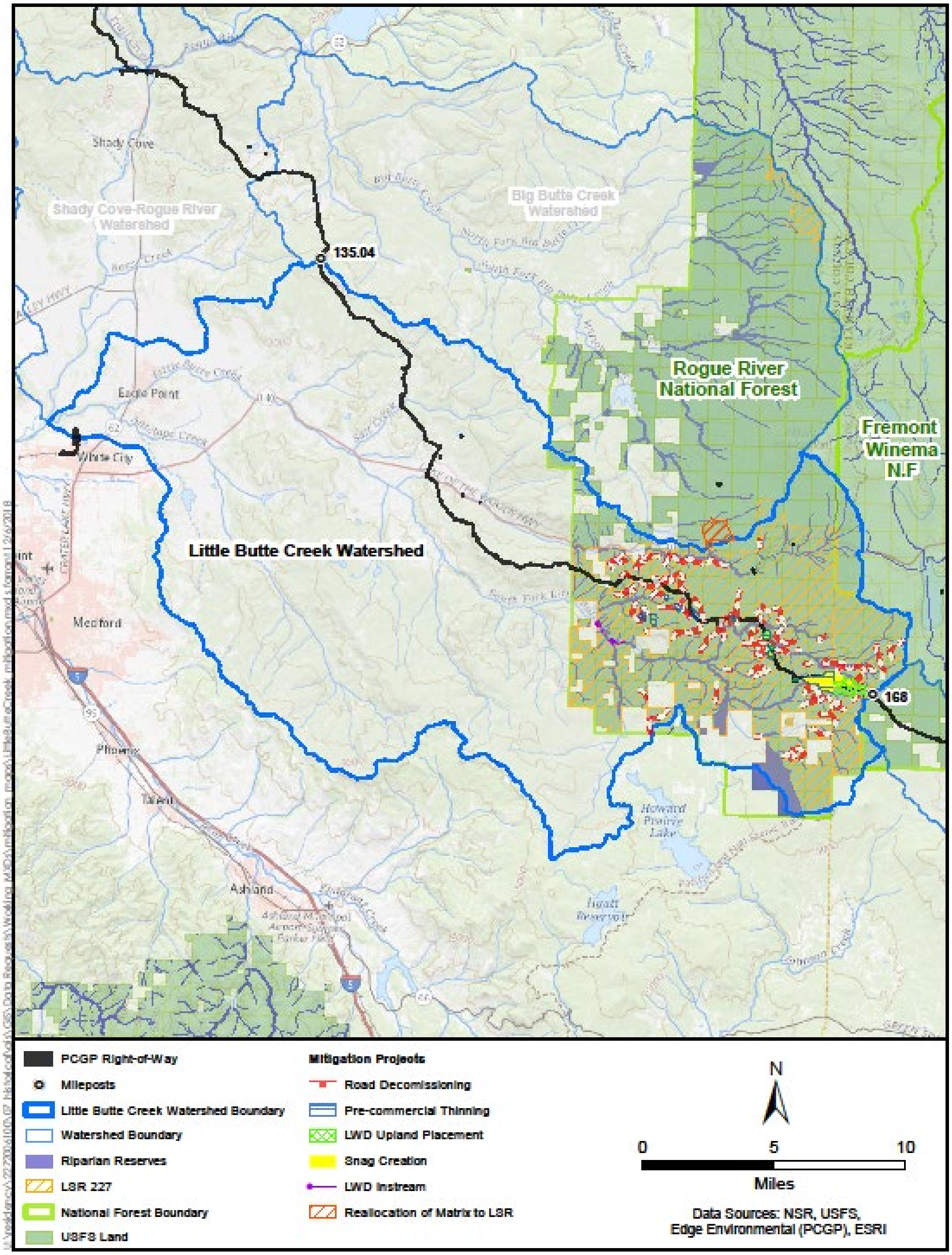
TABLE 2.2.1-2

Mitigation Projects to Address LRMP Objectives on the Rogue River NF

Unit	Watershed	Mitigation Group	Project Type	Project Name	Quantity a/	Unit
Rogue River NF	Little Butte Creek	Aquatic and Riparian Habitat	LWD In-stream	South Fork Little Butte Creek. LWD	1.5	mile
		Aquatic and Riparian Habitat	Stream Crossing Repair	Little Butte Creek Stream Crossing Decommissioning	32	sites
		Road sediment reduction	Road Decommissioning	Little Butte Creek Road Decommissioning	57.5	miles
		Stand Density Fuel Break	Pre-commercial Thinning	Little Butte Creek LSR Pre-commercial Thin	618	acres
		Terrestrial Habitat Improvement	Habitat Planting	Little Butte Creek Mardon Skipper Butterfly	20	acres
		Terrestrial Habitat Improvement	LWD Upland Placement	Little Butte Creek LSR LWD Placement	511	acres
		Terrestrial Habitat Improvement	Snag Creation	Little Butte Creek LSR Snag Creation	622	acres
		Reallocation of Matrix Lands to LSR	Land Reallocation from Matrix to LSR	LRMP Amendment RRNF 7, LSR 227 Reallocation	25	acres
	Big Butte Creek	Reallocation of Matrix Lands to LSR	Land Reallocation from Matrix to LSR	LRMP Amendment RRNF 7, LSR 227 Reallocation	497	acres

a/ Acres are rounded to the nearest whole acre and miles to the nearest tenth of a mile.

Figure 2.2-1. Map of CMP Projects in the Little Butte Creek Watershed on the Rogue River NF[8]



[8] The reallocation of matrix to LSR in the Big Butte Watershed is also shown on this map.

TABLE 2.2.1-3 **Summary of Rogue River NF Mitigation Projects by Mitigation Group and Project Type**				
Mitigation Group	**Project Type**	**Amount**	**Rationale**	**Environmental Consequences**
Aquatic and Riparian Habitat	Large Woody Debris In-stream	1.5 Miles	Placement of LWD in streams adds structural complexity to aquatic systems by creating pools and riffles, trapping fine sediments and can contribute to reductions in stream temperatures over time (Tippery et al. 2010). This is responsive to Aquatic Conservation Strategy (ACS) objectives 2, 3, 4, and 5.	**Short-term adverse effects**: LWD in-stream refers to logs (typically greater than 20 inches in diameter), limbs, or root wads that intrude into a stream channel. Placing this material in-stream can be accomplished with ground equipment such as excavators and/or helicopters. These activities have the potential to increase suspended sediment in streams and impact riparian vegetation as a result of heavy equipment use or the dragging of materials (e.g. logs) in the stream channel. Short-term impacts to water quality would occur in the form of suspended sediment and turbidity increases during in-stream implementation. However, no lasting measureable effect to water quality would occur as any sediment plume created, would quickly dissipate as soon as in-stream activities stop. In-stream work is done during summer low flow periods when turbidity plumes are an infrequently occurring event. Project design features (PDF) would include Best Management Practices (BMP) that would prevent any indirect effects to salmonids and other stream fish from project related sediment. The placement of LWD materials in the stream by using cable systems, excavators, or helicopters would create noise that could disturb NSO. The PDFs would focus disturbance outside the critical nesting period and beyond critical distances for NSO. These PDFs would reduce impacts from noise to acceptable levels. **Long-term beneficial effects:** Placing LWD in streams affects channel morphology, the routing and storage of water and sediment, and provides structure and complexity to stream systems. Complex pools and side channels created by instream wood provide overwintering habitat to stream salmonids and other aquatic organisms (Solazzi et. al. 2000). They also provide cover from predators during summer low flow periods when predation is at its highest. Providing more stream channel structure results in better over wintering habitat, improved summer pool habitat, and more abundant spawning gravels.
Aquatic and Riparian Habitat	Stream Crossing Repair	32 Sites	Restoring stream crossings reconnects aquatic habitats by allowing the passage of aquatic biota and restoring riparian vegetation. Over time, these actions reduce sediment and restore shade. Restoration of these crossings includes riparian planting as a mitigation which will help offset the impact of shade removal at pipeline R/W crossings.	**Short-term adverse effects:** Removing old culverts and restoring stream/road crossings would result in short-term adverse effects similar to the effects described for LWD above since both involve the use of heavy equipment in and around the stream channel. Similarly the work would be done during low summer flow periods to minimize impacts to aquatic species and PDFs would be designed to minimize disturbance for Northern Spotted Owl (NSO). **Long-term beneficial effects:** Stream crossing replacement would directly improve stream connectivity and habitat for aquatic species by immediately restoring access to formerly inaccessible habitats. Indirectly, these projects would reduce potential sediment levels in the long term by decreasing the potential for road failure. Stream crossing projects also reduce stream velocities by increasing stream crossing sizes, eliminating flow restrictions and allowing passage to additional reaches of habitat by removing barriers to aquatic species which improves access to spawning and rearing habitat and allows unrestricted movement throughout stream reaches during seasonal changes in water levels (Hoffman 2007).
Road Sediment Reduction	Road Decommissioning	57.5 Miles	Road closure reduces fine grained sediments by eliminating traffic impacts. Decommissioning roads can substantially reduce sediment delivery to streams (Madej 2000; Keppeler et al. 2007). Proposed road decommissioning would increase infiltration of precipitation, reduce surface runoff, and reduce sediment production from road-related surface erosion in the watershed where the impacts from the Project occur.	**Short-term adverse effects:** Road decommissioning methods generally include actions utilizing mechanized construction equipment to physically stabilize the road prism, restore natural drainage patterns, and allow for revegetation of the roadbed. Mechanized construction equipment might include excavators, backhoes and truck mounted loaders. Road closure is a method of preventing access to a road so that regular maintenance is no longer needed and future erosion is largely prevented by restoring drainage patterns if necessary and eliminating road traffic. Road decommissioning has the potential to cause short-term degradation of water quality by increasing sediment delivery to streams as roads are de-compacted by heavy equipment, culverts and cross

TABLE 2.2.1-3 **Summary of Rogue River NF Mitigation Projects by Mitigation Group and Project Type**				
Mitigation Group	**Project Type**	**Amount**	**Rationale**	**Environmental Consequences**
				drains are removed, and other restoration activities are implemented. The use of heavy mechanized equipment near streams could disturb the stream influence zone, deliver sediment, create turbidity, and cause stream bank erosion. There is also the potential of an accidental fuel/oil spill. These projects may cause a short-term degradation of water quality due to sediment input and chemical contamination. Stream bank condition and habitat substrate may also be adversely affected in the short term. However with careful project design and seasonal timing, these affects are expected to be of a limited extent and duration. Road decommissioning would create noise from heavy equipment that could disturb NSO. The potential for disturbance is mainly associated with breeding behavior at active nest sites. The PDFs would focus disturbance outside the critical nesting period and beyond critical distances for NSO. These PDFs would reduce impacts from noise to acceptable levels. **Long-term beneficial effects**: Proposed road decommissioning would increase infiltration of precipitation, reduce surface runoff, and reduce sediment production from road-related surface erosion in the watershed where the impacts from the Project would occur. Decommissioning roads would restore natural drainage patterns and thereby avoid large volumes of added sediment to the stream network that would be likely to eventually occur. In addition limited road maintenance dollars could be focused on the remaining road systems resulting in more maintenance of culverts and ditchlines resulting in less potential for catastrophic failure. Madej (2000) concluded that by eliminating the risk of stream diversions and culvert failures, road removal treatments significantly reduce long-term sediment production from retired logging roads.
Stand Density Management	Pre-commercial Thinning LSR	618 Acres	There will be direct impacts to existing interior, developing interior habitat. The project will result in additional fragmentation and preclude the recovery of fragmented habitat for those stands adjacent to the pipeline corridor. Both mature stands and developing stands will be removed during pipeline construction. Density management of forested stands will assist in the recovery of late-seral habitat, impact from fragmentation, reduction in edge effects and enhance resilience of mature stands. Accelerating development of mature forest characteristics will shorten the impacts of those biological services loss due to pipeline construction. Thinning of young stands is a recognized treatment within LRSs if designed to accelerate development of late-successional habitat characteristics.	**Short-term adverse effects:** Pre-commercial stand density management activities include the use of chain saws for cutting forest vegetation. Stand treatments would not be expected to adversely affect nesting habitat for the NSO since the treatments would not remove constituent elements of their nesting habitat. The proposed treatments could temporarily impact acres of dispersal habitat. This habitat would be impacted by reduction of canopy cover. The potential for disturbance is mainly associated with breeding behavior at active nest sites. The PDFs would focus disturbance outside the critical nesting period and beyond critical distances for NSO. These PDFs would reduce impacts from noise to acceptable levels. **Long-term beneficial effects:** By creating less dense stands with less tree competition, residual trees would benefit from the increased availability of sunlight, nutrients, and water. With the increase of available nutrients, trees should be more vigorous and less susceptible to large scale insect/disease outbreaks. The proposed treatments would enhance LSOG habitat by increasing the growth, health, and vigor of the trees remaining in the stands; restoring stand density, species diversity, and structural diversity to those considered characteristic under a natural disturbance regime.
Terrestrial Habitat Improvement	LWD Upland Placement LSR	511 Acres	The objective is to mitigate for the loss of recruitment of large down wood to adjacent stands and within the construction clearing zone. The project will forgo the development of large down wood for the life of the project and for decades after. Downed wood is a critical component of mature forest ecosystems. Large wood replacement will partially mitigate for the barrier effect of the corridor by creating structure across the corridor for use by small wildlife species. Placement in wood deficient areas adjacent to the corridor allows for scattering of stockpiled wood, reducing localized fuel loads while improving	**Short-term adverse effects:** Placement of LWD within and adjacent to the pipeline corridor would typically be done with heavy equipment that would drag the material into place. Heavy equipment use would increase the amount of detrimental soil damage within the treatment areas. By maintaining proper amounts of protective groundcover along with appropriate BMPs and PDFs, the risk of erosion, sediment delivery, and detrimental soil damage within the treatment areas is expected to be minimal and within LMP standards and guidelines. LWD placement would create noise from heavy equipment that could disturb the NSO. The potential for disturbance is mainly associated with breeding behavior at active nest sites. The PDFs would focus disturbance outside

TABLE 2.2.1-3

Summary of Rogue River NF Mitigation Projects by Mitigation Group and Project Type

Mitigation Group	Project Type	Amount	Rationale	Environmental Consequences
			habitat in deficient stands. Larger logs maintain moisture longer and are less likely to be fully consumed by fire. Managing for the proposed levels provide for a greater assurance of species abundance.	the critical nesting period and beyond critical distances for NSO. These PDFs would reduce impacts from noise to acceptable levels. **Long-term beneficial effects:** Beneficial effects include improving habitat for late-successional and other species and providing for long-term soil productivity.
Terrestrial Habitat Improvement	Snag Creation	622 Acres	Objective is to mitigate immediate and future impacts to snag habitat from the clearing of the pipeline right-of-way. The project prevents development of large snags during the life of the project and for decades after. Corridor construction will result in loss of snag habitat. As snags are a critical component of spotted owl habitat, replacement is needed. Replacement would be immediate though there would be a 10 year delay as snag decay develops.	**Short-term adverse effects:** Snag creation typically employs the use of chainsaws or inoculum to kill live trees. As such there is little if any ground disturbance and only minimal noise disturbance. The potential for noise disturbance is mainly associated with breeding behavior at active NSO nest sites. The PDFs would focus disturbance outside the critical nesting period and beyond critical distances for NSO. These PDFs would reduce impacts from noise to acceptable levels. Any adverse environmental impacts would be de minimus and very short term. **Long-term beneficial effects**: Beneficial impacts include the improvement of habitat for snag dependent species and in particular those species dependent on LSOG forests. Long-term benefits would also accrue as the created snags decay over time and eventually provide for LWD on the forest floor improving habitat for many other species and contributing to long-term soil productivity.
Terrestrial Habitat Improvement	Habitat Planting	20 Acres	The Dead Indian Plateau region is one of four known sites for Mardon Skipper butterflies in the world. It is also adjacent to a known site for Short-horned Grasshoppers. Both species are on the Regional Forester's Sensitive Species list. As a long-term opening, the pipeline corridor would provide a unique opportunity to develop habitat for these two species. Planting the corridor with plants preferred by these species has the potential to increase the habitat and local range for both species. This action would provide both short-term and long-term habitat for the local population of Mardon skipper butterflies and short-horned grasshoppers.	**Short-term adverse effects:** This activity would take place within the Pacific Connector pipeline corridor and would not result in any additional adverse impacts. **Long-term beneficial effects**: Beneficial impacts include helping to re-vegetate and stabilize the pipeline corridor and improving habitat for listed or sensitive insect species.
Reallocation of Matrix Lands to LSR	Reallocation of Matrix to LSR	522 Acres	This mitigation group contributes to the "neutral to beneficial" standard for new developments in LSRs by adding acres to the LSR land allocation to offset the long-term loss of habitat due to the construction and operation of the pipeline project. It compensates for the removal of suitable nesting, roosting, and foraging NSO habitat by adding additional LSOG acres to the LSR land allocation. Reallocation of matrix lands to LSR also contributes to ACS objectives and may benefit Survey and Manage species by providing additional habitat that is managed to create LSOG stand conditions over time.	**Short-term adverse effects:** The reallocation of matrix lands to LSR is an administrative action that would not have any immediate environmental consequences on the ground. **Long-term beneficial effects:** The proposed reallocation would change the management direction of approximately 522 acres from one of multiple uses with an emphasis on timber management to a management emphasis focusing on the creation and maintenance of late-successional forest habitat. Over time, this reallocation would benefit species dependent on late-successional forests through management actions that would be designed to improve or maintain late-successional habitat conditions.

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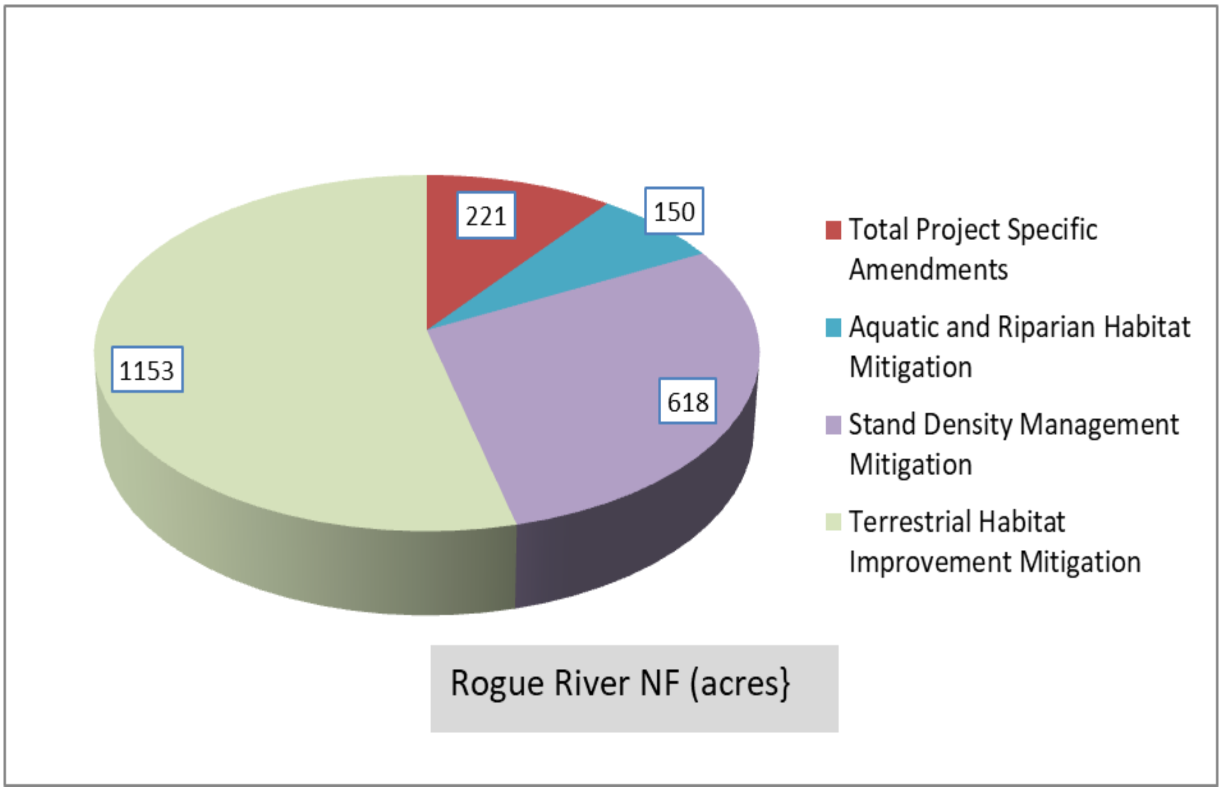
TABLE 2.2.1-4

Comparison of Total Acres of Proposed Project-Specific Amendments and Compensatory Mitigation on the Rogue River NF

Amendments and Compensatory Mitigation	Acres
Total Project Specific Amendments[1]	221
Aquatic and Riparian Habitat Mitigation[2]	150
Stand Density Management and Fuel Break Mitigation	618
Terrestrial Habitat Improvement Mitigation	1153

Data Source: USFS GIS Data Layers
1) Includes amendments FS-1, URRNF-2, RRNF-3 RRNF-4, RRNF-5 and RRNF-6
2) Includes road sediment reduction actions and assumes a 20 foot wide treatment area

Figure 2.2-2. Comparison of Total Acres of Proposed Project-Specific Amendments and Compensatory Mitigation on the Rogue River NF



2.3 WINEMA NF

There are six proposed forest plan amendments for the Pacific Connector pipeline project on the Winema NF. An evaluation of how the proposed amendments relate to the planning requirements in 36 CFR 219.8 – 219.11 is discussed in section 2.3.1 below. These proposed amendments are summarized in table 2.3.1-1 along with the project impacts and related project design features (PDF) and compensatory mitigation. The proposed CMP projects are listed in table 2.3.1-2 and evaluated in table 2.3.1-3, table 2.3.1-4, and figure 2.3-2 below. A map of the proposed CMP projects by watershed is displayed in figure 2.3-1.

2.3.1 Evaluation of Winema NF Proposed Forest Plan Amendments

The proposed Pacific Connector pipeline incorporates the most up-to-date engineering and technological practices for pipeline construction and operation. However, even with following these practices, it has been determined that one Forest Plan standard associated with rare and/or isolated species (Survey and Manage), two Forest Plan standards associated with the soil, water, and riparian resources, and three Forest Plan standards associated with visual resources would need to be modified so that the proposed construction and operation of the Pacific Connector pipeline can be in compliance with the Winema NF LRMP as amended by the NWFP and the January 2001 Survey and Manage ROD.

2.3.1.1 Forest Plan Amendments Related to Rare Aquatic and Terrestrial Plant and Animal Communities (FS-1):

Amendment FS-1: Project-Specific Amendment to Exempt Management Recommendations for Survey and Manage Species on the Winema NF.

One Forest Plan standard associated with rare and/or isolated species (Survey and Manage) would need to be modified so that the proposed construction and operation of the Pacific Connector pipeline can be in compliance with the Winema NF LRMP as amended by the NWFP and the January 2001 Survey and Manage ROD. This standard is:

- Management Direction: Manage All Known Sites (Survey and Manage ROD, Standards and Guidelines Page 8). Current and future known sites will be managed according to the Management Recommendation for the species. Professional judgment, Appendix J2 in the Northwest Forest Plan Final SEIS, and appropriate literature will be used to guide individual site management for those species that do not have Management Recommendations.

The proposed amendment to this standard is:

- Management Direction: Manage All Known Sites (Survey and Manage ROD, Standards and Guidelines Page 8). Current and future known sites will be managed according to the Management Recommendation for the species, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Professional judgment, Appendix J2 in the Northwest Forest Plan Final SEIS, and appropriate literature will be used to guide individual site management for those species that do not have Management Recommendations. (Proposed amendment FS-1 on the Winema NF)

While the amendment would provide an exception to meeting this standard, there would also be requirements to do what is appropriate, applicable and feasible to minimize, maintain or restore any effects of the pipeline's construction and operation on Survey and Manage species within the area affected by the pipeline. Consequently, each amended standard includes the requirement that the "applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented".

The purpose of this project-level amendment is to make the proposed Pacific Connector pipeline project consistent with the Winema NF LRMP. Thus, the substantive planning rule requirements that are directly related to this amendment are:

- 36 CFR 219.9(a)(2)(ii) – [the plan must include plan components to maintain or restore] "Rare aquatic and terrestrial plant and animal communities."
- 36 CFR 219.9(b)(1) – "The responsible official shall determine whether or not the plan components required by paragraph (a) provide ecological conditions necessary to: …maintain viable populations of each species of conservation concern within the plan area."

Because the proposed amendment is "directly related" to these two substantive requirements, the Responsible Official must apply the requirements within the scope and scale of the proposed amendment (36 CFR 219.13 (b)(5)).

In considering the "scope and scale" of the amendment, it is important to recognize that the applicable sections of 36 CFR 219.9(a) and (b) that are described above, requires plan components to maintain or restore rare aquatic and terrestrial plant and animal communities, across the entire planning area (i.e., the Winema NF). This plan amendment does not alter these LRMP plan requirements for managing rare plant and animal communities across 99.99% of the Winema NF. The proposed pipeline construction corridor including the TEWAs and the UCSAs is approximately 92 acres of the 1,043,547 acre Winema NF. Within this 92 acre construction corridor surveys have identified 45 Survey and Manage sites that could be potentially impacted by construction activities. The proposed amendment does not waive the persistence objective for Survey and Manage species. The analysis that was conducted (see section 4.6.4.3 of the DEIS and Appendix F.5) determined the Survey and Manage persistence objectives would be met. This means that for Winema NF lands within the project area, individual sites of Survey and Manage species may be impacted or lost to construction activities, but affected species are expected to persist within the range of the NSO despite the loss of these individual sites.

The amendment modifies this standard so that in the 92 acres of the project construction area the project need not be in compliance with this standard' specific requirements but instead, it is the "applicable mitigation measures identified in the POD and the Pacific Connector Project design requirements" that must be implemented. Or stated in another way, for the 92 acres of National Forest lands that would be within the operational right-of-way and construction zone for the Pacific Connector Pipeline, the management requirement described above would be replaced with the full set of management requirements that comprise the "applicable mitigation measures identified in the POD and Pacific Connector Project Design requirements". The inclusion of these management requirements as a part of the plan component language for the LRMP in this plan amendment, addresses the applicable 36 CFR 219.9(a) and (b) rule requirements within the "scope and scale" of the proposed plan amendments. The sections below describe in more detail how the applicable 36 CFR 219.9(a) and (b) requirements are being addressed.

How the Required Mitigation Measures would Maintain or Restore Effects to Rare Aquatic and Terrestrial Plant and Animal Communities and Meet the Applicable 36 CFR 219.9(a) and 36 CFR 219.9 (b) Requirements

The Forest Service has worked to inventory, analyze, and evaluate rare aquatic, terrestrial plant and animal communities that could be affected by this project. In addition, a third-party consultant for technical support was also utilized in reviewing the information gathered for the project. The POD is a document developed between the FS, BLM, FERC, and PCGP that contains the design features, mitigation measures, roles and responsibilities, monitoring, and procedures for the construction and operation of the pipeline on NFS lands. In addition, FERC's applicant prepared Plan and Procedures for construction and restoration enforceable, where applicable, for additional design features and mitigation. The design requirements and mitigation measures of the POD would be required by the modified standards and incorporated into BLM's ROW grant.

The mitigation measures incorporated into amendments for Survey and Manage species are designed to minimize, maintain or restore the potential for habitat fragmentation, edge effects, and loss of long-term habitats associated with effected species. To ensure adequate restoration and revegetation of the ROW, design features are identified in the *Erosion Control and Revegetation Plan* (POD I), *Right-of-Way Clearing Plan* (POD U), *Leave Tree Protection Plan* (POD P). In addition, routing considerations were identified during project development to ensure avoidance of known populations of rare plant and animal communities (See Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands, as well as, Appendix F.5, *Survey and Manage Persistence Evaluations*).

As a basis for Survey and Manage determinations, Appendix F.5 provides background research on Survey and Manage species that could be affected by the PCGP Project; a review of survey reports prepared by others for the PCGP Project; and processing and analysis of spatial data obtained from the Bureau of Land Management (BLM), Forest Service, and other sources over the past 12 years. Background information was used in combination with new information available as a result of surveys for the PCGP Project and recent surveys in other portions of old growth forests to discuss the currently known distribution of the species in old growth forests within the NSO range. Impacts to sites as a result of the PCGP Project were analyzed to determine if the species would continue to have a reasonable assurance of persistence in the NSO range following implementation of the PCGP Project, taking into consideration the status and distribution of the species and general habitat in the NSO range.

Some of the required mitigation measures in the POD sections to protect rare plant and animal communities include: flagging existing snags on the edges of the construction right-of-way or TEWAs where feasible to save from clearing; snags would be saved as and used in LWD placement post-construction to benefit primary and secondary cavity nesting birds, mammals, reptiles, and amphibians; other large diameter trees on the edges of the construction right-of-way and TEWAs would also be flagged to save/protect as green recruitment or habitat/shade trees, where feasible; trees would be girdled to create snags to augment the number of snags along the right-of-way to benefit cavity nesting birds, mammals, reptiles, and amphibians. See POD's P & U and 4.7—*Land Use* of the DEIS for a complete list of applicable mitigation measures for pipeline construction. Additional measures include low ground weight (pressure) vehicles would be used; logging machinery would be restricted to the 30-foot permanent right-of-way wherever possible to prevent soil compaction; the removal of soil duff layers would be avoided in order to maintain a cushion between the soil and the logs and the logging equipment; designed skid trails would be used to restrict detrimental soil disturbance (compaction and displacement) to a smaller area of the right-of-way over the pipeline trenching area; and the temporary construction area would be restored and revegetated using native seeds, to the extent possible, and saplings (POD I).

In an effort to minimize, maintain or restore the impacts to Survey and Manage species, PCGP adopted route variations to avoid certain species identified in the Survey and Manage Persistence Evaluations by co-locating the proposed construction corridor adjacent to existing roads, through managed timber stands or otherwise avoid unique LSOG habitats to the maximum extent practicable (See Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands).

