5.0 CONCLUSIONS AND RECOMENDATIONS

5.1 SUMMARY OF THE STAFF'S ENVIRONMENTAL ANALYSIS

The conclusions presented in this draft EIS are those of the environmental staff of the FERC working in cooperation with the Coast Guard, EPA, COE, BLM, Reclamation, FWS, Forest Service, DOT, and DOE. We (i.e., the Commission's staff) conclude that construction and operation of the Project would result in some limited adverse environmental impacts. However, most of these impacts would be reduced to less-than-significant levels with the implementation of the applicants' proposed mitigation measures and the additional measures we recommend in section 5.2. We developed measures that would appropriately and reasonably avoid, minimize, or mitigate environmental impacts resulting from construction and operation of the proposed Project. We recommend that our specific additional mitigation measures be attached as conditions to any authorizations issued by the Commission. If the Project is found to be in the public interest and is constructed and operated in accordance with the recommended mitigation measures, we conclude that it would be an environmentally acceptable action. Our conclusions are based on information provided by Jordan Cove and Pacific Connector; analyses and field investigations by Commission staff; review of comments from federal, state, and local agencies; and input from public groups and individual citizens.

The Coast Guard is a cooperating agency for the production of this EIS, serving as a subject matter expert for, and providing recommendations on, the maritime safety and security aspects of, the Project. In its LOR issued in 2009, the Coast Guard concluded that the waterway associated with the Jordan Cove LNG Terminal could be made suitable for LNG vessel traffic if the recommendations in its 2008 WSR were implemented, including a TMP. The Coast Guard has indicated that its findings remain valid for the current Jordan Cove LNG export proposal. In its most recent review of the 2014 up-date to Jordan Cove's WSA, the Coast Guard stated, on February 14, 2014, that: "we have no objection to your conclusion that the minor changes do not change the risk associated with the waterway or the facility as originally evaluated in your 2007 WSA." Given the design of LNG vessels, their safety record, and implementation of the risk mitigation measures recommended in the Coast Guard's WSR, it is highly unlikely that LNG would be released from a vessel in transit in the waterway and there should not be any significant adverse impacts on environmental resources within the Zones of Concern.

The DOT has authority to enforce safety regulations and design standards for the LNG terminal and pipeline, under the Natural Gas Pipeline Safety Act. In a June 18, 2014, letter to the FERC, PHMSA stated that it had reviewed the criteria used by Jordan Cove in identifying credible leakage scenarios and establishing the siting for the LNG terminal to confirm compliance with 49 CFR 193, and had no objections to Jordan Cove's methodologies.

The DOE must meet its obligations under Section 3 of the NGA, to authorize the import and export of natural gas, including LNG, unless it finds that the proposed import or export would not be consistent with the public interest. The purpose and need for the DOE action is to respond to the applications filed by Jordan Cove with the DOE. The DOE authorized Jordan Cove to export LNG to FTA nations in 2011, and authorized the export of LNG to non-FTA nations in March 2014.

The COE exerts authorities over waters of the United States pursuant to Section 10 of the RHA, Section 404 of the CWA, and Section 103 of the MPRSA, including regulation of the placement of structures or fill in waterbodies and wetlands, and ocean disposal of dredged materials. Jordan Cove and Pacific Connector submitted their comprehensive JPA to the COE in October 2013, and the COE would present its conclusions and recommendations in the permits it may issue in response to the applications.

The EPA has the authority to review and veto the COE decisions on the Section 404 permit. The EPA also co-administers the MPRSA with the COE.

The FWS would review the Project for compliance with the MBTA and would consult on species and habitats protected by the ESA. Likewise, the NMFS would consult on potential Project effects on ESA listed aquatic species, and impacts on EFH. Concurrent with this draft EIS, the FERC submitted a BA and EFH Assessment to the FWS and NMFS. In response, the Services would produce BOs that provide their conclusions as to whether authorizing the Project may jeopardize the continued existence of any species under their jurisdiction or would adversely modify or destroy designated critical habitat.

The BLM, Reclamation, and Forest Service are federal agencies that administer lands and facilities that would be crossed by portions of the Pacific Connector pipeline. The BLM has authority under the MLA to grant the right-of-way across federal lands, with the concurrence of the Forest Service and Reclamation. In addition, the BLM and Forest Service must amend certain portions of their LMPs to make allowance for the pipeline.

We recognize that the federal agencies with jurisdiction over lands and resources affected by the Project will use the information and analysis contained in this EIS in reaching their own independent conclusions regarding the environmental impacts of the Project on the lands and resources they administer. Nothing in this section should be read to affect the ability of another federal agency to reach a conclusion or impose a requirement that is different from that recommended by Commission staff. Additionally, nothing in this section should be read to affect in any way a federal agency's authority to monitor, enforce, or modify any requirement it imposes on Jordan Cove's or Pacific Connector's construction, operation, maintenance, or decommissioning of the Project.

5.1.1 Land Use

Virtually all of Jordan Cove's upland elements are on privately owned lands. However, Jordan Cove proposes to acquire one parcel from the Port as part of its *Habitat Mitigation Plan*. The majority of the waterway for LNG vessel marine traffic, the access channel to the terminal, and