During construction of the Project, Compliance Monitors representing FERC are present on a full-time basis to inspect construction procedures and mitigation measures and provide regular feedback on compliance issues to FERC and the Forest Service. Objectives of the Compliance Monitoring program are to facilitate the timely resolution of compliance issues in the field; provide continuous information to FERC regarding noncompliance issues and their resolution; and review, process, and track construction-related variance requests. Changes to previously approved mitigation measures, construction procedures, and construction work areas due to unforeseen or unavoidable site conditions would require various levels of regulatory approval from the applicable land management agencies. FERC would have the authority to stop any activity that violates an environmental condition of the FERC authorization issued to PCGP.

Additionally, environmental compliance oversight responsibilities for PCGP, FERC, FS and BLM are described in the POD (Environmental Briefings and Compliance Plan, POD G) that would apply to the construction, operation, and maintenance of the project specifically on NFS lands. The FS Authorized Officer would coordinate with the BLM in administering and enforcing ROW grant provisions and would have stop-work authority. The FS Authorized Officer's designated representatives would ensure that the stipulations and mitigation measures included in the POD that are designed to minimize, maintain or restore the effects to soil, water and riparian resources, are adhered to during project construction, operation, and maintenance. The BLM Authorized Officer would coordinate with the FS to ensure the work is being conducted in accordance with the ROW grant and agreed upon conditions. BLM and the FS would have stop-work authority. Field variance requests would be coordinated with the Authorized Officers.

How the Compensatory Mitigation Actions would help to Maintain or Restore Rare Aquatic and Terrestrial Plant and Animal Communities in the Plan Area (36 CFR 219.9(a), 36 CFR 219.9 (b)).

The CMP on the Winema NF includes proposals to improve aquatic and riparian habitat that would benefit rare aquatic plant and animal communities (see the discussion of *How the Compensatory Mitigation Actions would help to Maintain or Restore the Ecological Integrity of The Soils and Soil Productivity, including guidance to reduce soil erosion and sedimentation in the Plan Area (36 CFR 219.8(a)(2)(ii))* below for a discussion of benefits to aquatic habitats). The CMP also includes proposals to decommission approximately 29.2 miles of road.

Although the Pacific Connector project has been routed to avoid LSOG habitat as much as possible and is aligned along existing roads, the project would still cause some habitat fragmentation. Road decommissioning reduces the edge effects over time by revegetating road surfaces and eliminating road corridors. Revegetating selected roads could create larger blocks of late successional habitat in the future.

These projects have been designed by an interdisciplinary team of resource professionals on the Winema NF with input and coordination with the U.S. Fish and Wildlife Service, NOAA Fisheries, and State agencies. They were planned within the watersheds that would be affected by the Pacific Connector pipeline project. They are a component of the PCGP application and would be a requirement of the Right-of-Way grant. Overall, these projects would help maintain and restore rare aquatic and terrestrial plant and animal communities on the Winema NF (see tables 2.3.1-3 and 2.3.1-4 and figures 2.3-1 and 2.3-2 for additional information).

2.3.1.2 Forest Plan Amendments Related to Soil, Water and Riparian Areas (WNF -4, WNF-5):

Two Forest Plan standards associated with the soil, water, and riparian resources would need to be modified so that the proposed construction and operation of the Pacific Connector pipeline can be in compliance with the Winema NF LRMP. These standards are:

- Detrimental Soils Conditions, Standard and guideline 12-5, (WNF LRMP, 4-73). The cumulative effects of detrimental soil conditions should not exceed 20 percent of the total acreage within the activity area: any reason for exceeding the limitation shall be documented in an environmental assessment. Detrimental soil conditions include compaction, displacement, puddling, and moderately or severely burned soil from all activities (including roads, skid trails, and landings). Sites where the standards for displacement, puddling, and compaction are not currently met will require rehabilitation such as ripping, backblading, or fertilization. The potential for creating detrimental soil conditions will be specifically addressed through project environmental analyses. If needed, alternative management practices will be developed, and mitigating measures will be planned and implemented.
- Soil and Water, Standard & Guideline 3 (WNF LRMP 4-137). The cumulative total area of detrimental soil conditions in riparian areas shall not exceed 10 percent of the total riparian acreage within an activity area. Detrimental soil conditions include compaction, displacement, puddling, and moderately or severely burned soil.

The proposed amendments to these standards are:

- Detrimental Soils Conditions, Standard and guideline 12-5, (WNF LRMP, 4-73). The cumulative effects of detrimental soil conditions should not exceed 20 percent of the total acreage within the activity area: any reason for exceeding the limitation shall be documented in an environmental assessment, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented**. Detrimental soil conditions include compaction, displacement, puddling, and moderately or severely burned soil from all activities (including roads, skid trails, and landings). Sites where the standards for displacement, puddling, and compaction are not currently met will require rehabilitation such as ripping, backblading, or fertilization. The potential for creating detrimental soil conditions will be specifically addressed through project environmental analyses. If needed, alternative management practices will be developed, and mitigating measures will be planned and implemented. (Proposed amendment WNF-4)

- Soil and Water, Standard & Guideline 3 (WNF LRMP 4-137). The cumulative total area of detrimental soil conditions in riparian areas shall not exceed 10 percent of the total riparian acreage within an activity area, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Permanent recreation facilities or other permanent facilities are exempt. (Proposed amendment WNF-5)

While the amendments would provide an exception to meeting these standards, there would also be requirements to do what is appropriate, applicable and feasible to minimize, maintain or restore any effects of the pipeline's construction and operation on the soil, water and riparian resources within the area affected by the pipeline. Consequently, each amended standard includes the requirement that the "applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented".

The purpose of these two project-level amendments is to make the proposed Pacific Connector pipeline project consistent with the Winema NF LRMP. Thus, the substantive planning rule requirements that are directly related to these two amendments are:

- 36 CFR 219.8(a)(2)(ii) – [The plan must include plan components to maintain or restore] "soils and soil productivity, including guidance to reduce soil erosion and sedimentation."

Because the two proposed amendments are "directly related" to this substantive requirement, the Responsible Official must apply the requirements within the scope and scale of the proposed amendments (36 CFR 219.13 (b)(5)).

In considering the "scope and scale" of the two amendments, it is important to recognize that the applicable sections of 36 CFR 219.8(a) that are described above, requires plan components to "maintain or restore" the soil resources across the entire planning area (i.e., the Winema NF). These plan amendments do not alter these LRMP plan requirements for managing the soil resources across 99.99% of the Winema NF. The proposed pipeline construction corridor including the TEWAs and the UCSAs is approximately 92 acres of the 1,043,547 acre Winema NF. Of the 92 acres of pipeline corridor construction it is estimated that approximately 27 to 62 acres would not meet standards for soils described above.

The amendment modifies 2 standards so that in the 92 acres of the project construction area the project need not be in compliance with these standards' specific requirements but instead, it is the "applicable mitigation measures identified in the POD and the Pacific Connector Project design requirements" that must be implemented. Or stated in another way, for the 92 acres of National Forest lands that would be within the operational right-of-way and construction zone for the Pacific Connector Pipeline, the two management requirements described above would be replaced with the full set of management requirements that comprise the "applicable mitigation measures identified in the POD and Pacific Connector Project Design requirements". The inclusion of these management requirements as a part of the plan component language for the LRMP in this plan amendment, addresses the applicable 36 CFR 219.8(a) rule requirements within the "scope and scale" of these proposed plan amendments. The sections below describe in more detail how the applicable 36 CFR 219.8(a) requirements are being addressed.

How the Required Mitigation Measures would Maintain or Restore Effects to Soil, Water, and Riparian Resources and Meet the Applicable 36 CFR 219.8(a) Requirements.

The Forest Service has worked with Pacific Connector Gas Pipeline (PCGP) to inventory, analyze, and evaluate the geologic, soil, and hydrologic resources that could be affected by this project. In addition, a third-party consultant for technical support was also utilized in reviewing the information gathered for the project. The POD is a document developed between the FS, BLM, FERC, and PCGP that contains the design features, mitigation measures, roles and responsibilities, monitoring, and procedures for the construction and operation of the pipeline on NFS lands. In addition, FERC's applicant prepared Plan and Procedures for construction and restoration are enforceable, where applicable, for additional design features and mitigation. The design requirements and mitigation measures of the POD would be required by the modified standards and incorporated into BLM's ROW grant.

The mitigation measures, incorporated into amendments for soil, water, and riparian resources are designed to minimize, maintain or restore the potential for soil movement, slope stability, water quality, and to ensure adequate restoration and revegetation. These measures are identified in: the *Erosion Control and Revegetation Plan* (POD I); *Right-of-Way Clearing Plan* (POD U); *Wetland and Waterbody Crossing Plan* (POD BB); the *Forest Service Site Specific Stream Crossing Prescriptions* (NSR 2014); the *Stream Crossing Risk Analysis*; and *Stream Crossing Risk Analysis Addendum* (GeoEngineers2017d, 2018a). PCGP would also follow the FERC's applicant prepared Wetland Procedures and the Best Management Practices for the State of Oregon. To further reduce potential for landslides on steep slopes, the Forest Service, BLM, and FERC are also recommending additional industry best management practices and measures identified from the *Technical Report on Soil Risk and Sensitivity Assessment* (NSR 2014) be incorporated into PCGP's terms and conditions of the Right-of-Way Grant as described in the POD's identified above. See 4.2.3.3 of the DEIS for a description of soil risk and sensitivity assessment.

Areas with soils rated moderate to very high for risk or sensitivity (28 acres total) would be recommended for more site-specific validation of the risk criteria used in the *Technical Report on Soil Risk and Sensitivity Assessment* (NSR 2014) to confirm that specific locations merit consideration of the more aggressive soil remediation measures, such as: a 2- to 3-inch organic mulch surface application (80 percent coverage) of woodchips, logging slash, and/or straw; adaptive seed mixes and vegetation to better fit site conditions; deep subsoil decompaction with hydraulic excavators that leave constructed corridor mounded and rough with maximum water infiltration so that water cannot flow downhill for any appreciable distance; more aggressive use of constructed surface water runoff dispersion structures such as closely placed and more pronounced slope dips and water bars, etc.; more aggressive use of constructed surface runoff entrapments such as silt fencing, sediment settling basins, or straw bale structures, etc.; more aggressive placement (100 percent coverage) and depth (3 to 4 inches) of ground cover using woodchips, logging slash, straw bales, wattles (see POD's U and I). In efforts to protect soil productivity, topsoil segregation would be required for pipeline construction at wetland and waterbody crossings on NFS lands (POD U).

Some of the required mitigation measures in the POD BB and *Forest Service Site Specific Stream Crossing Prescriptions* (NSR 2014) to protect wetlands and minimize, maintain or restore compaction include: limiting the construction right-of-way width to 75 feet through wetlands; placing equipment on mats; using low-pressure ground equipment; limiting equipment operation and construction traffic along the right-of-way; locating temporary workspace (TEWAS) more than 50 feet away from wetland boundaries; cutting vegetation at ground level; limiting stump removal to the construction trench; segregating the top 12 inches of soil, or to the depth of the topsoil horizon; using “push-pull” techniques in saturated wetlands; limiting the amount of time that the trench is open by not trenching until the pipe is assembled and ready for installation; not using imported rock and soils for backfill; and not using fertilizer, lime, or mulch during restoration in wetlands. PCGP must also follow the FERC Waterbody and Wetland Construction and Mitigation Procedures. See 4.3.3.2 of the DEIS for a complete list of applicable mitigation measures for pipeline construction at specific waterbody and stream crossings.

In an effort to minimize, maintain or restore the impacts to streams and riparian areas, PCGP adopted route variations to co-locate the proposed construction corridor adjacent to existing roads and along dry ridge tops (See Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands). In addition, PCGP has committed to limit construction at waterbody crossings to times of dry weather or low water flow. PCGP would implement the required erosion control measures at the proposed stream crossings to minimize, maintain or restore potential erosion and sedimentation impacts. The applicable mitigation measures and monitoring requirements in the POD relating to water waterbody crossings are included in the *Site Specific Forest Service Stream Crossing Prescriptions, and Wetland and Waterbody Crossing Plan* (POD BB). In addition, applicable mitigation measures from the FERC approved applicant prepared Procedures for Wetland and Waterbody Crossings would be required.

During construction of the Project, Compliance Monitors representing FERC are present on a full-time basis to inspect construction procedures and mitigation measures and provide regular feedback on compliance issues to FERC and the Forest Service. Objectives of the Compliance Monitoring program are to: facilitate the timely resolution of compliance issues in the field; provide continuous information to FERC regarding noncompliance issues and their resolution; and review, process, and track construction-related variance requests. Changes to previously approved mitigation measures, construction procedures, and construction work areas due to unforeseen or unavoidable site conditions would require various levels of regulatory approval from the applicable land management agencies. FERC would have the authority to stop any activity that violates an environmental condition of the FERC authorization issued to PCGP.

Additionally, environmental compliance oversight responsibilities for PCGP, FERC, FS and BLM are described in the POD (Environmental Briefings and Compliance Plan, POD G) that would apply to the construction, operation, and maintenance of the project specifically on NFS lands. The FS Authorized Officer would coordinate with the BLM in administering and enforcing ROW grant provisions and would have stop-work authority. The FS Authorized Officer’s designated representatives would ensure that the stipulations and mitigation measures included in the POD that are designed to minimize, maintain or restore the effects to soil, water and riparian resources, are adhered to during project construction, operation, and maintenance. The BLM Authorized Officer would coordinate with the FS to ensure the work is being conducted in accordance with the ROW grant and agreed upon conditions. BLM and the FS would have stop-work authority. Field variance requests would be coordinated with the Authorized Officers.

How the Compensatory Mitigation Actions would help to Maintain or Restore the Ecological Integrity of The Soils and Soil Productivity, including guidance to reduce soil erosion and sedimentation in the Plan Area (36 CFR 219.8(a)(2)(ii)).

Part of the CMP on the Winema NF includes proposals to place large woody debris in-stream for 1.0 miles, repair stream crossings at 25 sites, provide Riparian Planting for 0.5 miles, provide Riparian Fencing for 6.5 miles, and decommission approximately 29.2 miles of road.

Placement of LWD in streams adds structural complexity to aquatic systems by creating pools and riffles, trapping fine sediments and can contribute to reductions in stream temperatures over time (Tippery et al. 2010). Placing LWD in streams affects channel morphology, the routing and storage of water and sediment, and provides structure and complexity to stream systems. Complex pools and side channels created by instream wood provide overwintering habitat to stream salmonids and other aquatic organisms (Solazzi et. al. 2000). They also provide cover from predators during summer low flow periods when predation is at its highest. Providing more stream channel structure results in better over wintering habitat, improved summer pool habitat, and more abundant spawning gravels.

Riparian planting is proposed along Spencer Creek just upstream of Buck Lake. This is a meadow site that has lost streamside vegetation and has compacted soils. There is an overall need to restore health and vigor to riparian stands by maintaining and improving riparian reserve habitat. Shade provided by the plantings would contribute to moderating water temperatures in Spencer Creek. Root strength provided by new vegetation would increase bank stability, decrease erosion and sediment depositions to Spencer Creek and provide habitat for species that use riparian habitats. Riparian fencing would serve to divide the Buck Indian Allotment into pastures north and south at Clover Creek Road. This fence would keep cattle from grazing newly revegetated areas in the construction corridor, including areas where the corridor crosses Spencer Creek, thus helping to ensure that erosion control and revegetation objectives are met. It would also serve to separate anticipated increased cattle grazing of the construction corridor from the highway; greatly reducing a safety hazard for vehicles traveling the Clover Creek road.

Restoring stream crossings reconnects aquatic habitats by allowing the passage of aquatic biota and restoring riparian vegetation. Over time, these actions reduce sediment and restore shade. Restoration of these crossings includes riparian planting as a mitigation which would help offset the impact of shade removal at pipeline crossings. The proposed pipeline would cross Spencer Creek upstream of Buck Lake. It is occupied by redband trout. Spencer Creek has been identified by NMFS as habitat for federally listed Southern Oregon/Northern California Coast Coho salmon. Additionally, once fish passage is provided through the Klamath River hydro facilities, steelhead would re-colonize Spencer Creek. Improving habitat quality at Spencer Creek provides the opportunity to be pro-active in providing quality habitat for SONC Coho, mitigating for any detrimental effects to other SONC Coho habitats, while improving habitat for redband trout and other aquatic species. Spencer Creek appears on the Oregon DEQ 303(d) list as water quality impaired from increased sedimentation. Improvements at this location would immediately benefit all downstream aquatic habitats and the species associated with those habitats.

Decommissioning roads can substantially reduce sediment delivery to streams (Madej 2000; Keppeler et al. 2007). Proposed road decommissioning and stormproofing would increase infiltration of precipitation, reduce surface runoff, and reduce sediment production from road-related surface erosion in the watershed where the impacts from the Project would occur. Decommissioning roads would restore natural drainage patterns and thereby avoid large volumes of added sediment to the stream network that would be likely to eventually occur. In addition limited road maintenance dollars could be focused on the remaining road systems resulting in more maintenance of culverts and ditchlines resulting in less potential for catastrophic failure. Madej (2000) concluded that by eliminating the risk of stream diversions and culvert failures, road removal treatments significantly reduce long-term sediment production from retired logging roads.

These projects have been designed by an interdisciplinary team of resource professionals on the Winema NF with input and coordination with the U.S. Fish and Wildlife Service, NOAA Fisheries, and State agencies. These projects have been planned within the watersheds that would be affected by the Pacific Connector pipeline project. These projects have been proposed by the Applicant as part of their application and would be a requirement of the Right-of-Way grant. These projects would help maintain and restore soil resources including reducing soil erosion and sedimentation on the Winema NF (see tables 2.3.1-3 and 2.3.1-4 and figures 2.3-1 and 2.3-2 for additional information).

2.3.1.3 Forest Plan Amendments Related Visual Resources (WNF -1, WNF-2, WNF-3):

Three Forest Plan standards associated with visual resources would need to be modified so that the proposed construction and operation of the Pacific Connector pipeline can be in compliance with the Winema NF LRMP. These standards are:

- Management Area 3, Lands, Standard and Guideline (4), (WNF LRMP 4-103). This management area is an avoidance area for new transportation and utility corridors.
- Management Area 3A, Foreground Retention, Standard and Guideline Scenic (1), (WNF LRMP 4-103 and 104). Evidence of management activities from projects that produce slash (tree harvest) or charred bark (underburning) will not be noticeable one year after the work has been completed.
- Management 3B, Foreground Partial Retention, Standard and Guideline Scenic (1), (WNF LRMP, 4-107). Evidence of management activities from projects that produce slash (tree harvest) or charred bark (underburning) should not be noticeable from two to three years after the work has been completed.

The proposed amendments to these standards are:

- Management Area 3, Lands, Standard and Guideline (4), (WNF LRMP 4-103). This management area is an avoidance area for new transportation and utility corridors**, with the exception of the Pacific Connector Pipeline right-of-way. The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** (Proposed amendment WNF-1)
- Management Area 3A, Foreground Retention, Standard and Guideline Scenic (1), (WNF LRMP 4-103 and 104). Evidence of management activities from projects that produce slash (tree harvest) or charred bark (underburning) will not be noticeable one year after the work has been completed, **with the exception of the Pacific Connector Pipeline right-of-way which shall attain the VQO within 10 - 15 years after completion of the construction phase of the project where the pipeline crosses Management area 3A. The applicable**

mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented. (Proposed amendment WNF-2)

- Management 3B, Foreground Partial Retention, Standard and Guideline Scenic (1), (WNF LRMP, 4-107). Evidence of management activities from projects that produce slash (tree harvest) or charred bark (underburning) should not be noticeable from two to three years after the work has been completed, **with the exception of the Pacific Connector Pipeline right-of-way, which shall attain the VQO within 10 - 15 years after completion of the construction phase of the project where the pipeline crosses Management area 3B. The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** (proposed amendment WNF-3)

While the amendments would provide an exception to meeting these standards, there would also be requirements to do what is appropriate, applicable and feasible to minimize, maintain or restore any effects of the pipeline's construction and operation on the visual resources within the area affected by the pipeline. Consequently, each amended standard includes the requirement that the "applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented".

The purpose of these three project-level amendments is to make the proposed Pacific Connector pipeline project consistent with the Winema NF LRMP. Thus, the substantive planning rule requirements that are directly related to these three amendments are:

- 36 CFR 219.10(a)(1) – […the responsible official shall consider: …] "(1) Aesthetic values,… scenery,... viewsheds...".
- 36 CFR 219.10(b)(i) – [the responsible official shall consider] "Sustainable recreation; including recreation settings, opportunities,…and scenic character…"

Because the proposed amendments are "directly related" to these two substantive requirements, the Responsible Official must apply the requirements within the scope and scale of the proposed amendments (36 CFR 219.13 (b)(5)).

In considering the "scope and scale" of the three amendments, it is important to recognize that the applicable sections of 36 CFR 219.10 that are described above, requires plan components to provide for aesthetic values and scenic character across the entire planning area (i.e., Winema NF). These plan amendments do not alter these LRMP plan requirements for managing visual resources across 99.99% of the Winema NF. The proposed pipeline construction corridor including the TEWAs and the UCSAs is approximately 92 acres of the 1,043,547 acre Winema NF. Of the 92 acres of pipeline corridor construction it is estimated that approximately 70 of these acres would not meet the standards for visual resources described above.

The amendments modify three standards so that in the 92 acres of the project construction area the project need not be in compliance with these standards' specific requirements but instead, it is the "applicable mitigation measures identified in the POD and the Pacific Connector Project design requirements" that must be implemented. Or stated in another way, for the 92 acres of National Forest lands that would be within the operational right-of-way and construction zone for the Pacific Connector Pipeline, the three management requirements described above would be replaced with the full set of management requirements that comprise the "applicable mitigation measures identified in the POD and Pacific Connector Project Design requirements". The inclusion of these management requirements as a part of the plan component language for the LRMP in this plan amendment, addresses the applicable 36 CFR 219.10 rule requirements within the "scope and scale" of these proposed plan amendments. The sections below describe in more detail how the applicable 36 CFR 219.10 requirements are being addressed.

How the Required Mitigation Measures would Consider, Minimize, Maintain or Restore Effects to Aesthetic Values and Scenic Character and Meet the Applicable 36 CFR 219.10(a) and 36 CFR 219.10(b)Requirements.

The Forest Service has worked to inventory, analyze, and evaluate visual resources, view sheds, and aesthetics that could be affected by this project. Forest Service landscape architect provided technical support to FERC and Forest Service third-party contractors by reviewing the information gathered for the project. The POD is a document developed between the FS, BLM, FERC, and PCGP that contains the design features, mitigation measures, roles and responsibilities, monitoring, and procedures for the construction and operation of the pipeline on NFS lands. In addition, FERC's applicant prepared Plan and Procedures for construction and restoration enforceable, where applicable, for additional design features and mitigation. The design requirements and mitigation measures of the POD would be required by the modified standards and incorporated into BLM's ROW grant.

The mitigation measures incorporated into amendments for Visual Quality Objectives, are designed to minimize, maintain or restore the potential for long-term impacts to visually sensitive areas. To ensure adequate restoration and revegetation of the ROW, design features are identified in the *Erosion Control and Revegetation Plan* (POD I), *Right-of-Way Clearing Plan* (POD U), *Leave Tree Protection Plan* (POD P), *Aesthetics Management Plan* (POD A), and *Recreation Management Plan* (POD S).

A visual assessment was conducted to determine the potential effects on visual resources associated with the pipeline. Representative viewpoint points (also referred to as KOPs) were identified within the view shed for the pipeline, defined as the area from which the pipeline would be potentially visible. Photographs of existing visual conditions were used in preparing computerized visual simulations for each KOP. Because the appearance of the pipeline right-of-way would change with time, a series of simulations were prepared to illustrate how the pipeline right-of-way would look at different timeframes following construction. These KOPs would also serve as monitoring points for mitigation.

Pacific Connector produced POD A that outlined measures to reduce visual impacts along its pipeline route. To the extent feasible, PCGP would use revegetation efforts to shape and blend the pipeline easement, enhance the setting, and mimic the natural features of the landscape. These measures would consist of revegetating all disturbed areas and replanting trees in TEWAs and any other areas of the temporary construction right-of-way that were forested prior to construction (see POD I).

On Forest Service lands, PCGP would maintain a cleared 30-foot width centered over the pipe allowing the remainder of the permanent easement to be reforested. This allows trees to naturally reestablish along the edges of the permanent easement at a staggered, more natural-looking interval. Replacing slash in forested areas of the right-of-way during restoration activities would immediately affect the visual contrast in color and texture of the disturbed right-of-way areas.

Over time, as the right-of-way revegetates and narrows in width and changes in form, texture and color, potential visual impacts would diminish.

Additionally, a row, or if necessary, clusters of trees and/or shrubs would be planted across the right-of-way to provide visual screens at key road and trail crossings in sensitive view sheds. For all revegetation practices, PCGP and/or its contractors would only use agency-approved tree and plant species, in compliance with management plan objectives and in consultation with agency specialists.

Site Specific Crossing Prescriptions:

Clover Creek Road (intersection of Dead Indian Memorial Highway and Clover Creek Road). Viewsheds in this area are managed for Foreground and Middleground Retention and Partial Retention, but also contain areas of private lands with recently harvested timber and several clusters of rural residential homes. The proposed alignment would cross the Dead Indian Memorial Highway perpendicularly in a thick forest foreground setting (at MP 168.83). PCGP would implement the mitigation recommendations detailed in Section 3.2 and 3.3 and further described in the POD I. These pipeline restoration efforts would include regrading to the approximate original contours, reseeding, scattering slash across the right-of-way, and replanting, which would minimize, maintain or restore visual contrast of the right-of-way. During restoration, PCGP would plant trees within forested areas to within 15 feet of the Pipeline, which would allow a strip of trees to establish along the easement and between the Pipeline and the road in this area. Because the Pipeline was recommended to abut the road and to eliminate the strip of trees between the road and the Pipeline easement, the Forest Service and BLM would specify if tree planting would occur on federal lands between the centerline and Clover Creek Road (but not within 15 feet of the pipeline). PCGP would also implement the mitigation recommendations in the Federal Lands Scenery Management Analysis at this location which include:

During construction of the Project, Compliance Monitors representing FERC are present on a full-time basis to inspect construction procedures and mitigation measures and provide regular feedback on compliance issues to FERC and the Forest Service. Objectives of the Compliance Monitoring program are to: facilitate the timely resolution of compliance issues in the field; provide continuous information to FERC regarding noncompliance issues and their resolution; and review, process, and track construction-related variance requests. Changes to previously approved mitigation measures, construction procedures, and construction work areas due to unforeseen or unavoidable site conditions would require various levels of regulatory approval from the applicable land management agencies. FERC would have the authority to stop any activity that violates an environmental condition of the FERC authorization issued to PCGP.

Additionally, environmental compliance oversight responsibilities for PCGP, FERC, FS and BLM are described in the POD (*Environmental Briefings and Compliance Plan*, POD G) that would apply to the construction, operation, and maintenance of the project specifically on NFS lands. The FS Authorized Officer would coordinate with the BLM in administering and enforcing ROW grant provisions and would have stop-work authority. The FS Authorized Officer's designated representatives would ensure that the stipulations and mitigation measures included in the POD that are designed to minimize, maintain or restore the effects to visual resources and recreational resources are adhered to during project construction, operation, and maintenance. The BLM Authorized Officer would coordinate with the FS to ensure the work is being conducted in accordance with the ROW grant and agreed upon conditions. BLM and the FS would have stop-work authority. Field variance requests would be coordinated with the Authorized Officers.

How the Compensatory Mitigation Actions would help to Provide for Aesthetic Values and Scenic Character in the Plan Area (36 CFR 219.10(a)(1), 36 CFR 219.10(b)(i)).

Part of the CMP on the Winema NF includes a proposal to reduce stand densities on 114 acres in a way that would help soften the visual impact of the Pacific Connector Project.

The Pacific Connector pipeline would create a hard line along the timbered edge of the corridor that does not fit with the visual objectives for the Clover Creek Road or the Dead Indian Memorial Highway. Thinning and fuels treatments can be used to soften the edge to a more natural appearing texture by restoring stand density to more natural levels and creating small openings that are consistent with the landscape. This proposal would restore stand density, species diversity, and structural diversity more characteristic under a natural disturbance regime.

This project has been designed by an interdisciplinary team of resource professionals on the Winema NF with input and coordination with the U.S. Fish and Wildlife Service, NOAA Fisheries, and State agencies. It was planned within the watersheds that would be affected by the Pacific Connector pipeline project. It is a component of the PCGP application and would be a requirement of the Right-of-Way grant. This project would help to restore visual resources on the Winema NF (see tables 2.3.1-3 and 2.3.1-4 and figures 2.3-1 and 2.3-2 for additional information).

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TABLE 2.3.1-1 Proposed LRMP Amendments on the Winema NF						
Amendment	**Description**	**Text of Proposed Amendment**	**Related Planning Rule Requirements**	**Pacific Connector pipeline Impacts**	**Project Design Features**	**Compensatory Mitigation**[9]
FS-1: Project-Specific Amendment to Exempt Management Recommendations for Survey and Manage Species on the Winema NF.	The Winema River NF LRMP (WNF LRMP 1990) would be amended to exempt certain known sites within the area of the proposed Pacific Connector right-of-way grant from the Management Recommendations required by the 2001 "Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (Survey and Manage ROD). For known sites within the proposed right-of-way that cannot be avoided, the 2001 Management Recommendations for protection of known sites of Survey and Manage species would not apply. For known sites located outside the proposed right-of-way but with an overlapping protection buffer only that portion of the buffer within the right-of-way would be exempt from the protection requirements of the Management Recommendations. Those Management Recommendations would remain in effect for that portion of the protection buffer that is outside of the right of way. The proposed amendment would not exempt the Forest Service from the requirements of the Survey and Manage ROD, as modified, to maintain species persistence for affected Survey and Manage species within the range of the northern spotted owl. This is a project-specific plan amendment applicable only to the Pacific Connector Pipeline Project and would not change future management direction for any other project. The amendment would provide an exception from these standards for the Pacific Connector Project and include specific mitigation measures and project design requirements for the project.	Management Direction: Manage All Known Sites (Survey and Manage ROD, Standards and Guidelines Page 8). Current and future known sites will be managed according to the Management Recommendation for the species, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Professional judgment, Appendix J2 in the Northwest Forest Plan Final SEIS, and appropriate literature will be used to guide individual site management for those species that do not have Management Recommendations.	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.9(a)(2)(ii) – [the plan must include plan components to maintain or restore] "Rare aquatic and terrestrial plant and animal communities." § 219.9(b)(1) – "The responsible official shall determine whether or not the plan components required by paragraph (a) provide ecological conditions necessary to: …maintain viable populations of each species of conservation concern within the plan area."	28 acres of late successional and old growth (LSOG) habitat directly impacted from construction activity[10] 92 total acres directly impacted from construction activity 45 survey and manage sites potentially impacted from pipeline construction This amendment would affect less than 0.01% of the Winema NF	POD (I) Erosion Control and Revegetation Plan POD (J) Plant Conservation Plan POD (P) Leave Tree Protection Plan POD (U) Right-of-Way Clearing Plan Chapter 3, DEIS Route Design and Modifications on NFS lands Appendix K, Survey and Manage Persistence Evaluations	Road Decommissioning – approximately 29.2 Miles LWD in-stream – 1.0 miles Riparian Planting – 0,5 miles Riparian Fencing – 6.5 miles Stream Crossing Repair – 25 sites
WNF-1: Project - Specific Amendment to Allow Pacific Connector Pipeline Project in	The Winema NF LRMP would be amended to change the Standards and Guidelines for Management Area 3 (MA-3) (LRMP page 4-103-4, Lands) to allow the 95-foot-wide Pacific Connector pipeline project in MA-3 from the Forest Boundary in Section 32, T.37S., R.5E.,	Management Area 3, Lands, Standard and Guideline (4), (WNF LRMP 4-103). This management area is an avoidance area for new transportation and utility	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.10(a)(1) – [the responsible official shall	Approximately 17 acres of MA-3 would be impacted	POD (A) Aesthetics Management Plan for Federal Lands	Clover Creek Visual Management – 114 acres

[9] The compensatory mitigation listed in this column reflects the mitigation most related to the proposed amendment. It should be noted that other actions in the CMP may also be beneficial.
[10] Direct Impacts include acres cleared for construction in the construction corridor and temporary extra work areas (TEWA), as well as acres modified from uncleared storage areas (UCSA)

TABLE 2.3.1-1

Proposed LRMP Amendments on the Winema NF

Amendment	Description	Text of Proposed Amendment	Related Planning Rule Requirements	Pacific Connector pipeline Impacts	Project Design Features	Compensatory Mitigation[9]
Management Area 3 – Scenic Management:	W.M., OR, to the Clover Creek Road corridor in Section 4, T.38S, R.5. E., W.M., OR. Standards and Guidelines for MA-3 state that the area is currently an avoidance area for new utility corridors. This proposed Pacific Connector Pipeline Project is approximately 1.5 miles long and occupies approximately 17 acres within MA-3. The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements. This is a project-specific plan amendment applicable only to the Pacific Connector Pipeline Project and would not change future management direction for any other project.	corridors**, with the exception of the Pacific Connector Pipeline right-of-way. The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.**	consider] "Aesthetic values,… scenery,... viewsheds...". § 219.10(b)(i) – [the responsible official shall consider] "Sustainable recreation; including recreation settings, opportunities,…and scenic character…"	This amendment would affect approximately 0.01% of Management area 3 on the Winema NF	POD (I) Erosion Control and Revegetation Plan POD (P) Leave Tree Protection Plan POD (U) Right-of-Way Clearing Plan	
WNF-2: Project-Specific Amendment of VQO on the Dead Indian Memorial Highway:	The Winema NF LRMP would be amended to allow 10-15 years to achieve the VQO of Foreground Retention where the Pacific Connector right-of-way crosses the Dead Indian Memorial Highway at approximately pipeline MP 168.8 in Section 33, T.37S., R.5E., W. M., OR. Standards and Guidelines for Scenic Management, Foreground Retention (LRMP 4-103, MA 3A, Foreground Retention) requires VQOs for a given location be achieved within one year of completion of the project. The Forest Service proposes to allow 10-15 years to meet the specified VQO at this location. The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements for the project. This is a project-specific plan amendment that would apply only to the Pacific Connector Pipeline Project in the vicinity of the Dead Indian Memorial Highway and would not change future management direction for any other project.	Management Area 3A, Foreground Retention, Standard and Guideline Scenic (1), (WNF LRMP 4-103 and 104). Evidence of management activities from projects that produce slash (tree harvest) or charred bark (underburning) will not be noticeable one year after the work has been completed, **with the exception of the Pacific Connector Pipeline right-of-way which shall attain the VQO within 10 - 15 years after completion of the construction phase of the project where the pipeline crosses Management area 3A. The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.**	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.10(a)(1) – […the responsible official shall consider: …] "(1) Aesthetic values,… scenery,... viewsheds...". § 219.10(b)(i) – [the responsible official shall consider] "Sustainable recreation; including recreation settings, opportunities,… and scenic character…".	Approximately 3 acres would be impacted by the project This amendment would affect approximately 0.01% of Management area 3A on the Winema NF	POD (A) Aesthetics Management Plan for Federal Lands POD (I) Erosion Control and Revegetation Plan POD (P) Leave Tree Protection Plan POD (U) Right-of-Way Clearing Plan	Clover Creek Visual Management – 114 acres
WNF-3: Project - Specific Amendment of VQO Adjacent to	The Winema NF LRMP would be amended to allow 10-15 years to meet the VQO for Scenic Management, Foreground Partial Retention, where the Pacific Connector right-of-way is adjacent to the Clover Creek Road from	Management 3B, Foreground Partial Retention, Standard and Guideline Scenic (1), (WNF LRMP, 4-107). Evidence of management	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.10(a)(1) – […the	The project would initially affect about 50 acres of Management Area 3B. Over a period of	POD (A) Aesthetics Management Plan for Federal Lands	Clover Creek Visual Management – 114 acres

TABLE 2.3.1-1 **Proposed LRMP Amendments on the Winema NF**						
Amendment	**Description**	**Text of Proposed Amendment**	**Related Planning Rule Requirements**	**Pacific Connector pipeline Impacts**	**Project Design Features**	**Compensatory Mitigation**[9]
the Clover Creek Road:	approximately pipeline MP 170 to 175 in Sections 2, 3, 4, 11, and 12, T.38S., R.5E., and Sections 7 and 18, T.38S., R.6E., W.M., OR. This change would potentially affect approximately 50 acres. Standards and Guidelines for Foreground Partial Retention (LRMP, page 4-107, MA 3B) require that VQOs be met within three years of completion of a project. The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements for the project. This is a project-specific plan amendment that would apply only to the Pacific Connector Pipeline Project in the vicinity of Clover Creek Road and would not change future management direction for any other project.	activities from projects that produce slash (tree harvest) or charred bark (underburning) should not be noticeable from two to three years after the work has been completed, **with the exception of the Pacific Connector Pipeline right-of-way, which shall attain the VQO within 10 - 15 years after completion of the construction phase of the project where the pipeline crosses Management area 3B. The applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.**	responsible official shall consider: …] "(1) Aesthetic values,… scenery,... viewsheds...". § 219.10(b)(i) – [the responsible official shall consider] "Sustainable recreation; including recreation settings, opportunities,…and scenic character…".	10 to 15 years, the affected area would decrease to about 29 acres. This amendment would affect approximately 0.3% of Management area 3B on the Winema NF	POD (I) Erosion Control and Revegetation Plan POD (P) Leave Tree Protection Plan POD (U) Right-of-Way Clearing Plan	
WNF-4: Project - Specific Amendment to Exempt Limitations on Detrimental Soil Conditions within the Pacific Connector Right-of-Way in All Management Areas:	The Winema NF LRMP would be amended to exempt restrictions on detrimental soil conditions from displacement and compaction within the Pacific Connector right-of-way in all affected management areas. Standards and Guidelines for detrimental soil impacts in all affected management areas require that no more than 20 percent of the activity area be detrimentally compacted, puddled, or displaced upon completion of a project (LRMP page 4-73, 12-5). The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements for the project. This is a project-specific plan amendment applicable only to the Pacific Connector Pipeline Project and would not change future management direction for any other project.	Detrimental Soils Conditions, Standard and guideline 12-5, (WNF LRMP, 4-73). The cumulative effects of detrimental soil conditions should not exceed 20 percent of the total acreage within the activity area: any reason for exceeding the limitation shall be documented in an environmental assessment, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented**. Detrimental soil conditions include compaction, displacement, puddling, and	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.8(a)(2)(ii) – [The plan must include plan components to maintain or restore…] "Soils and soil productivity, including guidance to reduce soil erosion and sedimentation"	Approximately between 24 and 56 acres of detrimental soil conditions could result from pipeline construction This amendment would affect less than 0.01% of the Winema NF	POD (I) Erosion Control and Revegetation Plan POD (U) Right-of-Way Clearing Plan Technical Report on Soil Risk and Sensitivity Assessment (NSR 2014)	Road Decommissioning – approximately 29.2 Miles

TABLE 2.3.1-1

Proposed LRMP Amendments on the Winema NF

Amendment	Description	Text of Proposed Amendment	Related Planning Rule Requirements	Pacific Connector pipeline Impacts	Project Design Features	Compensatory Mitigation[9]
		moderately or severely burned soil from all activities (including roads, skid trails, and landings). Sites where the standards for displacement, puddling, and compaction are not currently met will require rehabilitation such as ripping, backblading, or fertilization. The potential for creating detrimental soil conditions will be specifically addressed through project environmental analyses. If needed, alternative management practices will be developed, and mitigating measures will be planned and implemented.				
WNF-5: Project-Specific Amendment to Exempt Limitations on Detrimental Soil Conditions within the Pacific Connector Right-of-Way in Management Area 8:	The Winema NF LRMP would be amended to exempt restrictions on detrimental soil conditions from displacement and compaction within the Pacific Connector right-of-way within the Management Area 8, Riparian Area (MA-8). This change would potentially affect approximately 0.5 mile or an estimated 9.6 acres of MA-8. Standards and Guidelines for Soil and Water, MA-8 require that not more than 10 percent of the total riparian zone in an activity area be in a detrimental soil condition upon the completion of a project (LRMP page 4-137, 2). The amendment would provide an exception from these standards for the Pacific Connector Pipeline Project and include specific mitigation measures and project design requirements for the project. This is a project-specific plan amendment applicable only to the Pacific Connector Pipeline Project and would not change future management direction for any other project.	Soil and Water, Standard & Guideline 3 (WNF LRMP 4-137). The cumulative total area of detrimental soil conditions in riparian areas shall not exceed 10 percent of the total riparian acreage within an activity area, **with the exception of the operational right-of-way and the construction zone for the Pacific Connector Pipeline, for which the applicable mitigation measures identified in the POD and Pacific Connector project design requirements must be implemented.** Permanent recreation facilities or other permanent facilities are exempt.	The 36 CFR 219 planning rule requirements that are directly related to this amendment include: § 219.8(a)(2)(ii) – [The plan must include plan components to maintain or restore…] "Soils and soil productivity, including guidance to reduce soil erosion and sedimentation".	Approximately between 3 and 6 acres of detrimental soil conditions could result from the pipeline construction This amendment would affect less than 0.01% of the Winema NF	POD (I) Erosion Control and Revegetation Plan POD (U) Right-of-Way Clearing Plan POD (BB) Wetland and Waterbody Crossing Plan Forest Service Site Specific Stream Crossing Prescriptions (NSR 2014) Stream Crossing Risk Analysis; and Stream Crossing Risk Analysis Addendum (GeoEngineers2017d, 2018a) Chapter 3, DEIS Route Design and Modifications on Forest Service Managed Lands	Road Decommissioning – approximately 29.2 Miles LWD in-stream – 1.0 miles Riparian Planting – 0,5 miles Riparian Fencing – 6.5 miles Stream Crossing Repair – 25 sites

TABLE 2.3.1-2

Mitigation Projects to Address LRMP Objectives on the Winema

Unit	Watershed	Mitigation Group	Project Type	Project Name	Quantity a/	Unit
Winema NF	Spencer Creek	Aquatic and Riparian Habitat	Riparian Planting	Spencer Creek Riparian Planting	0.5	miles
		Aquatic and Riparian Habitat	Riparian Fencing	Spencer Creek Fencing	6.5	miles
		Aquatic and Riparian Habitat	LWD In-stream	Spencer Creek In-stream LWD	1.0	miles
		Aquatic and Riparian Habitat	Stream Crossing Repair	Spencer Creek Ford Hardening and Interpretive Sign	1	sites
		Aquatic and Riparian Habitat	Stream Crossing Repair	Spencer Creek Stream Crossing Decommissioning	25	sites
		Road sediment reduction	Road Decommissioning	Spencer Creek Road Decommissioning	29.2	miles
		Visuals	Stand Density Reduction	Clover Creek Visual Management.	114	acres

a/ Acres are rounded to the nearest whole acre and miles to the nearest tenth of a mile.

Figure 2.3-1. Map of CMP Projects in the Spencer Creek Watershed on the Winema NF

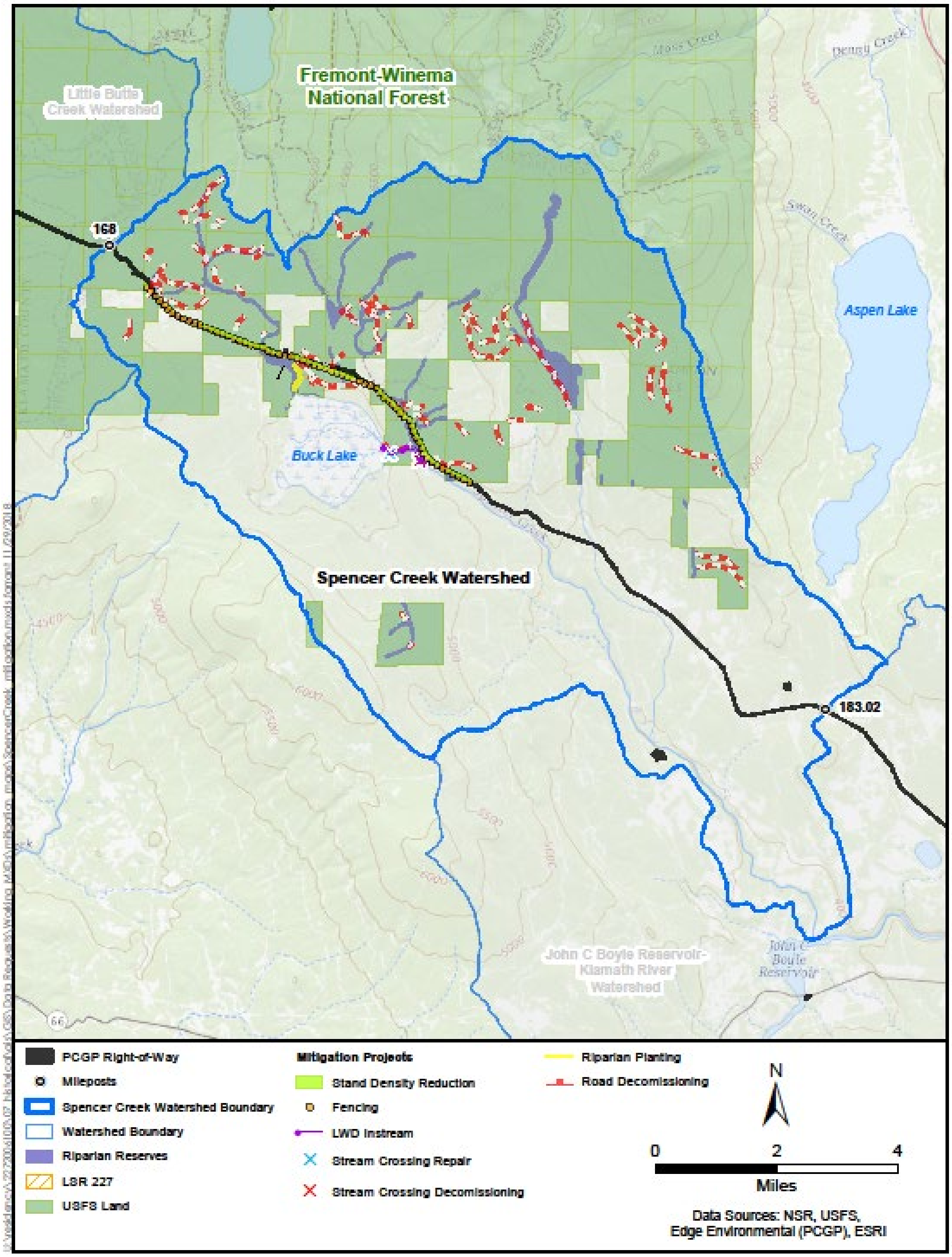

TABLE 2.3.1-3 **Evaluation of Winema NF Mitigation Projects by Mitigation Group and Project Type**				
Mitigation Group	**Project Type**	**Amount**	**Rationale**	**Environmental Consequences**
Aquatic and Riparian Habitat	Large Woody Debris In-stream	1.0 Miles	Over the last century, many streams with high aquatic habitat potential have become simplified, and therefore, have a reduced capacity to provide quality habitat. Riparian stands have decreased health and vigor, resulting in increased time to develop large tree structure for wildlife, stream shade, and future instream wood. Placement of LWD in streams adds structural complexity to aquatic systems, traps fine sediments and can contribute to reductions in stream temperatures over time (Tippery et al. 2010). The BLM completed placement last year on 3 miles of Spencer Creek below this reach. Addition of this segment would complete the stream rehabilitation on the reach of Spencer Creek where the project occurs. Logs from the Pacific Connector pipeline Right of Way will be used for the project. An estimated 75 pieces are needed. A helicopter will be used to place the logs. This is responsive to Aquatic Conservation Strategy (ACS) objectives 2, 3, 4, and 5.	**Short-term adverse effects**: LWD in-stream refers to logs (typically greater than 20 inches in diameter), limbs, or root wads that intrude into a stream channel. Placing this material in-stream can be accomplished with ground equipment such as excavators and/or helicopters. These activities have the potential to increase suspended sediment in streams and impact riparian vegetation as a result of heavy equipment use or the dragging of materials (e.g. logs) in the stream channel. Short-term impacts to water quality would occur in the form of suspended sediment and turbidity increases during in-stream implementation. However, no lasting measureable effect to water quality would occur as any sediment plume created, would quickly dissipate as soon as in-stream activities stop. In-stream work is done during summer low flow periods when turbidity plumes are an infrequently occurring event. Project design features (PDF) would include Best Management Practices (BMP) that would prevent any indirect effects to salmonids and other stream fish from project related sediment. The placement of LWD materials in the stream by using helicopters would create noise that could disturb NSO. The PDFs would focus disturbance outside the critical nesting period and beyond critical distances for NSO. These PDFs would reduce impacts from noise to acceptable levels. **Long-term beneficial effects:** Placing LWD in streams affects channel morphology, the routing and storage of water and sediment, and provides structure and complexity to stream systems. Complex pools and side channels created by instream wood provide overwintering habitat to stream salmonids and other aquatic organisms (Solazzi et. al. 2000). They also provide cover from predators during summer low flow periods when predation is at its highest. Providing more stream channel structure results in better over wintering habitat, improved summer pool habitat, and more abundant spawning gravels.
Aquatic and Riparian Habitat	Stream Crossing Repair and Interpretive Sign	25 Sites	Restoring stream crossings reconnects aquatic habitats by allowing the passage of aquatic biota and restoring riparian vegetation. Over time, these actions reduce sediment and restore shade. Restoration of these crossings includes riparian planting as a mitigation which will help offset the impact of shade removal at pipeline R/W crossings. The proposed pipeline will cross Spencer Creek upstream of Buck Lake. It is occupied by redband trout. Spencer Creek has been identified by NMFS as habitat for Federally listed Southern Oregon/Northern California Coast Coho salmon. Additionally, once fish passage is provided through the Klamath River hydro facilities, steelhead will re-colonize Spencer Creek. Improving habitat quality at Spencer Creek provides the opportunity to be pro-active in providing quality habitat for SONC Coho, mitigating for any detrimental effects to other SONC Coho habitats, while improving habitat for redband trout and other aquatic species. Spencer Creek appears on the Oregon DEQ 303(d) list as water quality impaired from increased sedimentation. Improvements at this location will immediately benefit all downstream aquatic habitats and the species associated with those habitats. This includes interpretive signage.	**Short-term adverse effects:** Removing old culverts and restoring stream/road crossings would result in short-term adverse effects from the use of heavy equipment in and around the stream channel. The work would be done during low summer flow periods to minimize impacts to aquatic species and PDFs would be designed to minimize disturbance for Northern Spotted Owl (NSO). **Long-term beneficial effects:** Stream crossing replacement would directly improve stream connectivity and habitat for aquatic species by immediately restoring access to formerly inaccessible habitats. Indirectly, these projects would reduce potential sediment levels in the long term by decreasing the potential for road failure. Stream crossing projects also reduce stream velocities by increasing stream crossing sizes, eliminating flow restrictions and allowing passage to additional reaches of habitat by removing barriers to aquatic species which improves access to spawning and rearing habitat and allows unrestricted movement throughout stream reaches during seasonal changes in water levels (Hoffman 2007).

TABLE 2.3.1-3

Evaluation of Winema NF Mitigation Projects by Mitigation Group and Project Type

Mitigation Group	Project Type	Amount	Rationale	Environmental Consequences
Aquatic and Riparian Habitat	Riparian Planting	0.5 Miles	Spencer Creek just upstream of Buck Lake. This is a meadow site that has lost streamside vegetation and has compacted soils. There is an overall need to restore health and vigor to riparian stands by maintaining and improving riparian reserve habitat. Shade provided by the plantings will contribute to moderating water temperatures in Spencer Creek. Root strength provided by new vegetation will increase bank stability, decrease erosion and sediment depositions to Spencer Creek and provide habitat for species that use riparian habitats.	**Short-term adverse effects**: This activity is not expected to result in any measurable adverse impacts. **Long-term beneficial effects:** Beneficial impacts include helping to re-vegetate and stabilize riparian habitat and improving habitat for listed or sensitive species.
Aquatic and Riparian Habitat	Riparian Fencing	6.5 Miles	This fence would serve to divide the Buck Indian Allotment into pastures north and south at Clover Creek Road. This fence would keep cattle from grazing newly revegetated areas in the Right of Way corridor, including areas where the corridor crosses Spencer Creek, thus helping to ensure that erosion control and revegetation objectives are met. It will also serve to separate anticipated increased cattle grazing of the ROW from the highway; greatly reducing a safety hazard for vehicles traveling the Clover Creek road. This fence would require 7-9 cattle guard crossings for Forest Roads intersecting the fence	**Short-term adverse effects**: This activity is not expected to result in any measurable adverse impacts. **Long-term beneficial effects:** Beneficial impacts include helping to ensure erosion control and revegetation objectives are met and providing additional protection of riparian areas from cattle grazing.
Road Sediment Reduction	Road Decommissioning	29.2 Miles	Road closure reduces fine grained sediments by eliminating traffic impacts. A construction corridor 75-95 wide with additional work areas will be cleared. Of this, a 30-wide route along the pipeline route will be maintained in early successional habitat. This strip of land, in a forested ecosystem, provides a barrier for movement of small animals between the remaining forest blocks and degrades neighboring habitat through edge effects and fragmentation. This is of special concern in riparian ecosystems where movement of wildlife species is concentrated. Decommissioning and planting selected roads can block up forested habitat and reduce edge effects and fragmentation in a period of about 40 years. Decommissioning roads can substantially reduce sediment delivery to streams (Madej 2000; Keppeler et al. 2007). Proposed road decommissioning would increase infiltration of precipitation, reduce surface runoff, and reduce sediment production from road-related surface erosion in the watershed where the impacts from the Project occur. This mitigation addresses ACS objectives 2, 4, 5, 8 & 9.	**Short-term adverse effects:** Road decommissioning methods generally include actions utilizing mechanized construction equipment to physically stabilize the road prism, restore natural drainage patterns, and allow for revegetation of the roadbed. Mechanized construction equipment might include excavators, backhoes and truck mounted loaders. Road decommissioning has the potential to cause short-term degradation of water quality by increasing sediment delivery to streams as roads are de-compacted by heavy equipment, culverts and cross drains are removed, and other restoration activities are implemented. The use of heavy mechanized equipment near streams could disturb the stream influence zone, deliver sediment, create turbidity, and cause stream bank erosion. There is also the potential of an accidental fuel/oil spill. These projects may cause a short-term degradation of water quality due to sediment input and chemical contamination. Stream bank condition and habitat substrate may also be adversely affected in the short term. However with careful project design and seasonal timing, these affects are expected to be of a limited extent and duration. Road decommissioning would create noise from heavy equipment that could disturb NSO. The potential for disturbance is mainly associated with breeding behavior at active nest sites. The PDFs would focus disturbance outside the critical nesting period and beyond critical distances for NSO. These PDFs would reduce impacts from noise to acceptable levels. **Long-term beneficial effects**: Proposed road decommissioning would increase infiltration of precipitation, reduce surface runoff, and reduce sediment production from road-related surface erosion in the watershed where the impacts from the Project would occur. Decommissioning roads would restore natural drainage patterns and thereby avoid large volumes of added sediment to the stream network that would be likely to eventually occur. In addition limited road maintenance dollars could be focused on the remaining road systems resulting in more maintenance of culverts and ditchlines resulting in less potential for catastrophic failure. Madej (2000) concluded that by

TABLE 2.3.1-3 **Evaluation of Winema NF Mitigation Projects by Mitigation Group and Project Type**				
Mitigation Group	**Project Type**	**Amount**	**Rationale**	**Environmental Consequences**
				eliminating the risk of stream diversions and culvert failures, road removal treatments significantly reduce long-term sediment production from retired logging roads.
Visuals	Stand Density Reduction	114 Acres	The Pacific Connector pipeline will create a hard line along the timbered edge of the corridor that does not fit with the visual objectives for the Clover Creek Road or the Dead Indian Memorial Highway. Thinning and fuels treatments can be used to soften the edge to a more natural appearing texture by restoring stand density to more natural levels and creating small openings that are consistent with landscape. Thinning of commercial sized material may be accomplished with a commercial timber sale. The mitigation is intended to supplement funding for the non-commercial part of that work for visual purposes that could not otherwise be accomplished.	**Short-term adverse effects:** Stand density management activities include the use of heavy equipment for cutting, skidding, slash piling, and hauling forest vegetation. Soil erosion risk would increase with the proposed activities because bare soil would be exposed during implementation. As the amount of bare/compacted soil increases, so does the risk of soil movement. Impacts caused by heavy equipment would increase the amount of detrimental soil damage within the treatment areas. By maintaining proper amounts of protective groundcover along with appropriate BMPs and PDFs, the risk of erosion, sediment delivery, and detrimental soil damage within the treatment areas is expected to be minimal and within LMP standards and guidelines. Stand treatments would not be expected to adversely affect nesting habitat for the NSO since the treatments would not remove constituent elements of their nesting habitat. Stand density treatments would create noise from heavy equipment that could disturb the NSO. The potential for disturbance is mainly associated with breeding behavior at active nest sites. The PDFs would focus disturbance outside the critical nesting period and beyond critical distances for NSO. These PDFs would reduce impacts from noise to acceptable levels. **Long-term beneficial effects:** By creating less dense stands with less tree competition, residual trees would benefit from the increased availability of sunlight, nutrients, and water. With the increase of available nutrients, trees should be more vigorous and less susceptible to large scale insect/disease outbreaks. The proposed treatments would enhance visuals by softening the edges created by the pipeline and restoring stand density, species diversity, and structural diversity more characteristic under a natural disturbance regime.

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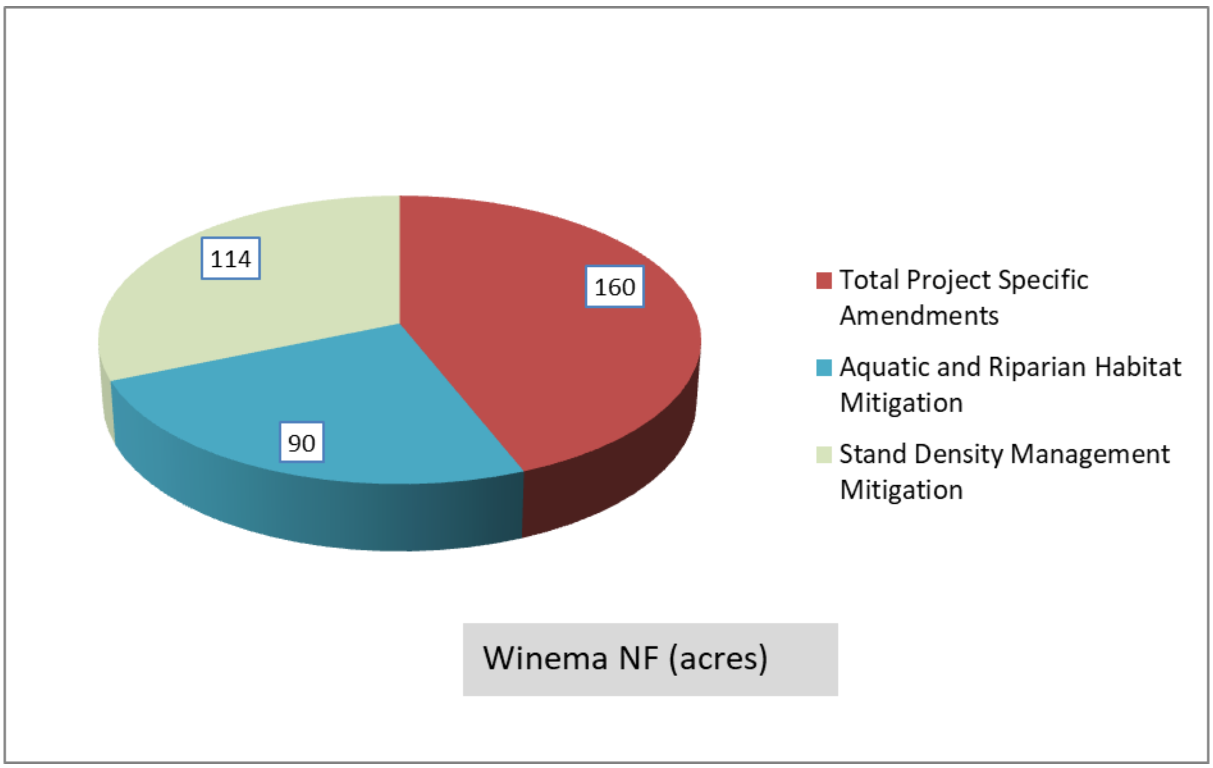
TABLE 2.3.1-4 **Comparison of Total Acres of Proposed Project-Specific Amendments and Compensatory Mitigation on the Winema NF**	
Amendments and Compensatory Mitigation	**Acres**
Total Project Specific Amendments[1]	160
Aquatic and Riparian Habitat Mitigation[2]	90
Stand Density Management (Visuals)	114

Data Source: USFS GIS Data Layers
1) Includes amendments FS-1, WNF-1, WNF-2 WNF-3, WNF-4 and WNF-5
2) Includes road sediment reduction, LWD, riparian fencing, and riparian planting actions and assumes a 20 foot wide treatment area

Figure 2.3-2. Comparison of Total Acres of Proposed Project-Specific Amendments and Compensatory Mitigation on the Winema NF



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APPENDIX P

Blasting and Helicopter Noise Analysis & Mitigation Plan

Construction Support Noise Analysis
Coos Bay to Malin, Oregon

Blasting and Helicopter Noise Analysis & Mitigation Plan

February 2008

Prepared for:

Pacific Connector Gas Pipeline, L.P.

Prepared by:

Michael Minor & Associates
Portland, Oregon

Table of Contents

List of Tables

List of Figures

Appendix

Summary

All data used in this report are taken from actual measured data taken in accordance with the American National Standards Institute (ANSI) or the Federal Aviation Administration methods for noise level measurements. All noise level projections used standard acoustical calculations for atmospheric noise reductions based on noise over a reflective plane for blasting and noise in free space for helicopters.

Empirical measured blast noise levels used for this analysis are taken from:

- Portland Light Rail Construction Project (Michael Minor & Associates, Inc.(MM&A, Inc.)1994-1997)

- Highway 26 Widening Project (MM&A, Inc.1996-2000).

Empirical measured data for the helicopters was taken from:

- Helicopter Noise Measurements, Boeing Vertol "Chinook" - CH-47(Federal Aviation Administration 1977),

- Helicopter Noise Blade Slap (NASA Contractor Report 1983), and

- Noise Measurement Flight Test for Boeing Vertol 243/CH 47-D Helicopter (Federal Aviation Administration 1984).

The empirical noise data for trench blasting and heavy transport helicopters were used analyzed to determine the distances for which noise levels remain below 92 dBA during construction operations with appropriate mitigation measures applied. Mitigation measures commonly applied to blasting of this type include drilling small (2.5-inch) charge holes, stemming the blast holes with sand and placing inert material on top of the blast area.

Under worst case conditions, the distance to 92 dBA with these measures is 175 to 200 feet for trench blasting operations and, 650 to 700 feet for helicopter operations. The greater distance for helicopter use is due to the directional aspects of blade slap noise which is directed toward the ground. Mitigation for helicopter noise includes operational restrictions, such as maintaining a high altitude and flight paths away from noise sensitive areas whenever possible. The table below summarizes the results of the analysis and indicates distance from a blast related noise source to the project 92 dBA criteria.

Blasting Noise Level Projections: Distance to 92 dBA under Different Conditions			
	Distance to 92 dBA Noise Level		
Propagation Conditions	**Un-Mitigated**	**Soft Rock**	**Hard Rock**
Normal[1]	Up to 4000	Less than 125 feet	Less than 125 feet
Moderate[2]	Up to 5000	125 feet	Less than 125 feet
High[3]	> 5500	200 feet	125 feet

Notes:

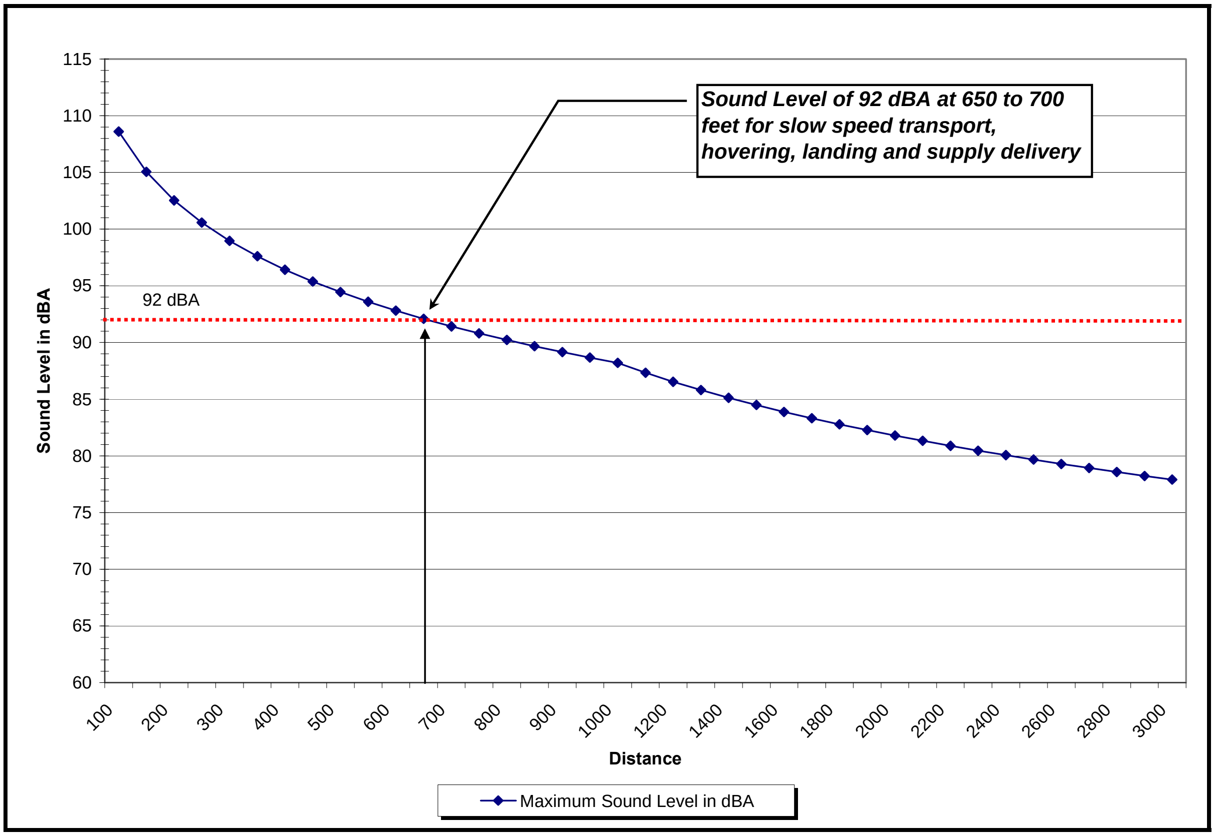
1. Normal assumes moderate temperatures and minimal reflective surfaces
2. Assumes colder temperatures, or reflective surfaces, or a low pressures system
3. Assumes combined low temperature with inversion, wind in the direction of the noise sensitive land use and low dense cloud cover.

Controlling blast noise and air overpressure is an essential part of blasting. High noise levels and high levels of overpressure from a blast indicate that much of the blast energy was wasted (creating noise and overpressure) and not used to fracture rock. In order to limit the noise and increase the level of energy forced into the rock, virtually all trench blasts would contain several forms of mitigation for noise and air overpressure in order to contain the blast energy and use it to fracture rock.

It should be noted, that on rare occasions, initial blasting noise levels may briefly exceed 92 dBA at 125 to 200 feet due to air overpressure blasts. However, once the blasters are aware of the rock type and potential for airblast, subsequent blasts can be modified to maintain levels below this criteria.

Noise projections for helicopter operations are shown on the figure below. The graph is a plot of noise levels versus distance for typical operations at low speeds. Helicopters typically travel at lower speeds when hauling, and as described above, the noise levels are dominated by blade slap. The graph shows that the noise levels reduce to 92 dBA at distances of 650 to 700 feet.

Noise Levels versus Distance for Helicopter Hauling Operations



1. Introduction

This technical noise analysis was performed for Pacific Connector Gas Pipeline, LP (Pacific Connector) to analyze the attenuation of noise created by pipeline trench blasting and helicopter operations anticipated for the Pacific Connector Gas Pipeline (PCGP) Project. The purpose of this analysis is to calculate the distances from blasting and helicopter activities to a 92 dBA criteria. The criteria is based on the commonly accepted noise level at which Marbled Murrelets (MAMU) and Northern Spotted Owls (NSO) could be disturbed or disrupted from normal activity during their breeding periods.

The disturbance and disruption distance to NSO and MAMU for double-rotor helicopters and blasting operations is set forth by the U.S. Fish and Wildlife Service (FWS). Currently, double-rotor helicopter and blasting operations are restricted within one mile from active NSO nest sites (Smith et al. 2007; Wille et al. 2006) or occupied MAMU stands (FWS 1997; Mack et al. 2003). FWS has established 92dB(A) as the sound-only injury threshold for both NSO and MAMU based on their document *Guidance: Estimating the Effects of Auditory and Visual Disturbance to Northern Spotted Owls and Marbled Murrelets in Northwestern California* (July 26,2006, Arcata Field Office).

This Noise Analysis & Mitigation Plan addresses the following:

- Calculated blast noise levels for worst case scenario and maximum noise propagation characteristics at various distances from the blast site
- Blast noise mitigation measures to reduce noise levels (Smith et al. 2007; Wille et al. 2006)
- Noise contours for typical helicopter operations, including slow speed hauling and moderate speed unloaded return flights, and operational guidance to maintain noise levels below the 92 dBA criteria.
- General project mitigation measures and best management practices to assist with any potential exceedances of the project criteria and to assist with general planning of blasting and helicopter flights

1.1. Project Description

Pacific Connector is proposing to construct a 36" diameter high pressure natural gas pipeline in Oregon from Coos Bay to Malin. Typically, the pipeline will be installed in a 6 to 10 foot deep trench. The construction of the pipeline excavation may require the use of conventional explosives in areas of dense rock that cannot be mechanically excavated.

Additionally, large, transport style helicopters will be used to access remotes sites and for timber removal and pipeline installation along the project corridor. Typical helicopters used could include the Boeing Chinook (CH-47) and Boeing Vertol 107-II (CH-46) or other similar heavy duty vehicles. This type of helicopter is required due to the payload requirements for this project. A typical Chinook CH-47 has a lift capacity of over 25,000 pounds, while the Vertol Ch-46 has a lift capacity of approximately 10,000 pounds. Noise levels generated from the helicopters will vary depending on the load weight and travel speed (Federal Aviation Administration 1977).

2. Methodology

This section provides a basic understanding of acoustics and the different descriptors that are used to describe noise levels. It also provides an introduction to blasting and helicopter noise modeling, and describes the methods used in this analysis.

2.1. Acoustic Terminology

Sound is defined as any pressure variation that the can be detected, from barely perceptible to sound levels that can cause hearing damage. The magnitude of air pressure variation from static (or normal) air pressure is a measure of the sound level. The number of cyclic pressure variations per second is the frequency of sound. When sounds are unpleasant, unwanted, or disturbingly loud, they tend to be classified as noise.

Compared with static air pressure, audible sound pressure variations range from the threshold of hearing; a very small 20 μPa (micro-Pascal or 20 x 10^{-6} Pascal) to 100 Pa, a level so loud it is referred to as the threshold of pain (Beranek 1988; U.S. EPA 1971, also see Figure 1). Because the ratio between these numbers is more than a million to one, using units of Pascals to describe sound levels can be awkward. The decibel (dB) measurement is a logarithmic conversion of air pressure level variations from Pascal, to a unit of measure with a more convenient numbering system. This conversion not only allows for a more convenient scale, but is also a more accurate representation of how the human ear reacts to variations in air pressure. Measurements made using the decibel scale are denoted dB.

The following are "rules of thumb" that are handy in understanding changes in noise levels and how humans perceive such changes.

- The smallest broad band noise-level change that can be detected by the human ear is approximately 3 dB;
- A 5 dB change in noise levels are clearly noticeable; and
- An increase of 10 dB is a doubling in sound pressure, and is also roughly equivalent to a doubling in the perceived sound level.

In acoustic measurements referenced to human audible ranges, an "A"-weighted filter is normally used to compensate for the sound level readings. The A-weighted filter attenuates the upper and lower frequency bands. Sound pressure level measurements made using the A-weighted filter are denoted dBA. The A-scale is used in most noise studies and was used in the FWS, *Estimating the Effects of Auditory and Visual Disturbances to Northern Spotted*

Owls and Marbled Murrelets in Northwestern California U.S. Department of Interior, July 2006. All noise levels presented are given in decibels with the A-weighted filter.

There are several noise metrics commonly used for the analysis of construction related noise, including blasting and helicopter use. The first is the equivalent sound pressure level, L_{eq}. The L_{eq} is defined as the average noise level, on an energy basis, for a stated time period (for example, hourly). Other often used descriptors include the L_{max} which is defined as the loudest root-mean-square (RMS) noise level during the measurement period, and the L_{min}, which is defined as the quietest root-mean-square (RMS) noise level during the measurement period. For this analysis, the primary noise descriptor will be the L_{max}, as it is the best descriptor for determining disruption and or disturbance to NSO and MAMU. Definitions and symbols for each descriptor are given in Table 1 (Beranek 1988; Broch 1984; Harris 1979).

Table 1. Noise Descriptors

Symbol	Description
L_{eq}	The average noise level (energy basis)
L_{max}	The maximum noise level
L_{min}	The minimum noise level

Figure 1 is intended to provide the reader with a general understanding of typical sound levels with reference to some familiar noise sources.

Figure 1. Typical Noise Sources, Impression and Loudness

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (human judgment of different sound levels)
Jet aircraft takeoff from carrier (50 feet)	140	Threshold of pain	64 times as loud
50 horse power siren (100 feet)	130		32 times as loud
Loud rock concert near stage, Jet takeoff (200 feet)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 feet)	110		8 times as loud
Jet takeoff (2,000 feet)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 feet)	90		2 times as loud
Garbage disposal (2 feet)	80	Moderately loud	Reference loudness
Typical at-grade light rail vehicle	70		½ as loud
Moderately busy department store Typical television show (10 feet)	60		1/4 as loud
Typical quiet office environment	50		1/8 as loud
Bedroom or quiet living room	40	Quiet	1/16 as loud
Quiet library, soft whisper (15 feet)	30	Very quiet	1/32 as loud
High quality recording studio	20	Just audible	1/64 as loud
Acoustic Test Chamber	10		1/128 as loud
	0	Threshold of hearing	

Sources: Beranek (1988) and MM&A measured data from multiple projects

2.2. Sound Propagation Characteristics

Several factors determine how sound levels reduce over distance. This reduction in sound is known as sound attenuation. Under ideal conditions, a point source noise in free atmospheric space will attenuate at a rate of 6 dB each time the distance from the source doubles (using the inverse square law). A point source over a reflective plane, such as surface blasting or equipment at a construction site, reduces at a rate of approximately 3 dB each time the distance doubles. Under real-life conditions however, interactions of the sound waves with the ground often results in attenuation that is slightly higher than the *ideal* reduction factors given above. Other factors that affect the attenuation of sound with distance include existing structures, topography, foliage, ground cover, and atmospheric conditions such as wind, temperature, and relative humidity. The following list provides some general information on the potential effects each of these factors may have on sound propagation (Beranek 1988; Broch 1984; Harris 1979; Rosenthal and Morlock 1987).

- **Existing Structures.** Existing structures can have a substantial effect on noise levels in any given area. Structures reduce noise by physically blocking the sound transmission and, under special circumstances, may cause an increase in noise levels if the sound is reflected off the structure and transmitted to a nearby receiver location. Measurements have shown that a single-story house has the potential, through shielding, to reduce noise levels by as much as 10 dB or greater for receivers and noise sources located at ground level. The actual noise reduction will depend greatly on the geometry of the noise source, receiver, and location of the structure. Increases in noise caused by reflection are normally 3 dB or less, which is the minimum change in noise levels that can be noticed by the human ear. It must also be noted, that for high-energy low frequency noise sources, such as blasting and helicopters, the reduction will always be much less than for mid- to higher frequency sources, such as traffic or ventilation systems.
- **Topography**. Topography includes existing hills, berms, and other surface features between the noise source and receiver location. As with structures, topography has the potential to reduce or increase sound depending on the geometry of the area. Hills and berms when placed between the noise source and receiver can have a significant effect on noise levels. In some situations, berms are used as noise mitigation by physically blocking the noise source from the receiver location. In some locations, however, the topography can result in an overall increase in sound levels by either reflecting or channeling the noise towards a sensitive receiver location. As with existing structures, topography also has less overall impact on the transmission of the low frequency sources.
- **Foliage.** Foliage, if dense, can provide reductions in noise levels. Studies have shown that dense foliage can reduce noise by 5 dB for locations with at least 30 feet of dense evergreen foliage, and the reduction increases with additional dense foliage. The actual noise reduction will vary based on the noise source, frequency of the noise, and type of foliage between the noise source and receiver.
- **Ground Cover.** The ground cover between the receiver and the noise source can have a significant effect on noise transmission. For example, sound travels very well across reflective surfaces such as water and pavement, but can be attenuated when the ground cover is field grass, lawns, or even loose soil.
- **Atmospheric Conditions**. Atmospheric conditions that can have an effect on the transmission of noise include wind, temperature, humidity and precipitation. Wind can increase sound levels if it is blowing from the noise source to the receiver; conversely, it can reduce noise levels if blowing in the opposite direction. Noise propagation can also be significantly affected when the temperature gradient is such that an inversion is formed. Low cloud cover in addition to a temperature inversion can cause an increase in transmission of low frequency noise. Other atmospheric conditions, such as humidity and precipitation are rarely severe enough to result in significant changes in noise level propagation within 500 feet of the noise source, but may affect noise propagation at greater distances.

2.3. Method of Analysis

This section provides a summary of the methods employed in blast and helicopter noise assessments. All noise level projections used standard acoustical calculations for atmospheric noise reductions (Beranek 1988; Broch 1984; Harris 1979) based on noise over a reflective plane for blasting (3 dB per doubling of distance) and noise in free space for helicopters (6 dB per doubling of distance).

2.3.1. Blast Noise Assessment

Blast noise assessment was performed by incorporating reference blast noise levels from similar blasts measured during the Portland Light Rail construction in Portland, Oregon (MM&A, Inc.1994 - 1997), work on Highway 26 in Oregon (MM&A, Inc.1996 - 2000). Blast noise levels were verified by reviewing the US Bureau of Mines for blasts estimates.

Base line blast noise level projections were generated assuming minimal blast noise mitigation and maximum noise propagation characteristics. Based on typical measurements, softer rocks, such as stones and many volcanic composites are up to 6 dBA louder then hard rock, such as granite. Based on this, two projections were performed, one for hard rock and one for softer rock with a 6 dBA safety factor. Where blast noise projections were predicted to exceed 92 dBA, noise mitigation analysis was performed, and recommendations made to reduce the blast noise levels below 92 dBA.

Using the final blast projection formulas and blast mitigation measures (if required), typical blasting noise level versus distance contours were developed for hard and soft rock blasting. The different contours were developed to provide a safety factor that could be applied under special circumstances, such as low cloud cover or high wind velocity. All blast projections were verified using measured data from the blasting in Portland Oregon described above.

2.3.2. Helicopter Noise Assessment

All data used in this report are taken from actual measured data taken in accordance with the American National Standards Institute (ANSI, 2005) or the Federal Aviation Administration methods for noise level measurements. All noise level projections used standard acoustical calculations for atmospheric noise reductions based on noise over a reflective plane for blasting and noise in free space for helicopters.

Empirical measured data for the helicopters was taken from:

- Helicopter Noise Measurements, Boeing Vertol “Chinook” - CH-47 (Federal Aviation Administration 1977),

- Helicopter Noise Blade Slap (NASA Contractor Report 1983), and

- Noise Measurement Flight Test for Boeing Vertol 243/CH 47-D Helicopter (Federal Aviation Administration 1984).

Noise levels contours were projected based on typical operation expected on this project. Because the noise projections for the Boeing CH-47 and CH-46 produce similar noise levels when loaded at slower speeds, the larger CH-47 is used for the analysis.

A typical mission for the helicopters would include a flight from the staging area, fully loaded with materials, flying to the work site, delivering the material, and making a return flight. Similar flights would occur during the timber removal process. Because of the anticipated payloads and short flight distances, typically less than 5 miles, helicopter speeds are not expected to exceed 80 knots.

3. Blast Noise Modeling Results and Exposure Contours

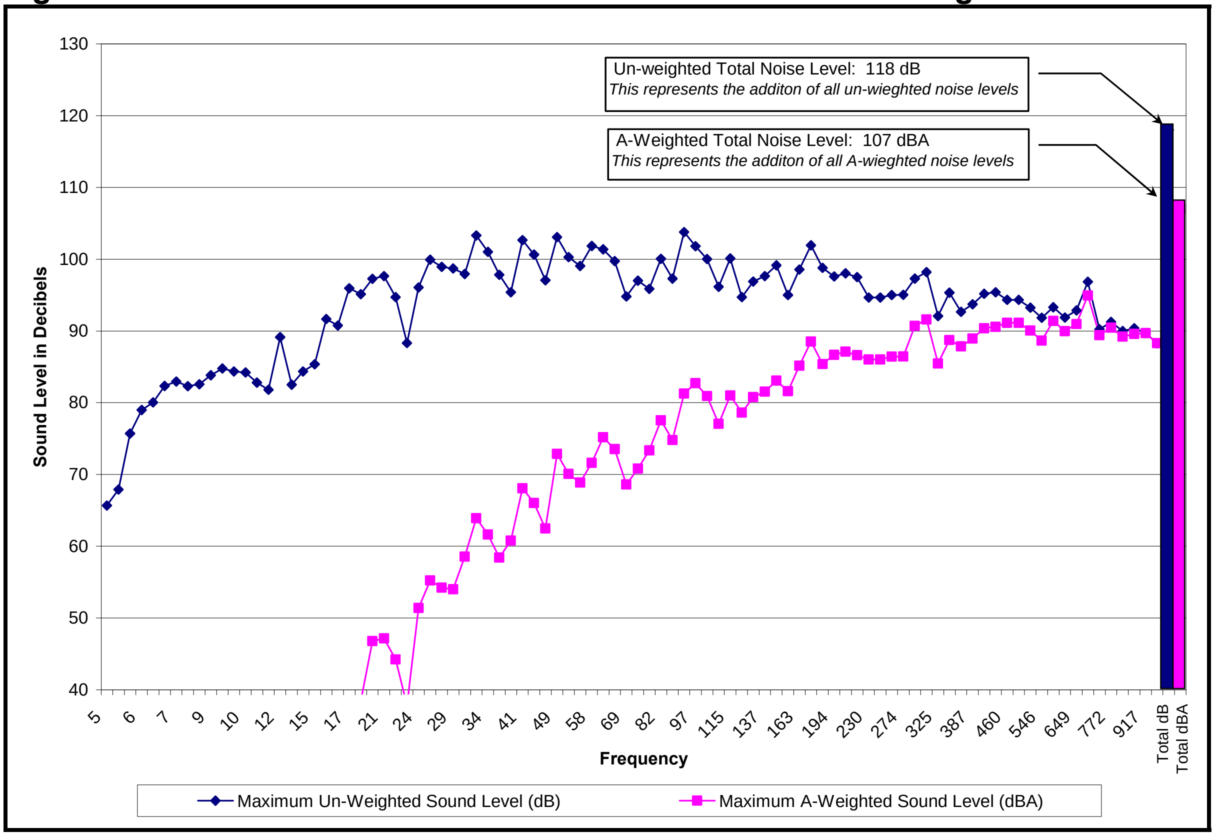
Noise level measurements taken during surface blasts for light rail and highway construction, along with data from the U.S. Bureau of Mines Offices of Mining Reclamation and Enforcement (Rosenthal, 1987) and blast design subcontractors were used to establish baseline blasting noise levels. The light rail and highway construction blasting is similar to the proposed blasting for this project, and consisted of surface blasts to lower the existing ground levels in a trench by 5 to 15 feet.

Blasting operations during construction of the west portal light rail track bed and the highway 26 Camelot overpass were measured using a noise level analyzer, which continuously records noise levels in 1/3 octave bandwidths. Frequency spectrums for each of the blasts were imported into a spreadsheet and corrected to represent a worst case un-mitigated sound level versus frequency graph for the type and size of blasting expected for the pipeline project. Noise levels between 5 Hz and 1000 Hz were extracted from the corrected data, as these frequencies account for the majority of blast noise energy. This frequency range also covers the low frequency ranges responsible for air-blast-over-pressure, which may have the capacity to shake structures.

Typically, noise levels are presented as a single number, such as 92 dBA. The single number is a logarithmic addition of the individual noise energy at each frequency. As will be shown, the noise from blasting covers a broad range of frequencies, however, the majority of the acoustical energy is found in the lower frequency range.

Figure 2 is a plot of reference blast noise levels with frequencies (tone) along the horizontal axis, and the sound level (in decibels) along the vertical axis. This is a plot of a typical surface blast as measured at 125 feet from the blast site. Two plots are provided, one with no frequency weighting, and a second with the A-weighted filter applied. The right side of the graph provides the overall logarithmic addition of the individual noise energy at each frequency for the un-weighted and A-weighted graphs. The overall un-weighted level is 118 dB and the A-weighted level is 107 dBA. Based on these values, un-mitigated blast noise levels would reduce to 92 dBA at 4000 to 5500 feet from the blast site, depending on the size and type of blast.

Figure 2. Reference Blast Noise Levels at 125 feet without Mitigation



Source: (MM&A, Inc.1996 – 2000, and 1994 - 1997)

The data in Figure 2 shows that the noise levels from blasting with no mitigation applied is 107 dBA or 118 dB. These levels are derived by logarithmic addition of the data in the graph. These are worst case un-mitigated noise levels from a typical surface blast.

3.1. Blast Noise Mitigation

There are several forms of mitigation that may be used to reduce noise and air overpressure from trench blasting. Controlling blast noise and air overpressure is an essential part of blasting. High noise levels and high levels of overpressure from a blast indicate that much of the blast energy was wasted (creating noise and overpressure) and not used to fracture rock. In order to limit the noise, and increase the level of energy forced into the rock, virtually all trench blasting operations would employ several forms of mitigation for noise and air overpressure in order to contain the blast energy and use it to fracture rock.

Additional mitigation can also be applied to stop noise from reaching noise sensitive areas. One method is to physically block the noise and air-over-pressure from sensitive receivers through the use of massive barriers. Another method is related to the blasting methodology and may involve several different aspects to how the charges are set. Each of these methods and how they relate to the PCGP Project are discussed below.

3.1.1. Charge Related Noise Mitigation

There are several methods the blast contractor could use to limit noise created from blasting activities. Table 2 summarizes the different blast mitigation methods and their benefits. The methods used and how effective they are will depend on the rock formation, height and width of the blast area, and topography surrounding the blast location (Explosive Product Divisions Blaster's Handbook, 1989).

Table 2. Charge Related Noise Mitigation Methods

Mitigation Method	Benefit
Drill small charge holes on tight centers	Blast energy is contained in the rock so less energy is released into the atmosphere as noise and air-over-pressure
Leave approximately 3-4 feet of soil on top of the blast area during initial mechanical excavations	Leaving the soil on the blast area will contain blast noise and air-over-pressure from the blast, reducing noise impacts
Use blast mats on top of the soil on the blast area	Additional mass of the mats also contains the blast noise and air overpressure, increasing energy for fracturing rock and also reduces noise and overpressure.
Use of timing delays for charges	Limit the number of charges going off at any one time reduces the overall noise and air-over-pressure from the blast
Blast small horizontal and vertical sections	By taking smaller sections for each blast, less explosives are needed reducing overall energy related to the blast
Stem the blast holes with dense sand	Stemming is the practice of packing the top portions of the blast holes with sand after the charge is loaded. This helps to force the energy of the blast into the rock and helps prevent energy from blowing out of the top of the hole, reducing noise and air-over-pressure impacts.
Timing charges to direct blast vibration away from sensitive receivers	Through the use of proper timing, charges can be detonated to direct the transmission of vibration away from sensitive receivers

Source: Explosive Product Divisions Blaster's Handbook, 1989 and Rosenthal, 1987

3.1.2. Physical Mitigation Methods

Physical mitigation for blast noise is performed using principles of the mass law, and would only be required if blasting was performed in areas sensitive to blast levels exceeding the 92 dBA criteria. The mass law is a method of predicting a reduction in noise levels due to the density of a barrier placed incident between the noise source and receiver. Accuracy of the law is questionable below 125 Hz, and therefore it is best to be conservative in calculations at lower frequencies. The goal is to reduce the blast noise levels at 25 to 250 Hz by approximately 15 dB over the reference levels. Existing data (MM&A, Inc.1996 – 2000, and 1994 - 1997) shows that the linear noise levels at these frequencies range from 96 to 101 dB. A reduction of 15 dB would require a mass of 10 to 12 pounds per square foot.

Covering the blast area with approximately 3 to 4 feet of on-site inert material should be sufficient to mitigate unacceptable noise and air-over-pressure impacts (Explosive Product Divisions Blaster's Handbook, 1989, MM&A, Inc.1996 – 2000, and 1994 - 1997). Typical weight of native sand in Oregon is approximately 90 to 106 pounds per cubic foot; therefore adding 2 feet of sand on top of the blast area is equivalent to adding approximately 180 pounds per square foot to the blast area. Conservatively assuming the on-site trench spoil would have a weight that is approximately ½ of sand, using 3 to 4 feet on the blast would accomplish the same level of noise reduction. This methodology was used during blasts along Highway 26 where noise levels remained below 92 dBA at 125 feet.

Additionally, mass could be added, as necessary, by covering the blast area with layers of blast mats. Blast mats are normally made of old tires or rubber conveyor belts and are very effective at reducing blast overpressure and noise. Typically, blast mats can weigh as much as 50 pounds per square foot. As shown in Figure 3 typical blast mats would require the use of a loader, crane, or heavy-duty forklift to move and place the mats.

Figure 3. Typical Blast Mats Made from Used Tires

3.2. Project Blast Noise Level Projections

The estimated noise reduction at each frequency for the proposed mitigation was added to the A-Weighted spectrum of the expected blast noise levels. The resulting overall A-Weighted noise level with mitigation for blasting was calculated based the measured blast data found in Figure 2. Table 3 summarizes the proposed blast scenario used for the final analysis.

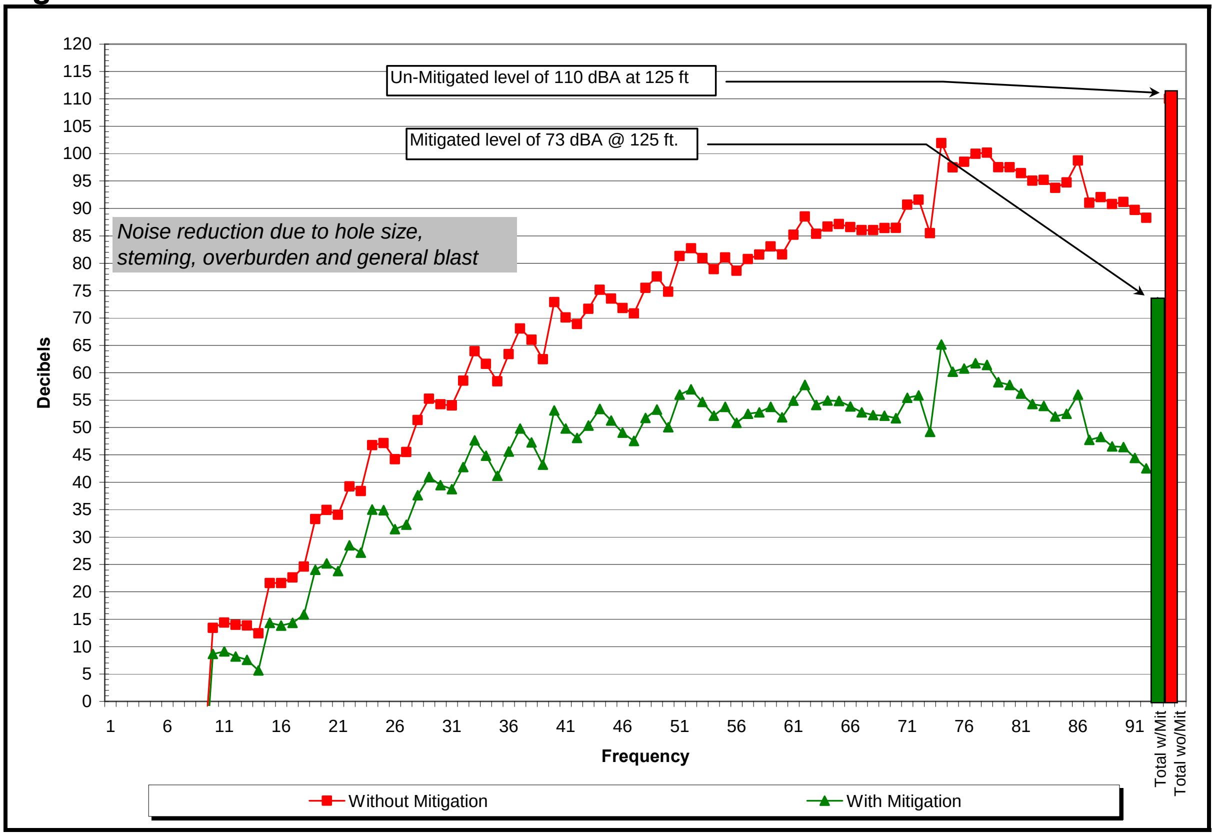
Table 3. Typical Blasting Scenario		
Blast Information	**Hard Rock Details**	**Soft Rock Details**
Diameter of borehole	2.5 inches	2.5 inches
Depth of borehole	Minimum 4 feet, Maximum 8 feet	Minimum 4 feet, Maximum 8 feet
Spacing	5ft x 5 ft (dice for ditch)	4 x 4 or 5ft x 5 ft zipper
Burden	5ft x 5ft	4 x 4 or 5ft x 5ft
Stemming	pack holes with sand	pack holes with sand
Surcharge	3- 4ft of onsite inert material	3- 4ft of onsite inert material
Holes per delay	1 to 2	1 to 2
Estimated pounds per delay	2 - 8 lbs for single delay/ double delay	2 – 5.5 lbs for single delay/ double delay
Subdrill	2 ft minimum	2 ft minimum
Initiation system	Nonel Detonator 25, 33	Nonel Detonator 25, 33
Delay between holes	25ms or greater (for a minimum 8ms interval)	25ms or greater (for a minimum 8ms interval)
Explosive type	NG based or Semi-Gelatin	Booster or detonator Sensitive Emulsion

(Source: Explosive Product Divisions Blaster's Handbook, 1989, and Rosenthal, 1987)

Table 3 also calls out several of the project noise mitigation measures that will be used for virtually all blasting. This includes using 2.5 inch holes adequate depth, and a blast plan that will be adopted depending on the type of rock. 3 to 4 feet of stemming material will be used to help restrict air overpressure and contain the energy in the rock. In addition, surcharge material may be added to further mitigate fly rock and noise based on principles of the mass law. Finally the project may utilize several different types of explosives, selected to best match the type of rock, size of blast, and other conditions, resulting in reduced air overpressure and associated noise.

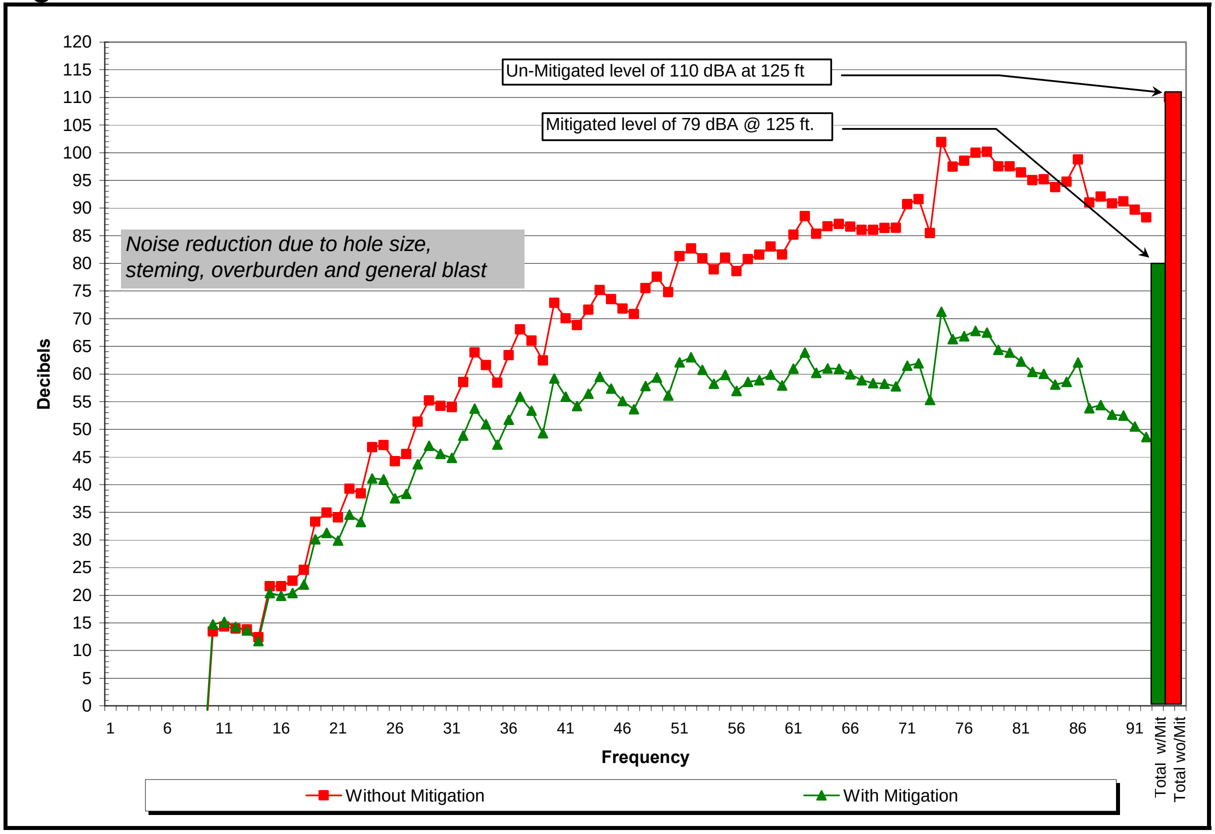
Projections were performed for both hard rock, such as granite, and softer rocks, such as sandstones, and many volcanic composites. Noise levels from blasting in softer rocks are often higher due to escaping air over pressure and energy that is not absorbed by the rock. The predicted noise levels at each frequency and the overall A-Weighted blast noise levels, with and without the proposed mitigation, for hard and soft rocks are given in Figures 4 and 5 respectively. The calculated levels assume 2.5" hole size, stemming, and a conservative effective mass of at least 12 pounds-per-square-foot of onsite inert material. Even though the actual mass applied to the blast area could be greater, experience with blasting and the mass law's ineffectiveness below 125Hz suggests the use of a very conservative effective mass for blast noise prediction.

Figure 4. Hard Rock Blast Noise Predictions at 125 feet



Source: (MM&A, Inc.1996 – 2000, and 1994 - 1997)

Figure 5. Soft Rock Blast Noise Predictions at125 feet



Source: (MM&A, Inc.1996 – 2000, and 1994 - 1997)

The data in Figures 4 and 5 shows that the noise levels from blasting (with mitigation applied) at 125 feet are 73 dBA for hard rock blasts and 79 dBA for soft rock blasts. This level is derived by logarithmic addition of the data in the graph. Projections of blast noise levels versus distance are given in Section 3.3.

3.3. Blast Noise Level with Distance

Using the data from Figures 4 and 5, projections for blast noise levels with distance was performed for hard and soft rock blasting. In addition, considerations of potential high propagation or reflections were also considered. Based on this, three different noise reduction projections were calculated conservatively for each rock type. Table 4 provides a summary of the distance to the 92 dBA contours for each scenario and under different propagation conditions. Due to potential issues related to the blast overpressure, the minimum distance of 125 feet is used as a minimum distance for safe blast noise levels. Figure 6 presents distance versus noise level curves used to obtain the data in Table 4. Figure 7 shows mitigated blast noise projections under worst-case propagation conditions blast noise out to 10,000 feet from the blast site. Predicted noise levels remain below 92 dBA at 175 to 200 feet.

Table 4. Distance to 92 dBA under Different Conditions			
	Distance to 92 dBA Noise Level		
Propagation Conditions	**Un-Mitigated**	**Soft Rock**	**Hard Rock**
Normal[1]	Up to 4000	Less than 125 feet	Less than 125 feet
Moderate[2]	Up to 5000	125 feet	Less than 125 feet
High[3]	> 5500	200 feet	125 feet

Notes:

1. Normal assumes moderate temperatures and minimal reflective surfaces
2. Assumes colder temperatures, or reflective surfaces, or a low pressures system
3. Assumes combined low temperature with inversion, wind in the direction of the noise sensitive land use and low dense cloud cover.

Figure 6. Noise Levels vs. Distance for Hard and Soft Rock Blasting

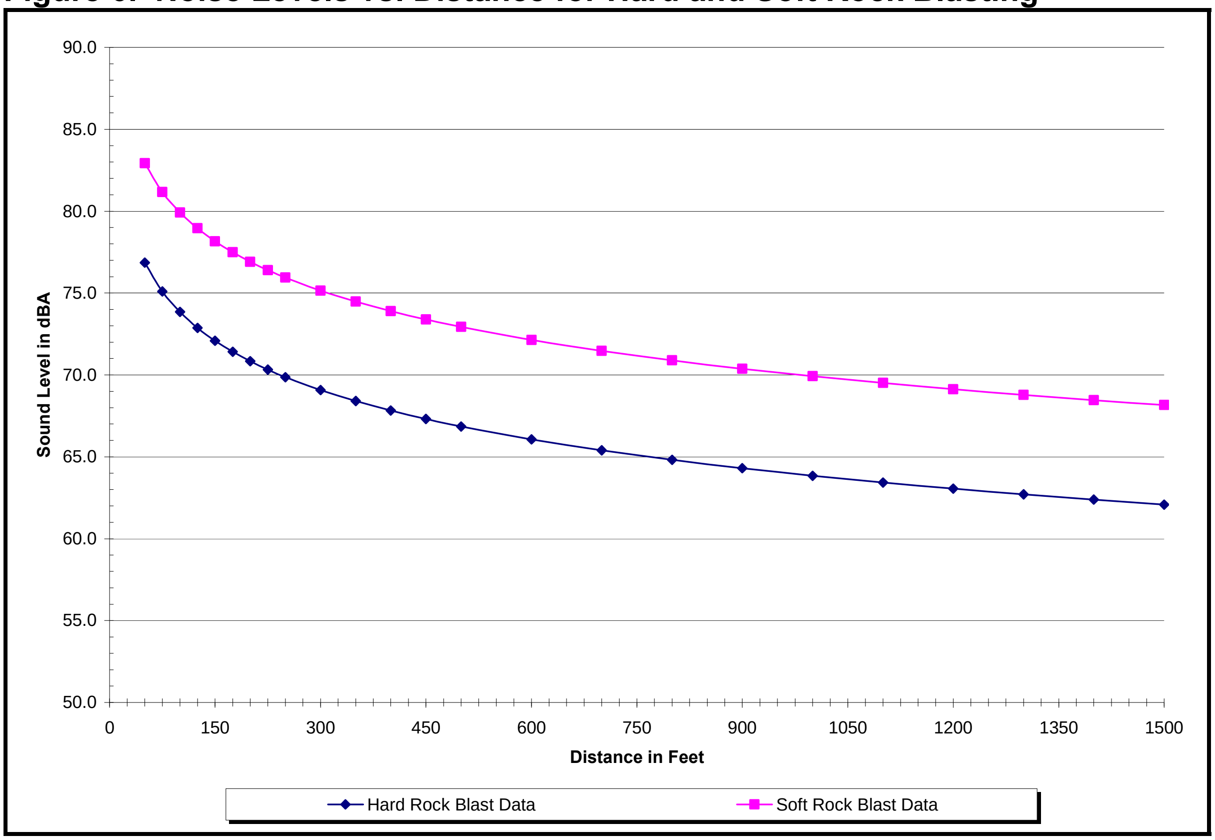
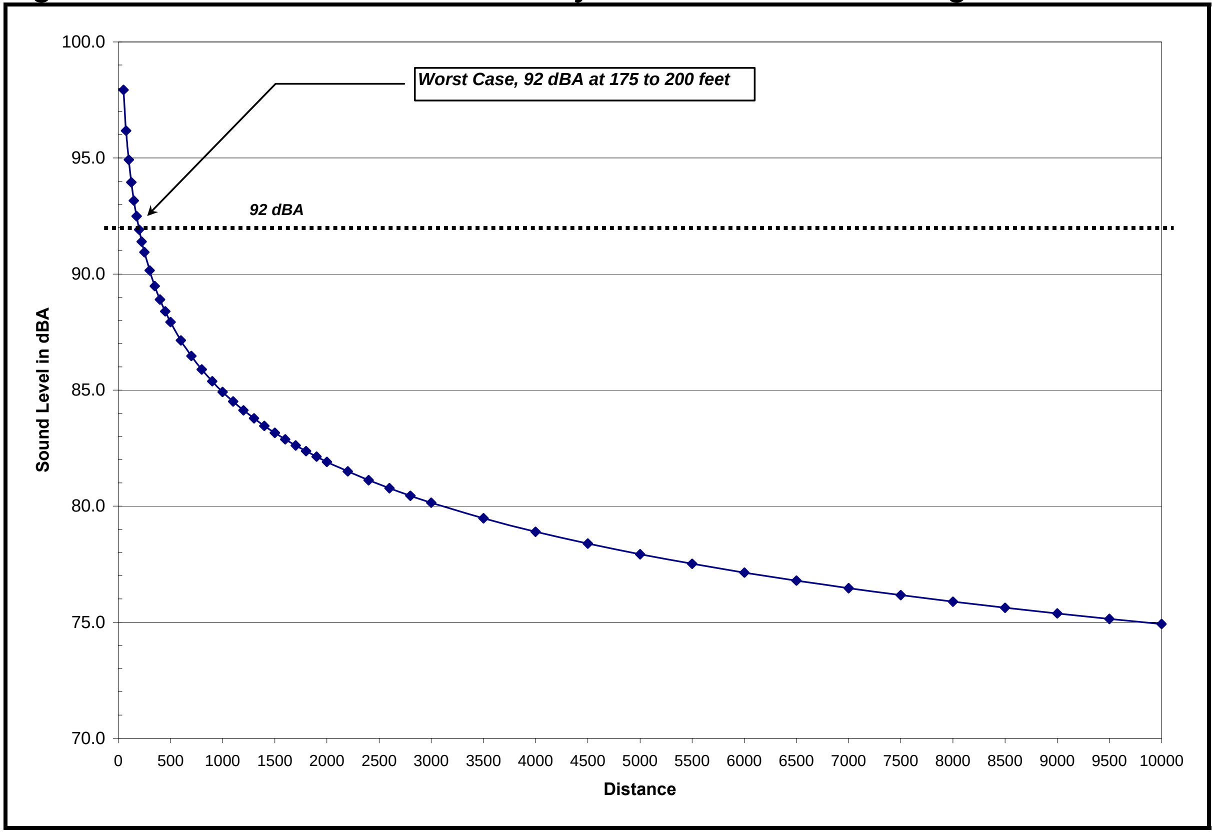


Figure 7. Worst Case Blast Noise Projections in dBA with Mitigation



3.3.1. Supplemental Blast Noise Mitigation

If the contractor was in a situation where blasting had a potential for blast noise impacts, additional blast mitigation could be applied to allow the blasting to continue. For example, adding an additional 180 lbs/sq-ft of sand or using additional blast mats could result in an additional reduction of up to 3 dB and allow for blasting under moderate conditions using the normal propagation characteristics.

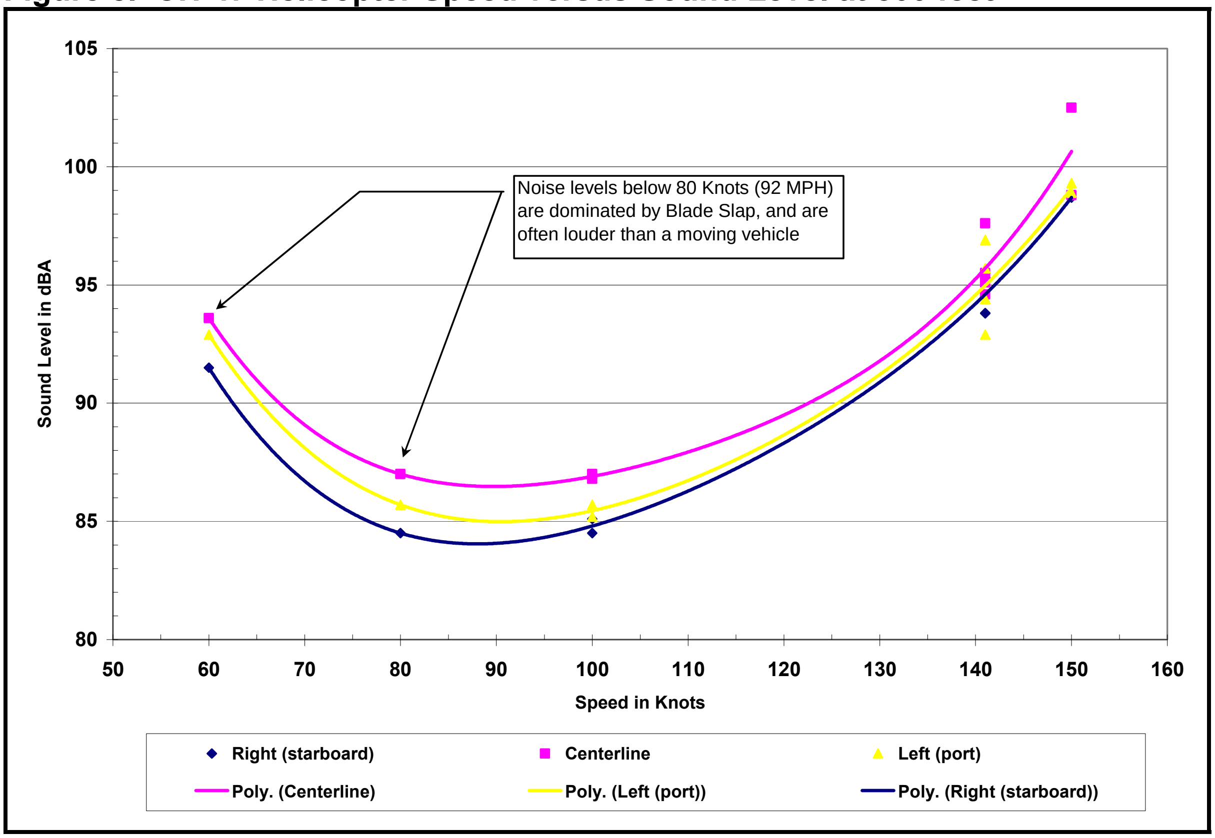
4. Helicopter Noise Modeling Results and Exposure Contours

Helicopter data was examined for the two types of aircraft proposed for the project. The Boeing Chinook (CH-47) is one of the loudest helicopters, with the Boeing Vertol 107 (CH-46) being only slightly quieter (1 to 2 dBA, depending on load). Therefore, the worst case CH-47 helicopter was used in this analysis.

4.1. Chinook CH-47 Noise Contours

Data from testing of the CH-47 helicopter was used to create sets of noise level curves, frequency spectrums, and finally, used to project the noise levels versus distance (Federal Aviation Administration 1977 and 1984). Because the speeds of the helicopter would be below 80 knots during most operations, the 80 knot noise level was used as the reference noise level. Noise levels from Ch-47 and Ch-46 helicopters actually increase for speeds less than 80 knots as the major noise source during operation at slower speeds is the blade slap. Blade slap is also the major noise source during hovering, loading, delivery and landing operations. Figure 8 is a plot of the measured noise levels versus speed for a typical CH-47 flyover as measured at 500 feet. The data is presented to show that at lower and higher speeds, noise from the helicopter would increase. The higher travel speeds would only occur during return trips when the vehicle is unloaded or lightly loaded and would likely fly at higher elevations (greater then 1000 feet), making noise impacts less of an issue. The graph shows that at speeds less or greater than 80 knots, the helicopter should attempt to maintain higher elevations.

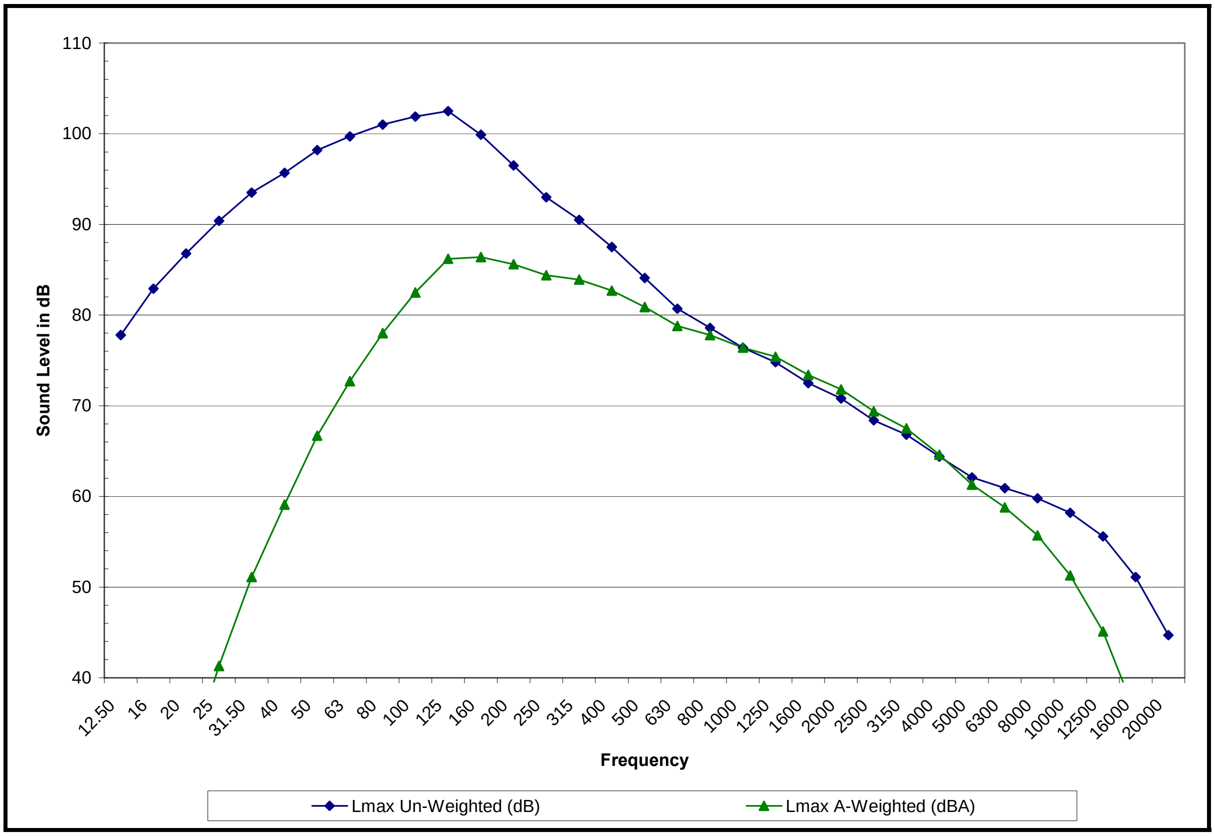
Figure 8. CH-47 Helicopter Speed versus Sound Level at 500 feet



Source: Federal Aviation Administration 1977

Second, based on noise levels measured by the FAA, a typical frequency spectrum for the CH-47 was developed and plotted. This is a crucial step, as different frequencies travel at a different speeds and also attenuate at different levels. A sound level versus frequency plot was developed for un-weighted and A-weighted noise levels based on the measured data. The frequency spectrum is shown in Figure 9. As with most helicopters, the main noise source is in the lower frequency range.

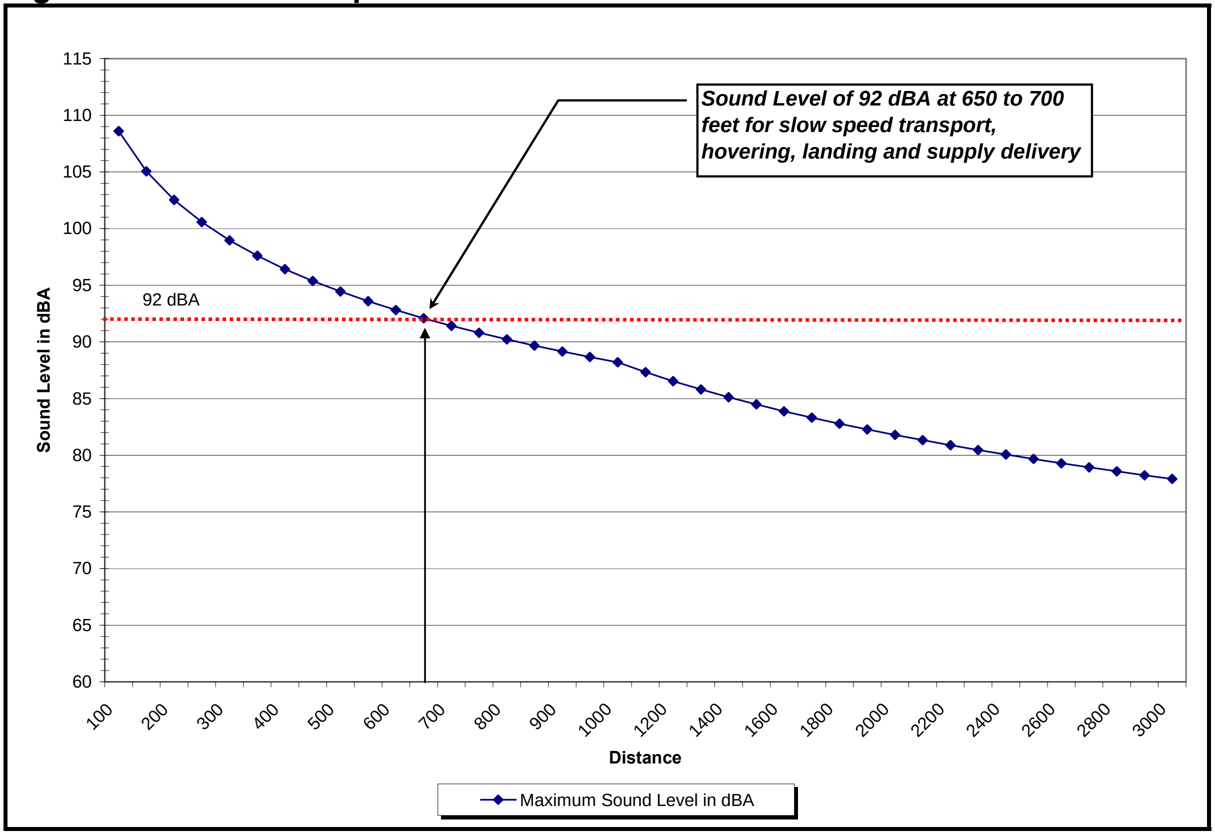
Figure 9. Frequency Spectrum for typical CH-47 Helicopter Fly-Over at 80 Knots



Source: Federal Aviation Administration 1977, 1984 and NASA 1983

Finally, a noise versus distance plot for the CH-47 was developed based on a speed of 60 knots (69 MPH) where blade slap is the dominate noise source. Figure 10 shows that the noise levels from the CH-47 would exceed 92 dBA at distances less than 650 to 700 feet. Therefore, maintaining an elevation of greater than 700 feet in route to the construction sites would maintain ground noise levels below the 92 dBA criteria.

Figure 9. CH-47 Helicopter Noise Levels versus Distance at 60 Knots or less



4.2. Helicopter Noise Mitigation

There are primary methods of reducing the noise levels from heavy transport helicopters include maintaining optimal flight speed of 80 to 90 knots (92 to 104 MPH) and increase the distance between the helicopter and noise sensitive receivers. Maximum distance and altitude separation from noise-sensitive areas is the most effective means of noise abatement. In addition, noise can be minimized by using controlled movement that is gradual and smooth. Some other general mitigation factors for the CH-47 and CH-46 are given below.

Noise exposure is

- Less on the left side than on the right side of the helicopter
- Less to the sides of the flight path than directly underneath
- Less upwind than downwind of the helicopter

Takeoff and Climb Mitigation

- Plan takeoff path away from noise-sensitive areas.

- Climb to cruise altitude at best rate of climb airspeed.

Landing and Approach Mitigation

- Plan the approach and landing to keep noise-sensitive areas forward and to the left of the helicopter, if possible.

- Avoid descending directly over noise-sensitive areas.

5. Conclusion

Based on the analysis and supporting empirical data, noise generated during blasting and helicopter operations can be limited to 92 dBA at 200 feet and 700 feet, respectively, by following the guidelines provided in this report.

Under worst case noise propagation conditions, blast noise levels reduce to 92 dBA at a distance of 125 to 200 feet with the use of standard blast noise mitigation measures. Mitigation measures commonly applied to blast of this type include drilling small charge holes, stemming the blast holes with sand and placing inert material on top of the blast area. Additional blast mitigation, such as leaving more material or using blast mats may be used when necessary.

It should be noted, that on rare occasions, blasting could exceed 92 dBA at 125 to 200 feet due to air overpressure blasts. However, once the blasters are aware of the rock type, the next blast can be modified to maintain levels below the criteria.

For helicopters the worst case distance to the 92 dBA distance is 650 to 700 feet. The greater distance from helicopters is due to the directional aspects of the blade slap noise being directly toward the ground. There are no feasible noise mitigation measures for helicopter noise during hauling, as the slow speeds used during hauling results in blade slap being the dominate noise source. Other mitigation for helicopter noise includes operational restrictions, such as maintaining a high altitude and flight paths away from noise sensitive areas whenever possible.

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APPENDIX Q

NSO and MAMU Disturbance Maps and Tables

CONFIDENTIAL AND PRIVILEGED FILING

APPENDIX R

Alternatives

In the draft Environmental Impact Statement (EIS) prepared for the Jordan Cove Energy Project (Project) issued on March 29, 2019, the environmental staff of the Federal Energy Regulatory Commission (FERC) recommended that four route variations be incorporated into the proposed action: 1) Blue Ridge Variation, 2) Survey and Manage Species Variation, 3) East Fork Cow Creek Variation, and 4) Pacific Crest Trail Variation. In this appendix, we are including information pertaining to federally-listed threatened and endangered species relative to the aforementioned recommended route variations. Table R-1 compares the impacts resulting from the four route variations to the corresponding segments of the proposed action.

Based on the information presented in this appendix, we have concluded that incorporation of these variations into the proposed action would not change the effects determinations in the Biological Assessment (BA).

Blue Ridge Variation

The 15.2-mile-long Blue Ridge Variation is located between mileposts (MPs) 11 and 25 of the currently proposed Project (see figure R-1) and would deviate from the proposed route just south of the Coos River, continuing southwest across Catching Slough, turning south/southeast, generally co-located with an existing utility right-of-way before rejoining the proposed route near MP 25. Additional details regarding this variation can be found in appendix F of the FERC EIS.

When compared to the corresponding segment of the proposed route, the Blue Ridge Variation would require clearing less (about 32 acres less) late successional-old growth (LSOG) forest (late-successional forest stands greater than 80 years old); would substantially reduce the number of occupied and presumed occupied (3 and 14 less, respectively) marbled murrelet (MAMU) stands affected as well as acres of suitable MAMU habitat removed (about 29 acres less); and cross five fewer miles of Late Successional Reserves (LSRs) and 0.47 mile less of northern spotted owl (NSO) home range. LSOG forest stands have a well-defined, multi-tiered canopy, which creates microhabitats for many species (Bingham and Sawyer, Jr. 1991; Spies and Franklin 1996), including the federally listed NSO and MAMU. Additionally, the variation would affect 3 fewer acres of designated Riparian Reserves on Bureau of Land Management (BLM)-managed lands and about 15 acres less of NSO High nesting, roosting, and foraging (NRF) and NRF habitat. However, the variation is longer and would increase the number of perennial waterbodies crossed by 27, and increase the number of known and assumed anadromous fish-bearing streams crossed from 4 to 18, which would also increase the clearing of upland riparian vegetation associated with each crossing.

The primary trade-offs between the proposed route and the variation are between terrestrial (e.g., LSOG forest and MAMU stands/habitat) and aquatic resources (e.g., waterbody crossings and anadromous fish habitat). With respect to terrestrial and aquatic resources, the measures that would be implemented to avoid or minimize these impacts differ considerably. Constructing and operating the pipeline along the proposed route would result in a permanent loss of LSOG forest and would adversely affect MAMU; the applicants have very minimal options available for avoidance and minimization measures to address these permanent effects to upland resources (i.e., LSOG and MAMU), and have not proposed mitigation to offset these permanent effects. In contrast, some of the impacts on aquatic resources, waterbodies, and anadromous fish are expected to be temporary to short-term with implementation of Jordan Cove's and Pacific Connector's proposed impact minimization and waterbody restoration measures (e.g., Jordan Cove's *Plan*, *Procedures,* and *Erosion Control and Revegetation Plan*). The applicant has also proposed some mitigation for the effects to waterbodies and anadromous fish as part of the BLM's right-of-way grant application and proposed plan amendments (see appendix O.4 of this BA). However, some permanent unmitigated effects on waterbodies and anadromous fish would occur in the form of the permanent loss of mature riparian areas associated with affected waterbodies.

Our experience from reviewing stream crossings by FERC-regulated pipelines constructed in numerous habitats across the United States has confirmed that the short duration of the crossing and the prompt restoration of the stream bed and stabilization of the stream banks results in very few impacts on waterbodies that extend in time beyond the construction and initial restoration of the right-of-way. This is in part due to implementation of best management practices such as dry crossing methods, timing and duration, and restoration methods that are required by the FERC's *Plan* and *Procedures*, which are methods that the applicant has incorporated into their proposal. By comparison, the removal of LSOG habitat is a permanent impact for the operational right-of-way and, even in temporary work areas, recovery of the habitat would take at least 80 years.

As presented above and in table R-1, the Blue Ridge Variation would reduce impacts to some Endangered Species Act (ESA)-listed species (e.g., MAMU) while potentially increasing impacts to ESA-listed fish species (see table R-1); however, the reduction in impacts to MAMU would not be significant and would not result in the effects determination falling below the current "may affect, likely to adversely affect" determination. Similarly, the current determination of effects for all ESA-listed fish is "may affect, likely to adversely affect," and the potential increase in impacts resulting from inclusion of the Blue Ridge Variation on these species (related to the increase in proposed stream crossings and extent of riparian impacts) would not result in a change to this current determination for all listed fish species.

Survey and Manage Species Variation

The 0.1-mile-long Survey and Manage Species Variation is located between MPs 111.5 and 111.6 of the currently proposed Project (see figure R-2). Under this variation, the construction right-of-way between MPs 111.5 and 111.6 would be shifted at least 25 feet to the northeast, and the uncleared storage areas (UCSAs) on the southwest side of the construction right-of-way would be eliminated in order to provide a no-disturbance buffer for *Sarcodon fuscoindicus* (i.e., a Survey and Manage fungi species). This buffer is necessary to protect this species and to comply with the 2001 Survey and Manage Record of Decision to maintain the persistence of the affected species within the range of the NSO.

This variation is not expected to have any appreciable or differential effects on ESA-listed species compared to the currently proposed action.

East Fork Cow Creek Variation

The 0.4-mile-long East Fork Cow Creek Variation is located between MPs 109.7 and 109.8 of the currently proposed Project (see figure R-3). This variation consists of a modified crossing of the East Fork Cow Creek (EFCC) to avoid the parallel pipeline alignment between the upper reaches of the perennial streams in this area. Under this variation, the pipeline from MP 109.6 would proceed southeasterly, crossing a reach of the EFCC, and then continue east, crossing an upper reach of the EFCC. The variation then follows a gentle ridgeline to the south rejoining the proposed route at MP 109.9. This variation would negate the need for amendment UNF-2 on the Umpqua National Forest.

The primary advantage of the variation is that it would reduce the amount of pipeline (about 535 feet) that would parallel tributaries to EFCC. In this area between the tributaries, the proposed route alignment also traverses a narrow ridgeline that supports old-growth forest/high NRF habitat within Riparian Reserves. Avoidance of this area would reduce the potential for long-term restoration and monitoring of hydrologic features affected during construction. The route variation incorporates crossings that are perpendicular to the hydrologic features, reducing the risk of site destabilization and increasing the likelihood of successful stream channel restoration (thereby reducing impacts to ESA-listed fish species). The EFCC Variation is the same length as the proposed route and would result in less disturbance (0.12 acre) than the proposed route because of neck-downs along the construction right-of-way at the crossings of EFCC. The EFCC Variation would also affect slightly less old growth and NSO-suitable habitat than the proposed route.

Although this variation would have slightly reduced impacts to habitats that are used by ESA-listed species, the reduction in impacts would not be significant enough for the current determination of “may affect, likely to adversely affect” for ESA-listed fish and the NSO to be reduced to a “not likely to adversely affect” determination. Therefore, this variation would not significantly alter the analysis presented in the BA if it were to be included in the proposed action.

Pacific Crest Trail Variation

The 1.8-mile-long Pacific Crest Trail Variation is located between MPs 166.4 and 168.1 of the currently proposed Project (see figure R-4). This variation uses an alternative crossing location of the Pacific Crest Trail (PCT) compared to the proposed action. The variation would co-locate the pipeline with an existing Forest Service Road (3720-700) north of MP 167.8, and would minimize potential impacts on trail users by realigning the pipeline to an area of the trail that is adjacent to existing disturbance/intrusion from Forest Service Road 3720-700.

The variation would avoid crossing the PCT in an old-growth forest stand and a corresponding recreation corridor that lies between Peterson Snow Park and the Brown Mountain Shelter, thereby reducing visual impact from pipeline clearing on trail users. This would also alleviate the need for a multiple-year revegetating/screening plan at the proposed crossing location, which was expected to require ongoing monitoring to ensure new vegetation is successfully established post construction. The PCT Variation would also cross approximately 0.5 mile less of NSO nest patch and core areas, and would impact less old-growth habitat (175+ years old) than the proposed route.

Although this variation would have slightly fewer impacts to habitats that are used by ESA-listed species, the reduction in impacts would not be significant enough for the current determination of “may affect, likely to adversely affect” for the NSO to be reduced to a “not likely to adversely affect” determination. Therefore, this variation would not significantly alter the analysis presented in the BA if it were to be included in the proposed action.

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TABLE R-1

Comparison of Potential Effects on Federally-Listed Species Between Four Pipeline Route Variations and the Corresponding Segments of Proposed Route

Environmental or Habitat Factor a/	Pipeline Variation							
	Blue Ridge Variation	Corresponding Proposed Route (MPs 11.2R–25.2BR)	East Fork Cow Creek Variation	Corresponding Proposed Route (MPs 109.7–109.8)	Survey and Manage Spec. Variation	Corresponding Proposed Route (MPs 111.5–111.6)	Pacific Crest Trail Variation	Corresponding Proposed Route (MPs 166.4-168.1)
GENERAL								
Pipeline length (miles)	15.2	14.0	0.4	0.4	0.1	0.1	1.8	1.7
Pipeline length parallel or adjacent to existing rights-of-way (miles)	7.1	8.3	0.0	0.0	0.1	0.1	1.4	0.2
Construction area, including TEWAS (acres)	232.5	198.4	5.6	5.7	1.8	1.8	22.0	20.0
Uncleared Storage Areas (acres)	1.5	45.4	1.3	0.0	0.9	1.1	10.7	8.5
Permanent easement (acres)	92.1	85.0	2.6	2.6	0.9	0.9	10.7	10.0
Perennial waterbodies crossed (number)	30	3	2	2	0	0	1	0
Intermittent waterbodies crossed (number)	29	5	0	0	0	0	0	0
Anadromous fish-bearing streams crossed – known (number)	9	4	0	0	0	0	0	0
Anadromous fish-bearing streams crossed – assumed (number)	9	0	0	0	0	0	0	0
SPECIES-SPECIFIC								
Pipeline length within Gray Wolf Analysis Area (OR-7's previous AKWA) (miles)	NA	NA	NA	NA	NA	NA	1.8	1.7
Forest clearing within fisher Analysis Area (acres)	169.4	159.4	5.4	5.2	1.8	1.8	17.8	19.7
LSOG forest clearing within fisher Analysis Area (acres)	8.8	40.5	2.7	2.7	0.0	0.0	3.5	2.8
Pipeline length within MAMU terrestrial nesting analysis area (miles)	15.2	14.0	NA	NA	NA	NA	NA	NA
MAMU known occupied stands crossed (number) b/	0	3	NA	NA	NA	NA	NA	NA
MAMU presumed occupied stands crossed (number) b/	4	18	NA	NA	NA	NA	NA	NA

TABLE R-1

Comparison of Potential Effects on Federally-Listed Species Between Four Pipeline Route Variations and the Corresponding Segments of Proposed Route

	Pipeline Variation							
Environmental or Habitat Factor a/	**Blue Ridge Variation**	**Corresponding Proposed Route (MPs 11.2R–25.2BR)**	**East Fork Cow Creek Variation**	**Corresponding Proposed Route (MPs 109.7–109.8)**	**Survey and Manage Spec. Variation**	**Corresponding Proposed Route (MPs 111.5–111.6)**	**Pacific Crest Trail Variation**	**Corresponding Proposed Route (MPs 166.4-168.1)**
MAMU suitable habitat removed (acres)	3.0	32.2	NA	NA	NA	NA	NA	NA
NSO suitable habitat (high NRF and NRF) affected (acres)	8.8	23.8	2.7	2.7	1.8 c/	1.8 c/	4.9	2.8
NSO nest patches and core areas affected (acres) d/	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
NSO critical habitat affected (acres)	0.0	0.0	5.6	5.7	1.8 c/	1.8 c/	22.0	20.0
Waterbodies crossed within green sturgeon Riverine Analysis Area (number)	2	1	NA	NA	NA	NA	NA	NA
Green sturgeon critical habitat waterbodies crossed	0	0	NA	NA	NA	NA	NA	NA
Waterbodies crossed within coho salmon SONCC ESU Riverine Analysis Area (number)	NA	NA	NA	NA	0	0	0	0
Construction area within coho salmon SONCC ESU Riverine Analysis Area (acres)	NA	NA	NA	NA	1.8	1.8	22.0	20.0
Perennial and intermittent waterbodies crossed within coho salmon Oregon Coast ESU Riverine Analysis Area (number)	59	8	2	2	NA	NA	NA	NA
Coho salmon Oregon Coast ESU critical habitat waterbodies crossed (number)	7	4	0	0	NA	NA	NA	NA
Construction area within coho salmon Oregon Coast ESU Riverine Analysis Area (acres)	232.5	198.4	5.6	5.7	NA	NA	NA	NA

NA = Not Applicable because the variation and corresponding segment of proposed route are outside of the species Analysis Area.

a/ Includes factors evaluated for listed species for which the species Analysis Area in this BA overlaps the four variations considered, or generally for species that could occur between MP 11 and MP 168 of the Pacific Connector Pipeline. Does not include factors for species that would occur in marine or estuarine waters (whales, short-tailed albatross, sea turtles, and Pacific eulachon, as well as the marine and/or estuarine analysis areas for MAMU, green sturgeon, and coho salmon (SONCC and Oregon Coast ESUs)), species that would only be affected by the LNG terminal facilities (Pacific marten and western snowy plover), and species with Analysis Areas in specific locations that do not overlap the variations (Oregon spotted frog, vernal pool fairy shrimp, Lost River sucker, shortnose sucker, and the six plants included in this BA).

b/ Known occupied stands are confirmed occupied based on surveys completed following species-specific protocol (Mack et al. 2003). Presumed occupied stands have not been surveyed.

c/ Estimated from figure 3.3.4-1 of this BA.

d/ See table 3.3.4.1-15 of this BA. For the Pacific Crest Trail Variation this is updated data from that presented in the EIS.

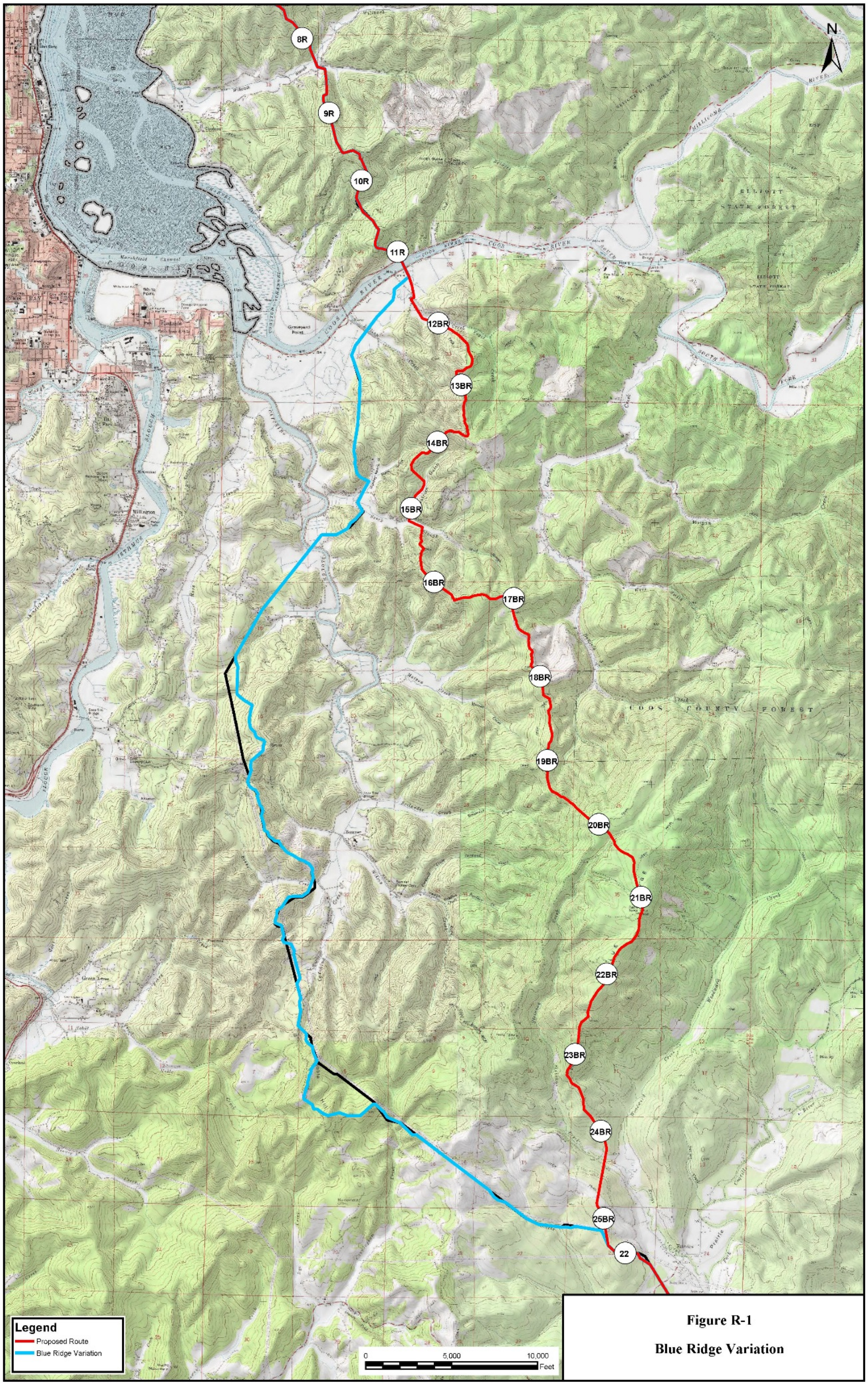

Figure R-1

Blue Ridge Variation

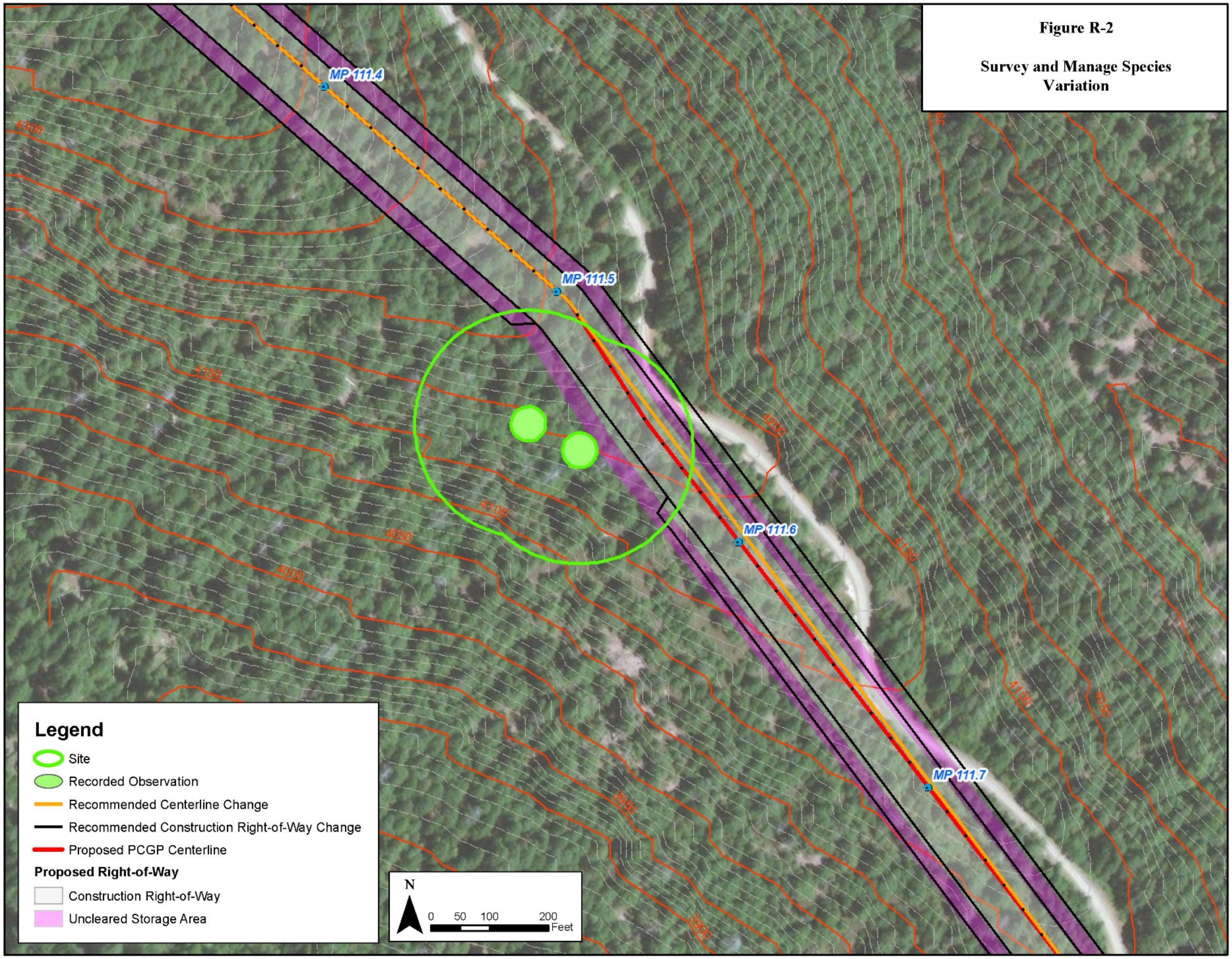
Figure R-2
Survey and Manage Species Variation
MP 111.4
MP 111.5
MP 111.6
MP 111.7
Legend
Site
Recorded Observation
Recommended Centerline Change
Recommended Construction Right-of-Way Change
Proposed PCGP Centerline
Proposed Right-of-Way
Construction Right-of-Way
Uncleared Storage Area
N
0 50 100 200
Feet

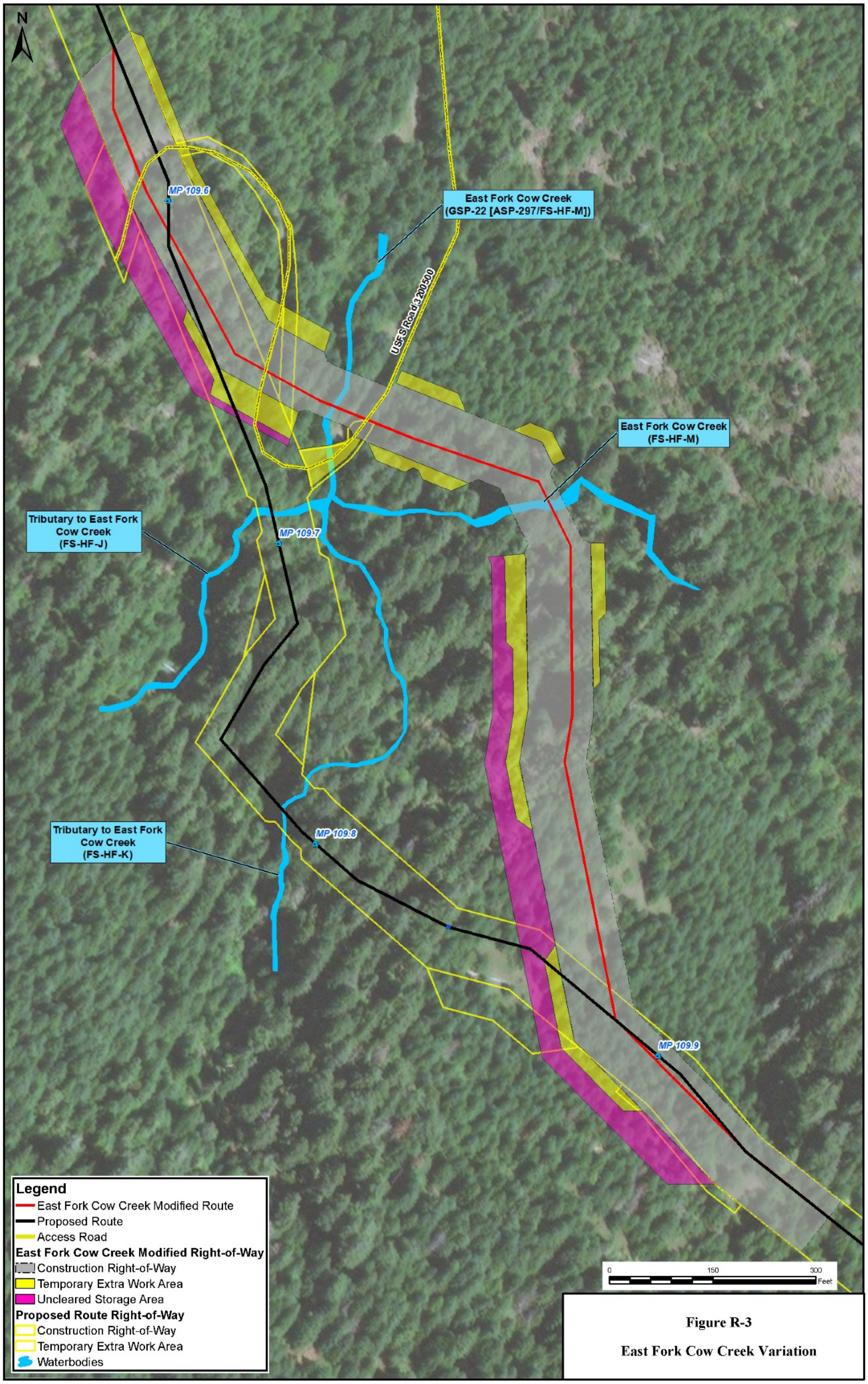

Figure R-3

East Fork Cow Creek Variation

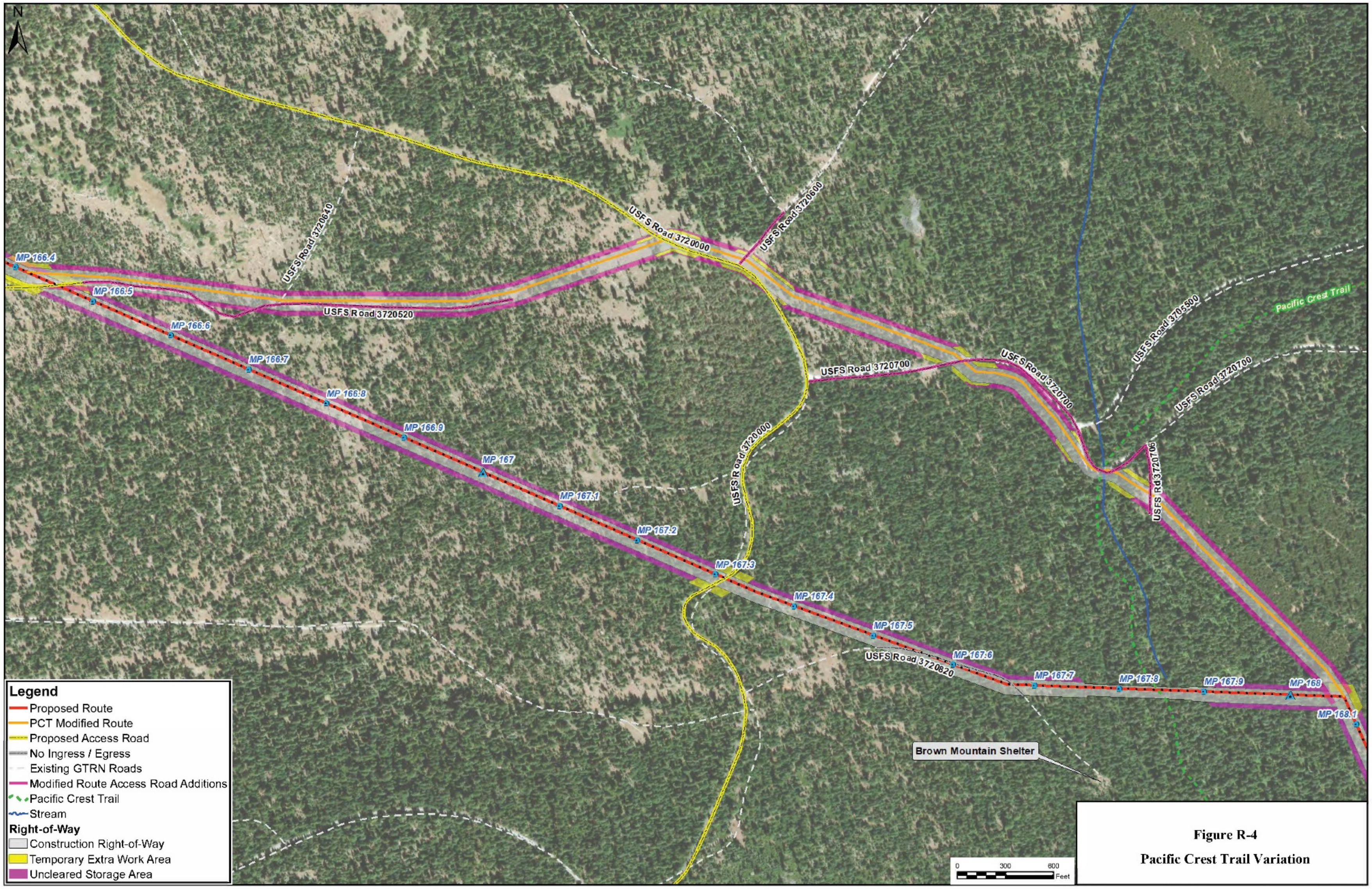

Figure R-4
Pacific Crest Trail Variation

APPENDIX S

Records of Conversations

From: Staci MacCorkle
To: Rebecca Buseck
Cc: Randy Miller (Randy.Miller@williams.com); Dan Duce; bill.vanderlyn@williams.com; Doug_Young@fws.gov
Subject: PCGP - NSO Survey Guidance
Date: Tuesday, December 11, 2012 2:24:33 PM
Attachments: image002.png

Hi Rebecca,
I understand you are travelling today, so disregard my earlier e-mail request for a phone call today. I wanted to get FWS' NSO survey recommendation to you now that we have run it through the review process. See below and give me a call if you have any questions.

FWS response to Williams' request for NSO survey guidance:

Background: Full protocol NSO surveys have been completed along the entire route of the Pacific Connector pipeline project. These surveys established locations of NSO pairs and singles, and were combined with historic NSO locations and predictive sites to establish "least NSO impact" pipeline routing and timing/distance buffers for each site. Additionally, we understand that the upcoming Section 7 consultation will assume all unoccupied known and predictive sites are occupied. Combined, the completed NSO surveys and other conservative routing/BMP commitments/assumption that all NSO sites are occupied serve as important avoidance and minimization of NSO impacts during pipeline construction and operations.

Williams recently requested FWS guidance on whether additional, full-protocol NSO surveys were necessary. FWS technical experts considered this request and determined that further NSO surveys would only be necessary if there were additional opportunities to further reduce incidental take to individual NSO.

FWS therefore recommends:

- Additional protocol NSO surveys across the entire project are not necessary, however preconstruction spot check surveys are recommended.
- A single year of preconstruction NSO spot check surveys are recommended, with at least 3 site visits to confirm occupancy status, to inform additional opportunities to fine-tune timing or distance buffers around active NSO activity centers.
- Spot check surveys should occur in all known, historic, and predicted NSO Home Ranges, but only in those areas where the activity center occurs on or within the Disturbance distance range from Project activities. The disturbance distance for the recommended surveys is based on the noise analysis conducted for the most impactful Project activity(s).

I hope that is helpful!
Staci

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PC TRASK
AND ASSOCIATES

Table S-1
Working/Discussion Table for Collaborative Discussions with Agency Biologists (FWS, BLM, USFS), OSU Demographic Study (Steve Andrews), Pacific Connector, and Edge Environmental
Regarding Northern Spotted Owl Activity within the Proposed Pacific Connector Gas Pipeline Project Area
(*Note: the table does not include all the NSO sites that were analyzed for the proposed project, just those sites that were included in discussions*)

Participants (via conference call, email, and/or individual phone communications): Rob Horn and Nancy Duncan (BLM Roseburg), Dave Roelofs, Linda Hale, and Steve Haney (BLM Medford), John Guetterman, John Chatt, and Holly Witt (BLM Coos Bay), Steve Andrews (OSU Demographic Study – Rogue River-Siskiyou/Fremont-Winema N.F.), Ray Davis (Umpqua N.F.), Norman Barrett (Rogue River – Siskiyou N.F.), Bridgette Tuerler, Scott Center, and Doug Young (FWS), Steve Hayner (Lakeview BLM), the Pacific Connector surveyors – Siskiyou Biological Surveyors (Romain Cooper, Lee Webb, and Clem Stockard), Randy Miller (Pacific Connector), and Rebecca Buseck and Dan Duce (Edge Environmental, Inc.).

Project Location [1]		Site ID [2]	Site Name	NSO Status [3]	Distance From Project Centerline or Rock Source (feet) [4]	Distance to Access Road within 1/4 mile (feet) [5]	CHU or LSR	MAP ID[6]	Comments	Discussion/Resolution	Additional Actions/Comments
Nest Patch	**1/4 mile**										
Coast Range Physiographic Province											
37.77-37.94	37.47-38.25	P804G*	Predicted	P - surveyed	0	N/A	OR-60	35.0 Big Creek	RS (paired with STVA) located within core area 2008; unknown located in core area in 2007	PCGP 035.0 resident single to be considered best location (see below); discontinue consideration of predicted site for BA analysis	will keep in BA for information purposes but not anlyze (see site below).
N/A	37.61-38.19	**PCGP 035.0**	**Big Creek**	08 - RS	425	N/A	OR-60	35.0 Big Creek	**Should this site be considered rather than Predicted owl P804G?** Note: this owl paired with STVA	analyze this site - NSO activity documented in 2007/2008	**analyze.** *Still analyze disturbance from nest patch rather than site b/c no nest located.*
Klamath Mountains Physiographic Province											
N/A	81.73-82.10; EAR 81.15	**PCGP 081.4**	**South Myrtle**	08-PR, N	775*	1230*	neither	81.4 South Myrtle	Nest site located in 2008 (failed); BLM considers alternate nest site of Wood Creek (MSNO 0361O).	Analyze this site rather than MSNO 0361O since most recent activity documented here and worst case scenario. But, make note that this is an alternate site to Wood Creek 0361O (below).	**analyze.** will change name to Wood Creek and change Site ID to 0361A (PCGP 81.4). *Consider disturbance buffer from site rather than nest patch.* **Roseburg BLM provided confirmation and updated UTMs (NAD 83): 485572E, 4764428N)**
N/A	N/A	0361O	Wood Creek	K	2,135	N/A	neither	81.4 South Myrtle	analyzing all three "Wood Creek" sites; surveyors indicated that BLM could not figure out what was going on in this area; NSO all over the place but not nesting. **Consider all Wood Creek sites?**	this site is alternate with no recent activity documented by PCGP or BLM; use alternate nest site (PCGP 81.4/MSNO 0361A) which is also more conservative for BA analysis (see above)	will keep in BA for information purposes but analyze the alternate nest site above
EAR 84.22	84.30-84.86; EAR 84.22	**PCGP 084.1**	**Wood Creek**	07-PR	665	0	neither	81.4 South Myrtle	see above	This site is the known BLM MSNO 1984O alternate site, Wood Creek East and is considered an alternate site to the one 715 feet north of this site (UTMNAD83: 488219E, 4763279N). Analyze this site as worst case and provide information on its alternate site at above UTMs	**analyze.** rename this site to Wood Creek East and provide Site ID as MSNO 1984O (PCGP 84.1 Wood Creek); use BLM original site alternate provided 4/15/08 and 9/19/08 as nest location. *Consider disturbance buffer from site rather than nest patch.* **Received UTMs for 1984O alt site and will use for analysis.**

Project Location[1]		Site ID[2]	Site Name	NSO Status[3]	Distance From Project Centerline or Rock Source (feet)[4]	Distance to Access Road within 1/4 mile (feet)[5]	CHU or LSR	MAP ID[6]	Comments	Discussion/Resolution	Additional Actions/Comments
Nest Patch	1/4 mile										
N/A	N/A	**PCGP 083.3**	**Wood Creek**	08-PR	4,320	0	neither	81.4 South Myrtle	see above	During conference call thought this was an alternate site to Wood Creek East, but determined not - will analyze as its own site since not considered a site by BLM.	**analyze.** Per email communication with N. Duncan (9/18/08) this is not an alternate to Wood Creek East. Analyze as best location - nest patch not site.
90.08-90.33; EAR 90.19	89.82-90.59	PCGP 088.6	Bland Mountain	08-PR	0	0	neither	88.6 Bland Mtn.	best location based on survey results close to centerline BUT marginal habitat. **Any suggestions as to better location or stick with this site?**	possibly ash creek/4538 site since BLM located 4538 Pair late in season and barred owls located in 2008 could be pushing out; analyze this site as worst case scenario. BLM would not call this a new site	**analyze.** *Analyze disturbance from nest patch rather than site.*
N/A	N/A	4538O	Ash Creek	K	1,500	N/A	neither	88.6 Bland Mtn.		identify that this could possibly be an alternate site to the PR documented above in 2008 (PCGP 088.6 Bland Mountain). Will still analyze separately for worst case scenario.	**analyze.** *Continue to analyze disturbance from site.*
N/A	EAR 93.58-93.62	PCGP 91.0	St. John's Creek	07-PR	1,500	480	neither	88.6 Bland Mtn.		BLM doesn't consider this a new site. Will continue to analyze this '07 PR for BA	**analyze.** *Analysis on nest patch/best location.*
EAR 92.63	94.05-94.41	PCGP 91.6	St. John's Creek/Milo North	08-PR	1,305	0	neither	88.6 Bland Mtn.		BLM considers new site; both birds captured and banded; called Lower St. John's Creek MSNO 1998O (UTMNAD83: 495927E, 4753918N).	**analyze.** *Analyze from site rather than nest patch.* This site will change name to Lower St. John's Creek and Site ID as MSNO 1998O (PCGP 091.6). **Change UTM coordinates to reflect BLM's site location.**
95.18-95.41	94.89-95.66; EAR 95.54&96.29	PCGP 94.8	Milo South	08-PR	665	N/A	OR-32/LSR	94.8 Milo South		analyze; not enough information to assume an althernate to known sites S of site. BLM indicates that the NSO move around a lot here because of the limited habitat and this site could be an alternate to either 4052A or 3909O, but not enough data to provide information one way or other; MALE was seen with white band (BLM assumed white band with red polka dots) - Nancy Duncan indicated that three stout female has that coloring band, but not the male(s).	**analyze.** *Analyze disturbance from nest patch rather than site.*
EAR 95.54 & 96.29; EAR 97.95	N/A	4052A	Three Stouts	K	3,340	465	OR-32/LSR	94.8 Milo South		see above	**analyze**
N/A	EAR 97.95	3909O	No Doubt Stout	K	3,740	1,225	OR-32/LSR	94.8 Milo South		see above	**analyze**

Project Location [1]											
Nest Patch	1/4 mile	Site ID [2]	Site Name	NSO Status [3]	Distance From Project Centerline or Rock Source (feet) [4]	Distance to Access Road within 1/4 mile (feet) [5]	CHU or LSR	MAP ID[6]	Comments	Discussion/Resolution	Additional Actions/Comments
N/A	N/A	PCGP 97.6 Hatchet Creek/N&S Callahan		08-U	4,550	N/A	OR-32/LSR		located within core area of predicted owl site P035G.	move activity center/nest patch to this site and indicate that activity is associated with predicted site P035G below	**analyze**. *Use nest patch for disturbance analysis.*
N/A	N/A	P035G	Predicted	P - surveyed	4,025	N/A	OR-32/ LSR	94.8 Milo South	some unknowns (PCGP 97.6 Hatchet Creek) documented in core area (2008). **Keep this location?**	move activity center to where activity was documented in 2008 (best location PCGP 097.6 Hatchet Creek/N&S Callahan) and indicate that activity is associated with predicted site P035G	track but remove from analysis. analyze new best location for unknown status/activity in 2008 PCGP 97.6 Hatchet Creek (inserted above)
EAR 100.75	EAR 107.5; EAR 102.3	UMP 0420	Hatchet Creek South	K	2,345	425	LSR	100.8 Green Butte	new nest location provided by UMP in Feb 2008; RS documented in core area (2008 - 100.8 Green Butte see below); also unknown in 2007. **Should '08 RS below be considered UMP 0420? Or other suggestions?**	shifted UMP 0420 approx. 0.3 mi N/NE of original location near 2008 survey documentation and in better habitat further from STVA	**analyze**. *Use nest patch for disturbance analysis since nest tree location is unknown.*
N/A	N/A	**PCGP 100.8**	**Green Butte**	08-RS	2,145	0	neither	100.8 Green Butte	see comment above (UMP 0420)	Assumed to be part of the UMP 0420 pair.	no analysis - remove from activity center/ best location consideration.
102.12-102.25; EAR 102.3; EAR 101.77-101.92	101.74-102.51; EAR 102.3; EAR 102.62-102.83; EAR 101.77-101.92	PCGP 100.8	Green Butte	07-RS	0	0	OR-32	100.8 Green Butte	SBS best location moved by UMP to this location based on biologist habitat knowledge; nest patch overlaps SBS 2008 PR best location (see below). **Should PR location below trump this site?**	no longer consider this site - considered to be associated with new Callahan Creek Pair.	no analysis - remove from activity center/ best location consideration.
N/A	102.10-102.47; EAR 102.62-102.83; EAR 102.3	**PCGP 100.8**	**Green Butte**	08-PR	1,010	680	neither	100.8 Green Butte	within core area of RS best location in 2007 (**note**: UMP moved best location point & used for analyses - see PCGP 100.8 above). **Should PR location trump RS UMP location?**	no longer consider this site - considered to be associated with new Callahan Creek Pair.	no analysis - remove from activity center/ best location consideration.
		NEW UMP SITE	Callahan Creek	08-PR?				100.8 Green Butte		new site created based on habitat, topography, dates of detections, and adjacent barred owl detections; UMP assumes this site replaces '07 resident single site and computer generated site (P459G).	**ananlyze.** *Use nest patch for disturbance analysis purposes since no nest documented.* **Ray to verify with Scott Center - FWS that the changes are okay. Scott Center okayed.**
EAR 104.24	EAR 104.24	P459G	Predicted	P - surveyed	4790	0	LSR	100.8 Green Butte	barred and unknown documented in core area in 2008; PCGP 103.4 Pair located on edge of core area in 2008. **Activity far enough away to still consider point? (see survey area)**	remove this predicted site because now within new Callahan Creek Pair Site	no analysis - remove from activity center/ best location consideration.

Project Location [1]		Site ID [2]	Site Name	NSO Status [3]	Distance From Project Centerline or Rock Source (feet) [4]	Distance to Access Road within 1/4 mile (feet) [5]	CHU or LSR	MAP ID[6]	Comments	Discussion/Resolution	Additional Actions/Comments
Nest Patch	1/4 mile										
N/A	EAR 104.24	PCGP 103.4	Neuman Gap	08-PR	2,650	540	neither	100.8 Green Butte	located on edge of P459G core area (see above). **Would activity documented influence predicted site P459?**	no longer consider this site - considered to be associated with new Callahan Creek Pair.	no analysis - remove from activity center/ best location consideration.
N/A	EAR 102.3	PCGP 100.8	Green Butte	08-PR	3,280	990	neither			UMP created new pair activity site - Devil Creek; placed in adj suitable habitat based on 2008 survey data where pair was moused in off-site 50-yr plantation, just SE of '08 documented activity	**analyze**. Use nest patch for disturbance analysis since nest tree location is unknown.Change name and site id to reflect new UMP NSO Activity center.
EAR 104.84 & 105.14-105.32	EAR 104.84 & 105.14-105.32	PCGP 103.4	Neuman Gap	08-PR	2,385	0	neither	100.8/103.4	best location adjacent to UMP FS road (Granite T.S. - 3230100) - single lane. **UMP suggest better"best location"?**	UMP created new pair activity site - Upper Granite - based offsuitable habitat and 2008 survey data. Site was placed in suitable habitat at one of the detected '08 pair sites. As a result, predicted owl site P484G shifts slightly to South to maintain spacing requirements.	**analyze**. *Use nest patch for disturbance analysis since nest tree location is unknown.*Change name and site id to reflect new UMP NSO Activity center.
		P484G	Predicted	P - surveyed			neither	100.8/103.4		site moved approximately 0.25 mi south of original location to maintain spacing requirements after creating new pair activity site.	**analyze.** *Use site for analysis rather than nest patch.*
EAR 108.20	EAR 108.21	UMP 0499	Upper East Cow	K	2,740	0	neither	105.3 Drew Lake	last year UMP assumed PCGP 107.3 documented in 2007 was this site. **Same assumption for 107.3 PR documented in 2008 (below)?**	yes, same site; UMP moved UMP 0499 site 0.15 mi to other side of ridge to '07 PR site as "activity site" where young documented since no activity recorded in '08 and '07 surveys near historic site (1993)	**analyze.** *Use nest patch for analysis since no tree located.* **Analyze from '07 PR coordinates b/c closer to proposed project - check UTMs provided by UMP**
EAR 108.20	EAR 108.20	**PCGP 107.3**	**Wildcat Ridge**	08-PR	1,400	0	LSR	105.3 Drew Lake	PCGP 2008 site very close to PCGP 2007 site; last year UMP assumed this site to be UMP 0499; **assume UMP 0499?**	agree; this site is UMP 0499. use '07 PR site and call UMP 0499	document PR activity located in 2007 and 2008.
N/A	N/A	P473G	Predicted	P - not surveyed	7,040	N/A	neither	N/A		shifted this predicted activity center 0.2 mi NE closer to '08 documentations, even though the detections did not meet criteria for establishing an activity center; had previously been placed on private land; now in suitable habitat and FS land near Richter Mtn.	**Analyze.** *Analyze from nest patch as this is still considered a "predicted" site.* BUT, note that NSO were documented in 2008 in core area - 2 males and 1 female - not enough info to determine PR/RS status. This site was not previously considered b/c outside of the 1.3 mi radius, but with the shift it is now considered.

Project Location [1]											
Nest Patch	1/4 mile	Site ID [2]	Site Name	NSO Status [3]	Distance From Project Centerline or Rock Source (feet) [4]	Distance to Access Road within 1/4 mile (feet) [5]	CHU or LSR	MAP ID[6]	Comments	Discussion/Resolution	Additional Actions/Comments
110.14-110.35; EAR 110.22 & 110.27 & 110.34; EAR 110.68	109.87-110.61; EAR 110.22 & 110.27 & 110.34; EAR 110.68; EAR 109.84	PCGP 109.7	Peavine	07-PR	0	0	neither	109.7 Richter to 111.1 Peavine	SBS best location moved by UMP (and renamed) to this location; 2008 PR documented within core area of this site. **Still maintain/analyze UMP selected site?**	use same site.	**analyze**. *Use nest patch for disturbance analysis since nest tree location is unknown.*
N/A	EAR 112.07	**PCGP 111.7**	**Dead Horse**	08-PR	1,514	910	neither	109.7 Richter to 111.1 Peavine	last year UMP assumed PCGP 111.7 documented in 2007 was UMP 0409 (PCGP best location was located in nest patch - same as 2008 PR documentation); **assume 2008 PR location (indicated by purple dot) is UMP 0409 (below)?**	yes, same site. Use known site	document PR activity located in 2007 and 2008.
N/A	EAR 112.07	UMP 0409	Long Prairie	K	1,780	1,242	neither	109.7 Richter to 111.1 Peavine	**assume 2008 PCGP 111.7 above is this site?**	yes, same site	**Analyze.** *Use site for analysis rather than nest patch.*
West Cascades Physiographic Province											
N/A	EAR 126.27-126.59	4074O	Dry Indian	K	1,500	1,270	neither	125.8 Indian Creek	assumed 2007 PCGP 125.8 Indian Creek East - PR was MSNO 4074O since best location located in this nest patch. **Agree?**	yes, same site. Use known site. Also, additional NSO with "PR" unknown status documented in Home Range within 130 yr/60yr doug fir stand. Assume this is also part of this 4074 site	**Analyze**. *Use site for analysis rather than nest patch.* Document activity located in 2007/2008.
		PCGP 133.1	Obenchain Mountain North	07 - RS	620	720	neither	133.1 Obenchain	2007 PCGP 133.1 RS was "removed" from analysis when 2008 PCGP 133.1 PAIR/NEST documented; BUT, now see on map and over 1.25 miles away from original RS single status - located within core area of MSNO 3381A. **should PCGP 133.1 RS site return?**	previously suggested by conference call members that need to consider as worst case since not enough information available to indicate another site or altenrate of a known site. Further communications with Steve Haney/Dave Roelofs with Medford BLM indicated that this RS site was most likely a "passer-by" since only observed during V-1. No analysis necessary.	document that an unbanded 1yr old female documented in 2007, but not considered an activity center. No analysis.
133.59-133.70; EAR 133.59	EAR 134.14	**PCGP 133.1**	**Obenchain Mountain North**	07/'08 - P, N	3280*	1015*	neither	133.1 Obenchain	this site is located within core area of MSNO 2627B. **Is the 2008 PCGP NEST and this site the same pair?**	use this site for analysis; the best location documented in 2007 and other known site (2627B) surveyed in 2007/2008 documented no activity in 2007 and/or 2008. Medford BLM detected same PAIR with one fledgling and attribute that activity with site 2627C approximately 770ft to the East (further from the proposed project). Use the PCGP site/nest tree and indicate most likely an alternate tree for alternate site 2627C since this pair has bounced around the past few years from tree to tree on this private land	**analyze**. *Use site rather than nest patch for disturbance analysis.* Document activity/known sites below.
N/A	N/A	2627B	Obenmac	K	4,930	N/A	neither	133.1 Obenchain	**Should this site be considered in addition to KNOWN PCGP 133.1 nest site (above)?**	consider this site alternate to the nest located in 2008. no analysis. Medford BLM (Dave Roelofs) indicated that this PR/site has been monitored since 1991 and in 2004 started to nest in alternate trees/sites near 133.1 and known as alt site 2627C. Band data indicates same pair.	document that is an alternate site to the more recent activity detected near PCGP 133.1/2627C. See above

Project Location [1]		Site ID [2]	Site Name	NSO Status [3]	Distance From Project Centerline or Rock Source (feet) [4]	Distance to Access Road within 1/4 mile (feet) [5]	CHU or LSR	MAP ID[6]	Comments	Discussion/Resolution	Additional Actions/Comments
Nest Patch	1/4 mile										
EAR 134.14	134.22-134.88; EAR 134.14; EAR 134.87; EAR 134.70	PCGP 134.7	West Flank Obenchain	07-PR	155	0	neither	133.1 Obenchain	This is best location. Nest located approx 1/2 mile from this 2007 site in 2008 (see above). **Still consider this site in analysis?**	consider this site alternate to the nest located in 2008. no analysis.	MD BLM assumed this documented PR was most likely associated with the nesting PR documented in 2007 at 2627C so not necessary to analyze but document that a "best location" pair activity was detected in '07
N/A	136.36-136.97; EAR 136.46; EAR 137.13; EAR 137.14	P163G*	Predicted	P - surveyed	435	735	neither	133.1 Obenchain	unknown status documented in 2007 on edge of core area (just outside of map)	stick with predicted site since unknown located on edge of core plus status/sex unknown; activity included unsolicited contact (no calling), ate two mice, stayed in area until dawn then flew away.	**analyze.** *Continue to analyze disturbance from predicted owl site nest patch.*
N/A	EAR 150.35-150.64	PCGP 151.7	Heppsie Mountain	08-RS	2,040	1,030	neither			BLM MD indicated that there was not enough information to consider the male documented in June/July '08 to be associated with the PR documented in 3932A/Heppsie Mountain and to analyze as worst case scenario.	**analyze**. Analyze disturbance from nest patch.
N/A	EAR 150.35-150.64; EAR 152.36	**PCGP 151.7**	**Heppsie Mountain**	08-PR	2,660	215	OR-37	151.7 Heppsie	assumed 2007 PCGP 151.7 PR was the known MSNO 3932A (below) since located within nest patch; **same assumption for 2008 PCGP 151.7 PR since also located within nest patch of MSNO 3932A?**	agree this site is known MSNO 3932A	document PR activity located in 2007 and 2008.
N/A	EAR 150.35-150.64; EAR 152.36	3932A	Heppsie Mountain	K	2,980	876	OR-37	151.7 Heppsie	**assume this known site are the PAIRS documented in 2007 and 2008 (PCGP 151.7)?**	yes, same site; note documented pairs in 2007/2008	**analyze.** *Continue to analyze disturbance from known site*
N/A	N/A	0990 (RRS 2026)	Heppsie	K	3,920	N/A	OR-17/LSR		OSU documented male from this PR in 2008 within core area of PCGP PR documented in 2007 - below. 2007 PR also documented outside of this core area - roosting - by OSU demo surveys.	keep this site for analysis - a lot of activity recorded throughout the decades, although most recent activity outside of the core area - but further from the proposed project. Single male documented in site below paired with female in 2007 associated with this site.	**analyze**. *Continue to analyze disturbance from nest site. Indicate that activity documented below could actually be associated with this monitored site.*
N/A	155.76-156.16; EAR 155.49-156.00	**PCGP 155.2**	**Grizzly Creek**	07-PR	855	1,030	OR-37	155.2 Robinson Prairie	no NSO documentation in 2008, only STVA. RS located W of this site in 2008. **Should these be considered the same site and if so, which one?**	Steve Andrews/OSU Demo study indicated that there is a lot of turnover in this area. OSU documented male from RRS 2026/MSNO 0990 pair in this best location core area in 2008. PR documented in 2007 by PCGP may possibly be same pair as in RRS 2026/MSNO 0990 but without band data cannot say for sure. Analyze all three sites as worst case scenario.	**Analyze.** *Analyze from nest patch since no nest documented. Indicate that this may be the same pair located nesting by OSU demo study in 2007 at MSNO 0990/RRS 2026 site.*

Project Location [1]		**Site ID [2]**	**Site Name**	**NSO Status [3]**	**Distance From Project Centerline or Rock Source (feet) [4]**	**Distance to Access Road within 1/4 mile (feet) [5]**	**CHU or LSR**	**MAP ID[6]**	**Comments**	**Discussion/Resolution**	**Additional Actions/Comments**
Nest Patch	**1/4 mile**										
N/A	156.30-156.83; EAR 156.77	**PCGP 155.2**	**Robinson Prairie**	08-RS	800	860	OR-37/ LSR	155.2 Robinson Prairie	**see comment/question above**	OSU demo study documented single male associated with MSNO 0990/RRS 2026 activity site in 2007 PR core area in 2008 - possible this male documented in 2008 by PCGP is the same male but no band information to solidify. Andrews had indicated that two males had been documented but not visually before on this side of the hill. Worst case - analyze as separate activity/best location sites.	**Analyze.** *Analyze from nest patch as this is an activity site for RS male. Also indicate that this may be the male that OSU demo study documented in 2008 at the 2007 PR site above, but with no band data, difficult to determine.*
N/A	N/A	0624 (RRS 9030)	Robinson Prairie	K	2,430	N/A	OR-37/LSR		is this alternate site to RRS 0624 - below?	most recent NSO/nesting activity documented in 2006 at alternate site NW of recently analyzed site (2005 roosting); analyze the 2006 nesting site since closer to the proposed project and most recent activity.	**analyze.** *Analyze from 2006 visual nesting site NW of other site*
N/A	N/A	624	Robinson Prairie	K	1,360	N/A	OR-37/LSR		is this alternate site to RRS 9030/MSNO 0624 above?	Steve Andrews/OSU indicated that the RRS 0624 last had activity in 2004 and this was associated with 4334 Robinson Butte; habitat is recently cut and thinned - consider only analyzing site above. Is considered an alternate to the site above. **However, RRS (Norm Barrett) indicated that RRS identified nesting PR with 2 juveniles at site in 2006 - although this data came from OSU demo; unknown activity detected in 2004 - continue to analyze.**	**ANALYZE - recent nesting activity? (RRS); habitat has been recently cleared, including the "nest site". Document it has potential alternate site to RRS 9030/MSNO 0624 - but OSU documented Nesting PR in 2006 at that site, as well - so maybe not. MAY CHANGE TO NO ANALYSIS IF FURTHER DISCUSSION DETERMINES THAT ACTION. Continue to Analyze – activity/non-activity unclear.**
EAR 156.77	EAR 156.77	PCGP 155.2	Robinson Prairie	08-RS	3,745	0	OR-37/ LSR	155.2 Robinson Prairie	best location adjacent to UMP FS road (2815000). **Potential better location based on habitat or use this site for analysis?**	2008 male band does not correspond with any OSU demo males; possibly new site or owl from BLM study area?	**analyze.** *Analyze from nest patch rather than nest site since this is best location.*
161.22-161.40; EAR 161.41	160.93-161.65; EAR 161.15; EAR 161.41; EAR 160.84-160.89	PCGP 160.7	Big Elk	07-PR	0	0	OR-37/ LSR	160.7 Big Elk	this is best location from 2007 surveys **(apparent nest located and bird banded).** No NSO documented in core area in 2008 **(oops - yes documented - a male in nest patch)**. other PR best location documented in 2008 SE of this site. **Could these be the same or consider separately?**	this its own site - unbanded bird in 2007 was banded and apparent nest located with M/F taking mice. Roosting female documented by OSU in nest patch in 2007. Male located in nest patch in 2008. analyze this site.	**analyze.** *Analyze from nest site.*

Project Location [1]		Site ID [2]	Site Name	NSO Status [3]	Distance From Project Centerline or Rock Source (feet) [4]	Distance to Access Road within 1/4 mile (feet) [5]	CHU or LSR	MAP ID[6]	Comments	Discussion/Resolution	Additional Actions/Comments
Nest Patch	1/4 mile										
EAR 163.14	EAR 163.14; EAR 162.80-162.90	**PCGP 160.7**	**Big Elk**	08-PR	1,795	0	OR-37/ LSR	160.7 Big Elk	existing access road goes through nest patch of best location (FS 3700100); near RRS 2040. **Could these be same owls?** No survey info available from demo study yet this year	conversation/consulting with Steve Andrews/OSU study: this is most likely alternate site for RRS 2040/MSNO 0994. No nesting behavior detected recently but 2 juveniles detected with adults within larger contiguous patch of older forest in 2006/2008?. use juvenile site as "best location" and analyze from nest patch rather than a nest site for disturbance. Andrews also indicated that this could possibly be combined with the Cox Butte best location since the adults located were the Cox Butte banded owls "kicked out" by barred owls in 2006	analyze site below and document that PR activity was detected in 2008.
EAR 163.14	163.03-163.48; EAR 163.15-163.21; EAR 163.14	RRS 2040	No data	K	825	25	OR-37/ LSR	160.7 Big Elk	2008 PCGP 160.7 Big Elk documentation (RS) located in core area	discussed with Steve Andrews - possible alternate site with PCGP 160.7 Big Elk 2008 PR. Use 2006/2008? juvenile site as best location - see above.	***analyze.*** *Change analysis location to 2006/2008? juvenile location since no nest location recently and analyze disturbance from nest patch.*
EAR 164.29-165.93	163.87-164.20; EAR 163.95-164.21	RRS 2067	No data	K	1,020	610	OR-37/ LSR	160.7 Big Elk	surveyors documented "best location" for pair in 2008 (PCGP 163.4) within core area of this site. **Should these be considered same or separate owls for analysis?**	Steve Andrews indicates that this site is probably alternate activity site with PR documented at PCGP 163.4 Cox Butte in 2008 below. This site had visual roosting in 2005 and is closest to proposed pipeline, so analyze as worst case scenario even though most recent activity documented by OSU and PCGP was further from the proposed activity. Barred owls "kicked out" adults in 2006 and found closer to Cox Creek - MSNO 0994	***analyze.*** *Analyze from nest site.*
EAR 164.29-165.93	EAR 164.29-165.93	**PCGP 163.4**	**Cox Butte**	08-PR	2,830	0	OR-37/ LSR	160.7 Big Elk	2008 PR located on edge of RRS 2067 Core Area; BEST Location is located adjacent to FS Road 3720000. **Could this be same pair as RRS 2067 or consider separately?**	Steve Andrews with OSU considered activity at this site most likely to be associated with the RRS 2067/MSNO 4277 but without band information cannot be for sure. This site is further from the proposed action and is within more fragmented/harvested habitat. Analyze the MSNO 4277 site as worst case scenario even though more recent activity has been further from the proposed project area.	document the PR detection/gps tree location of M/F in 2008 by PCGP surveyors. Also indicate additional detections in/around core area detected by OSU in 2008 as well.
N/A	N/A	P917G	Predicted	P - surveyed	1,790	N/A	neither			this was a historic site that recently had NSO activity detected - not within the "nest patch" but within the core area. Will move this predicted site and change name to Buck Lake and use the MSNO 0023 - historic site. Use the VNG - single female location from July 2, 2008	***analyze.*** *Analyze from 2008 OSU VNG site closest to the proposed project. Analyze from nest patch rather than nest site b/c nest not located.*

Project Location [1]		Site ID [2]	Site Name	NSO Status [3]	Distance From Project Centerline or Rock Source (feet) [4]	Distance to Access Road within 1/4 mile (feet) [5]	CHU or LSR	MAP ID [6]	Comments	Discussion/Resolution	Additional Actions/Comments
Nest Patch	1/4 mile										

Notes:

[1] Columns provide construction spread and either the PCGP milepost range that is within the 1) the nest patch; 2) 1/4 mile from the NSO Nest Site or Nest Patch (predicted/PCGP best location). If an existing access road (EAR) is within or near the known or predicted NSO Site, its milepost designation is provided. Description of EARs associated with each NSO site are located in Table 4 in Appenidx Q.

[2] Site ID includes either Master Site Numbers (MSNO) provided by the agencies, a Predicted Site ID provided by FWS, a unique ID provided by Umpqua and Rogue River National Forests, or the Survey Area ID provided by surveyors for Pacific Connector and consist of PCGP and associated Milepost.

[3] Status indicates if a NSO Site is 1) K = Known (provided by BLM Districts or National Forests within the project area, or FWS); 2) 07/08 = owls(s) located during 2007 and/or 2008 NSO surveys for the PCGP Project - PR=Pair, RS=Resident Single, R-2=2 fledglings, N=Nest; 3) P -surveyed = a potential NSO site provided by FWS in 2008 and incorporated in 2007/2008 survey efforts; or 4) P - no survey = a potential NSO site provided by FWS in 2008 and was not incorporated in PCGP survey efforts - either beyond survey effort or not considered suitable NSO habitat.

[4] Distance is measured from 1) the known nest location (K or 07/08-N) to the centerline, 2) from the edge of a nest patch ('07, '08, and P) to the centerline (exception nest located – N). An asterisk after the distance value indicates that measurement is from the nest location if a nest (N) was located during NSO surveys in 2007 or 2008 ('07, '08).

[5] Distance is measured from 1) the known nest location (K or 07/08-N) to the access road or 2) from the edge of a nest patch ('07, '08, and P) to the access road. An asterisk after the distance value indicates that measurement is from the nest location if a nest (N) was located during NSO surveys in 2007 or 2008 ('07, '08).

[6] Map ID coordinates with PDF binder of northern spotted owl sites provided to group participants. Maps included spotted owl and barred owl sites collected by Siskiyou Biological Services in 2007 and 2008, monitoring and demographic survey data, BLM and Forest Service historic owl data including alternate nest sites, and FWS predicted spotted owl sites on aerial photography with geographical information (i.e., UTM coordinates, section lines, PCGP mile posts).

Table S-2

Working/Discussion Table for Collaborative Discussions with Agency Biologists (FWS, BLM, USFS), OSU Demographic Study (Steve Andrews), Pacific Connector, and Edge Environmental Regarding Northern Spotted Owl Activity within the Proposed Pacific Connector Gas Pipeline Project Area

(*Note: the table does not include all the NSO sites that are analyzed for the proposed project, just those sites that were included in discussions*)

Participants (via conference call, email, and/or individual phone communications): Rex McGraw (BLM Roseburg), Dave Roelofs, Robin Snider, and Steve Godwin(BLM Medford), John Guetterman and Steve Fowler (BLM Coos Bay), Steve Andrews (OSU Demographic Study – Rogue River-Siskiyou/Fremont-Winema N.F.), Jen Sanborn (Fremont-Winema N.F.), Rob Cox (Umpqua N.F.), Jeff VonKienast (Rogue River – Siskiyou N.F.), Scott Center and Doug Young (FWS), Steve Hayner (Lakeview BLM), Randy Miller (Pacific Connector), Eileen Stone (PC Trask & Associates), and Rebecca Buseck and Dan Duce (Edge Environmental, Inc.).

Project Location	MSNO or Site ID	Site Name	Owl Status	Date Highest Status (PR, RS, M/F)	NSO Activity Center within CHU and/or LSR	Distance from Centerline, EAR, or other Component (feet)	Comments	Discussion/ Resolution	Additional Actions/ Comments
COAST RANGE PHYSIOGRAPHIC PROVINCE									
near MP 37.51 in ROW	P804G	Predicted	P	N/A	None	0	CB provided in 2013; this area survyed in 2012; no NSO documented	2012 surveys documented NSO near this predicted site; no nest or pair located/documented	Analyze
36.33-39.52	PCGP 037.8 (P804G)	Big Creek[B]	’08-RS (PR w/ STVA)	2008	None	425	Surveyed in 2007/2008 and NSO documented - use this site rather than 804G	Do not analyze this site; surveys in 2012 documented NSO near this site, but more NSO documented in/near P804G in 2012	Do not analyze. Analyze predicted site P804G
36.46-38.54	2317A	Brewster Valley	K-PR	2012	None	5,750	Include this site; several NSO documented in 2012		Analyze

Project Location	MSNO or Site ID	Site Name	Owl Status	Date Highest Status (PR, RS, M/F)	NSO Activity Center within CHU and/or LSR	Distance from Centerline, EAR, or other Component (feet)	Comments	Discussion/ Resolution	Additional Actions/ Comments
KLAMATH MOUNTAINS PHYSIOGRAPHIC PROVINCE									
59.10-59.53	PCGP 059.2 (0239O)	Olalla/McNabb	'08-PR	2008	None	5,895	Considered this site previously but 540ft from (0239O - RO site considered in 2010); will not use - see next record (0239A); no nest documented - best location site		Do not analyze
58.95-61.87	0239A	Heart of Olalla	K	??	None	1,593	This site was provided in 2013 by Roseburg BLM - an alternate to 0239O (see above); this site is closest to the PCGP Project - will use this site.		Analyze
80.65-83.75	0361B	Wood Creek	K-P,N	2008	None	775	Alternate site 0361B was provided in Roseburg BLM 2013 NSOOM; this site will be used rather than 0361A used in 2008 because closer to PCGP Project.		This site will be analyzed, but NOTE: Pacific Connector considering a line alteration to hit clearcut off BLM and south of the current location and get out of nest patch

Project Location	MSNO or Site ID	Site Name	Owl Status	Date Highest Status (PR, RS, M/F)	NSO Activity Center within CHU and/or LSR	Distance from Centerline, EAR, or other Component (feet)	Comments	Discussion/ Resolution	Additional Actions/ Comments
82.97-86.31	1984O (PCGP 84.1)	Wood Creek[B]	K-PR	2007	None	1,380	Are 1984O and 1984A alternate sites? Should we be using both? Used 1984O in 2008 but Roseburg BLM provided 1984A as consultation site.	1984O is an old nest site (1988); more recent activity at 1984A and RO BLM uses for consultation. Use 1984A and not 1984O.	Do no Analyze.
83.10-85.22	1984A	WOOD CREEK EAST	K	??	None	2,966	see above	see above	Analyze.
83.66-87.32	PCGP 084.6	Wood Creek[B]	’08-PR	2008	None	3,750	Based on best location site during PCGP survey efforts in 2007/2008	Just an FYI	Analyze site
96.90-97.50	0296A	Mighty Fine	K	??	KLE-2 LSR	6,310	Site moved closer to PCGP Project	Just an FYI	Analyze site
96.80-98.38	PCGP 097.6	Hatchet Creek/N&S CallahanB	’08-U/M	2008	KLE-2 LSR	3,880	This is a best location site of an unknown sex and male documented in 2008.	Continue to analyze, along with 2096A and P020G. No direct guidance provided.	Analyze.
97.10-98.83	P020G	Predicted	P	N/A	KLE-2 LSR	4,831	Predicted site (Est. 20) provided by Roseburg BLM in 2013 NSOOM.	see above; no direct guidance provided so continuing to use all three sites.	Continue to analyze
99.25-102.00	4008B	Hatchet Creek South[B]	K	??	KLE-1 LSR	893	alternate nest site to 4008A or Umpqua 0420? Site provided by Roseburg BLM in 2013 NSOOM	Use this site; most recent activty at this site.	Analyze

Project Location	MSNO or Site ID	Site Name	Owl Status	Date Highest Status (PR, RS, M/F)	NSO Activity Center within CHU and/or LSR	Distance from Centerline, EAR, or other Component (feet)	Comments	Discussion/ Resolution	Additional Actions/ Comments
99.16-101.63	4008A	Hatchet Creek South[B]	K-PR,F	2002	KLE-1LSR	2,345	This site was provided in 2008 NSOOM; this nest patch overlaps UMP 0420 nest patch	No agency provided this site in 2012/2013 NSOOM; this site overlaps nest patch of UMP 0420 and is alternate of 4008B.	Do not Analyze
99.30-101.90	UMP 0420	Hatchet Creek South	K-PR	1992	KLE-1 LSR	2,985	This site was provided by UMP NF in updated NSOOM	Analyze this site; UMP NF provided in 2012 NSOOM and closer to habitat removal than 4008A	Analyze
WEST CASCADES PHYSIOGRAPHIC PROVINCE									
150.49-152.79	PCGP 151.9	Heppsie Mountain	'08-RS	2008	KLE-5	3,360	previously considered this site; Site 3932O had not been provided (see below)	do not use this site?	Do not Analyze; was Resident single; if anything, use 3932O
150.50-153.10	3932O	Hepsie Mountain	K-PR	2004	None	2,142	Medford BLM - NSOOM 2012 provided both sites 3932O and 3932A in analysis file. Are these alternate nest sites? Should both be considered?	Medford considers both sites (3932O a d 3932A) as separate sites. Analyze both	Analyze
151.76-153.90	3932A (PCGP 152.8)	Heppsie Mountain	K-PR	2008	KLE-5	2,980	see above. This site was analyzed in 2008, along with PCGP 151.9 (see above).	see above	Analyze

Project Location	MSNO or Site ID	Site Name	Owl Status	Date Highest Status (PR, RS, M/F)	NSO Activity Center within CHU and/or LSR	Distance from Centerline, EAR, or other Component (feet)	Comments	Discussion/ Resolution	Additional Actions/ Comments
161.81-164.49	994 (RRS 2040)	Cox Creek	K-PR,F	2006	KLE-4 LSR	875	FYI: keeping 2008 location because 2012 location provided by Rogue River NF in wrong locaiton; 2008 location right		Analyze
162.85-165.19	4277 (RRS 2067)	Cox Butte[B]	K-PR	2005	KLE-4 LSR	1,050	This site analyzed in 2008. New 4277 site provided in 2012 (2010 nest site).	will analyze 4277 and 944 (See above); demographic study treats these areas as a single site since Cox Butte owls were located in Cox Creek; analyzing . only discuss another more recent nest site at 4277A; 4277 has greater habitat effects than 4277A.	Analyze
EAR 161.41; 162.91-164.00	4277A	Cox Butte[B]	K-PR, N	2010	KLE-4LSR	5,363 (from ROW); adjacent to EAR	new nest site provided for this MSNO (4277) adjacent to access road; this site to be analyzed, as well - 1 mile from other site.	Will analyze older nest site 4277 and 994 and discuss this site (4277A); demographic study treats these areas as a single site since Cox Butte owls were located in Cox Creek; analyzing .	Do Not Analyze

APPENDIX T

Pacific Connector's Fish Salvage Plan

Pacific Connector Gas Pipeline, LP

Fish Salvage Plan

Pacific Connector Gas Pipeline Project

(During the previous NEPA process, PCGP submitted a Plan of Development to meet BLM Right-of-Way Grant requirements based on BLM regulations. These plans will be updated in consultation with the Federal land managing agencies [BLM, USFS, and Reclamation] during the current NEPA process.).

September 2017

1.0 INTRODUCTION

This fish salvage plan has been developed to minimize adverse effects to Endangered Species Act (ESA) listed salmonids (Southern Oregon/Northern California Coast coho salmon and Oregon Coast coho salmon), non-listed salmonids (Chinook, steelhead, cutthroat trout) and ESA-listed catostomids (Lost River sucker and shortnose sucker) during construction of the Pacific Connector Gas Pipeline Project (Pipeline project). The plan has been developed to:

1. Exclude fish from instream construction sites;
2. Minimize risk of injury or death while capturing fish that might remain after exclusion efforts,
3. Minimize risk of injury or death due to handling captured fish, and
4. Release fish to non-impacted environments.

Portions of the plan relevant to salvaging ESA-listed salmonids were adapted from the protocol developed by Washington State Department of Transportation (WSDOT, 2008) which specifies procedures to 1) isolate the work area, 2) remove fish and dewatering the work area, 3) handle, hold and release fish, and 4) document fish that have been captured, handled, held and released and notify the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). Application of the same protocol will be suitable for salvaging ESA-listed catostomids (Larson, 2009).

2.0 PERMITS

ODFW requires an Oregon Scientific Take Permit to take fish for scientific purposes, including rescue/salvage required for construction activities. (Required by ORS 497.298 and OAR 635-043, see http://www.dfw.state.or.us/fish/license_permits_apps/scientific_taking_permit.asp#oar).

In addition, an In Water Blasting Permit from the ODFW "is required for any use of explosives in the cause of removing any obstruction in any waters of this state, in constructing any foundations for dams, bridges or other structures, or in carrying on any trade or business" (Required by ORS 509.140, see http://licenseinfo.oregon.gov/?fuseaction=license_icon&link_item_id=14778).

For threatened endangered species, permits may be issued by NMFS and FWS for scientific research, enhancement of propagation or survival, and taking that is incidental to an otherwise lawful activity.

3.0 INSTREAM CONSTRUCTION

Construction across waterbodies will occur within the Oregon Department of Fish and Wildlife (ODFW) recommended instream construction timing window, although the majority of bridges, where required, will be installed prior to and removed after the instream timing window. General timing of activities for each of the 5 construction spreads is discussed below and shown schematically in Resource Report 1. A more comprehensive project description specific to each listed species will be included in the Applicant-Prepared Draft Biological Assessment (APDBA).

If water is present in the streambeds at the time of construction, PCGP will utilize a dry-open cut crossing method (flume or dam and pump) to cross all minor and intermediate waterbodies consistent with the requirements of Section V.B.6 of the Federal Energy Regulatory Commission's (FERC) Wetland and Waterbody Procedures. Fluming and dam-and-pump procedures are described in Resource Report 2. Both techniques require that the work space within a waterbody is isolated, usually by dams constructed of sand bags with interwoven plastic sheeting installed upstream and downstream from the site where the pipeline will be installed. Sand bag dams would be placed on the edges of the certificated construction right-of-way, whether 95 feet or 75 feet wide at the stream crossing site.

If blasting is required because the streambed is exposed bedrock, the dam-and-pump procedure will be utilized. Generally, the pipeline trench is not in the center of the instream construction right-of-way but offset to one side so that a temporary equipment crossing bridge can be placed on the opposite side of the right-of-way. The equipment bridge would be located across the stream within the area eventually to be isolated by the sand bag dams.

3.1 Fish Exclusion

Prior to any instream work and placement of the sand bags to be used for fluming or dam-and-pump procedures, as many fish as possible will be excluded from an area that includes the construction right-of-way. If blasting within the streambed or on stream banks is necessary during construction, the area of fish exclusion will likely be larger than the limits of the construction right-of-way across the waterbody. In order to minimize risk to listed and non-listed fish by blasting, they should be excluded from a distance where the overpressure change from the blast dissipates to 2.7 psi (Alaska Department of Fish and Game, 1991) a level for which no fish mortality would be expected (see Resource Report 3). Typical trench blasting scenarios use multiple 1 to 2 pound charges separated by an 8-milisecond delay to excavate the trench. With use of 1 to 2 pound charges in rock, the set back distance (at which 2.7 psi would occur) from the blast trench to the fish habitat is between 34 and 49 feet.

When using the dam-and-pump stream crossing methodology, the typical right-of-way distribution of an isolated streambed (dry open-cut) will be no less than 25-feet on one side of the pipe trench and 50+ feet on the opposite side of the pipe trench depending on whether it's a 75 or 95 foot width crossing. Therefore, an area within the waterbody crossing equivalent to length of the blasting trench and approximately 25-feet wide (in the worst case scenario) would be exposed to instantaneous hydrostatic pressure changes above 2.7 psi. Thus, fish would be excluded within waterbodies from an additional 25 feet beyond the construction right-of-way.

One or more block nets will be installed upstream from the pipeline crossing, farther than 50 feet from the pipeline trench if blasting is required, and upstream from where the sand bag dam will be installed. The block net material is typically a 9.5 millimeter stretched mesh (WSDOT, 2008) that will prevent fish and other organisms from moving into the work area from upstream locations. Sites will be selected based on desirable attributes such as slower flows and without heavy vegetation, undercut banks, or deep pools so that the block net seals off the work area to the maximum extent possible. The block net(s) will have to be frequently inspected for sealing capacity and leaf/debris collected will be frequently removed. Block nets need to be secured on both banks and within the stream channel to prevent failure during rain events or debris collection (WSDOT, 2008).

Once the upstream block net is in place, one or more seining crews will proceed from that site to the downstream block net site. The objective of seining is not to capture fish but to maneuver them downstream and out of the construction zone. Small two-stick seines will be operated by at least 2 people although a third person may be required to move the seine over bottom debris and/or to seal the bottom of the net along the streambed. Similar to the block net, seines would be made of a 9.5 millimeter stretched mesh (WSDOT, 2008) that will prevent fish and other organisms from escaping.

In some situations where heavy instream and/or stream bank vegetation is present, or with undercut banks or deep pools, a haul seine or two-stick seine may not completely seal the water column from bank to bank or from water surface to streambed. In those situations, compressed air will be used to generate underwater bubbles, either from a perforated hose, wand or nozzle, that will drive fish away from vegetation debris, out from undercut banks or from deep pools in advance of the seining crew. Whether one or more air compressors are required to generate bubbles through more than one hose will depend on site conditions and the distances over which the bubble generator must operate. The use of bubble scare tactics will be site-dependent and may require one or more people in addition to the seining crew(s) to dislodge fish from difficult instream situations, to increase the efficiency of the seine, and to exclude as many fish as possible from the construction area.

Once the seining crew(s) reaches the downstream block net site, the downstream block net will be installed behind (upstream from) the seining crew(s). Similar precautions to insure an adequate seal as those employed at the upstream site will be necessary. The downstream block net will also be monitored for accumulated litter and debris that will be removed during the entire construction operation. These actions to exclude fish from the construction right-of-way and from areas where they could be affected by blasting should reduce or eliminate the risk of death or injury to fish by construction and by dewatering the isolated work area that will require other fish removal methods.

When construction is completed and flume pipe or dam-and-pump diversion is removed, the upstream and downstream block nets will remain in place as the sand bag dams are removed. Generally, the downstream dam is the first to be removed. Retention of the block nets will limit fish from entering the construction zone as water flows over the site and when turbidity is most likely. Turbidity and sedimentation impacts associated with dry open cut methods are generally minor and are associated with 1) installation and removal of the upstream and downstream dams, 2) water leaking through the upstream dam and collecting sediments as it flows across the work area and continues through the downstream dam, 3) movement of instream rocks and boulders to allow proper alignment and installation of the flume and dams, and 4) when streamflow is returned to the construction work area after the crossing is complete and the dams and flume are removed (Reid et al., 2004). Both block nets will be removed when turbidity at the construction site has dissipated.

3.2 Dewatering and Fish Removal

Once the upstream and downstream block nets are in place, construction crews will begin building sand bag and plastic sheeting dams on the edges of the construction right-of-way to completely isolate the construction zone. When the dams are functional with flume pipes or dam-and-pump diversion is installed and working, water contained between the dams will be pumped out and discharged within dewatering structures (see Resource Report 2). All water intakes, whether for dewatering or for dam-and-pump diversion, will be screened according to NMFS standards to prevent entrainment of aquatic species. The screens will also prevent aquatic life from entering the intake hose if a block net should fail. Screens shall be placed approximately 2 to 4 feet from the end of the intake hose to assure fish are not pinned upon the screen (WSDOT, 2008). Dewatering will be slow enough to allow for additional removal of fish if any remain after the fish exclusion procedures described above. During dewatering, the construction site will be monitored to prevent stranding organisms.

PCGP will retain contracted fish removal and handling personnel to conduct the fish removal operations. Agency personnel will be allowed to observe the fish removal activities but active participation will be limited to contractor personnel. When crossing Bureau of Reclamation (Reclamation) facilities, fish salvage will be performed in coordination with Reclamation and the Klamath Falls U.S. Fish and Wildlife Service office. Additional fish removal from within the isolated construction site may include additional seining with two-stick seines, using dip nets, or removing fish and other organisms by hand. Additional fish removal will also be conducted in the remaining water column between the block nets and sand bag dams only if blasting is required to construct the pipeline through bedrock. Even though electrofishing can result in injury to fish, the risk of injury due to blasting in those water columns is likely to be greater and warrant electrofishing. Electrofishing will be used only when other methods have been determined to be ineffective (WSDOT, 2008), and if its use is approved by NMFS. At other (non-blasting) work areas, if other methods are ineffective, electrofishing will be utilized if its use is approved by NMFS.

The following have been incorporated or adapted from procedures and conditions developed by WSDOT (2008) to minimize risks to ESA-listed species by electrofishing to remove fish from construction zones:

1. The USFWS and NMFS will be provided a project schedule 10 working days prior to the potential initiation of construction, whether or not electrofishing is actually utilized at a specific location.

2. Electrofishing shall only be conducted when a biologist with at least 100 hours of electrofishing experience is on site to conduct or direct all activities associated with capture attempts. Appropriate experience includes knowledge about electrofishing including the interrelated effects of voltage, pulse width and pulse rate on fish species and associated risk of injury/mortality, knowledge and abilities to recognize symptoms associated with galvanotaxis, narcosis, and tetany, and their respective relationships to injury/mortality rates.

3. The following table provides guidance for electrofishing in water where the potential to encounter ESA-listed juvenile fish exists. Only direct current (DC) or pulsed DC current will be used. Visual observation of the size classes of fish in the work area is helpful to avoid injury to larger fish by the mistaken assumption that they are not present.

Parameter	Initial Setting	Conductivity (µS/cm)	Maximum Settings
Voltage	100 V	≤300	800 V
		>300	400 V
Pulse Width	500 µs		5 ms
Pulse Rate	15 Hz		60 Hz [1]

[1] In general, exceeding 40 Hz will injure more fish
Source: WSDOT, 2008 - adapted from NMFS Backpack Electrofishing Guidelines, June 2000, and WDFW Electrofishing Guidelines for Stream Typing, May 2001

4. Electrofishing within each waterbody will begin with low settings for pulse width and pulse rate. If fish present in the area being electrofished do not exhibit an appropriate response, the settings shall be gradually increased until the appropriate response is achieved (galvanotaxis). The lowest effective setting for pulse width, pulse rate and voltage will be used to minimize personnel safety concerns and help minimize injury/mortality rates to listed fish species.

5. If blasting is required and electrofishing is necessary to remove fish from the water column between the sand bag dam and block net (whether upstream or downstream from the blasting site), an individual will be stationed at the downstream dam or block net continuously during electrofishing sessions to recover stunned fish in the event they are washed downstream and pinned against the structure or net.
6. The electrofishing operator will avoid allowing fish to come into contact with the anode. The zone of potential fish injury is 0.5 m from the anode. Netting shall never be attached to the anode. Techniques employed when using an unnetted anode keep fish farther from the anode and expose them to significantly less time in the zone of potential injury. Extra care shall be taken near in-water structures or undercut banks, in shallow waters or high-density fish areas. In these areas, fish are more likely to come into close contact with the anode because fish may be less visible and the voltage gradients may be abnormally intensified.
7. Voltage settings in shallow water sections shall be checked and readjusted by the operator, if necessary. When electrofishing areas near undercut banks or where structures may provide cover for fish, the anode will be used to draw the fish out by placing the activated anode near the area fish are likely present and slowly drawing the anode away. Fish experiencing galvanotaxis will be attracted to the anode and will swim away from the structure toward the anode so that they can be netted. This will not work on fish that experience narcosis or tetany. Therefore, fish response will be noted in adjacent areas prior to attempts made near structures. This should help avoid prolonged exposure of fish to the electrical field while in an immobilized state.
8. Electrofishing shall be performed in a manner that minimizes harm to fish. Once an appropriate fish response (galvanotaxis) is noted, the stream segment should be worked systematically, moving the anode continuously in a herringbone pattern through the water without electrofishing one area for an extended period of time. The number of passes will be kept to a minimum, will be dependent upon site-specific characteristics, and be at the discretion of the directing biologist. Adequate numbers of personnel shall be on-site to minimize the number of passes required for fish removal. Adequate staff to net, recover, and release fish as soon as possible shall be present. Fish shall be removed from the electrical field immediately. Fish shall not be held in the net while continuing to capture additional fish.
9. Condition of captured fish will be carefully observed and documented. Dark bands on the body and extended recovery times are signs of injury or handling stress. When such signs are noted, the settings for the electrofishing unit and/or manner in which the electrofishing session is proceeding will require adjustment and evaluation as to whether continued electrofishing is appropriate at the site.
10. Electrofishing will not occur when turbidity reduces visibility to less than 0.5 meter, when water conductivity exceeds 350 μS/cm, or when water temperature is above 18°C (64.4°F) or below 4°C (39.2°F).

Adult Pacific lamprey, and possibly ammocoetes, are expected to be captured during fish salvaging by seining. However, salvage techniques for salmonids may not be effective for salvaging ammocoetes which may remain in dewatered sediments. Electrofishing procedures to sample larval Pacific lampreys have been recommended (see Appendix A in FWS, 2010) but seining and use of dip-nets may also be effective once the workspace has been dewatered, depending on substrate conditions at the time of construction. PCGP will contract with either ODFW or a qualified consultant to capture the fish. Personnel that would handle and/or remove fish on federal lands would be approved by the Forest Service or the BLM or Reclamation or be done directly by agency personnel if approved by ODFW.

3.3 Fish Handling, Holding and Release

The following has been adapted from procedures and conditions developed by WSDOT (2008) to minimize risks to ESA-listed species during their removal from construction zones and release:

1. Fish handling will be kept to the minimum necessary to remove fish from the work site.

2. Fish will not be sampled or anesthetized during removal activities as this protocol is intended to address fish removal not research. Fish species, number, age class estimate, and release location will be documented.

3. Individuals handling fish will ensure that their hands are free of sunscreen, lotion, or insect repellent and bare skin will be wetted to avoid drying out fish skin at points of contact and increasing potential for fungal or other skin lesions.

4. Fish or other aquatic life captured will immediately be put into dark colored containers filled with clean stream water. Fish removal personnel shall provide a healthy environment for fish with minimum holding periods and low fish densities in holding containers to avoid effects of overcrowding. Large fish shall be kept separate from smaller fish to avoid predation during containment. Water-to-water transfers will occur whenever possible.

5. ESA listed fish should not be transferred out of water to prevent added stress. Holding container temperature and well being of specimens will be frequently monitored to assure that all specimens will be released unharmed. Potential shade areas and supplemental oxygen for fish holding shall be considered in designing fish handling operations.

6. Unless site conditions require alternative release locations, all fish captured by any means will be released upstream from the upstream block net. Release at an upstream site will ensure that the captured fish will be held for very short durations. Also, release upstream will minimize effects of turbidity generated when the sand bag dams are removed and water flows over the dry open-cut construction site.

7. Each released fish shall be capable of remaining upright and have the ability to actively swim upon release. ESA-listed or proposed fish will have priority over other species for release. One person shall be designated to transport specimens in a timely manner to the site selected for release.

8. All dead ESA-listed fish will be preserved and delivered to the pertinent regulatory agency (see documentation below) as outlined in the appropriate permit conditions.

9. If authorized level of take is exceeded, the pertinent regulatory agency shall be notified as soon as possible.

3.4 Documentation

1. All work area isolation, fish removal and fish release activity shall be thoroughly documented in a log book with the following information: project location, date, methods, personnel, instream temperature, visibility, electrofisher settings, and other comments.

2. Species, number of each species, age class estimate, and location of release will be recorded for all fish handled.

3. Information regarding injuries or mortalities to ESA-listed or proposed species will be documented and provided within to NMFS or USFWS, depending on which agency has jurisdiction over that species, within a timeframe specified by each agency.

4.0 REFERENCES

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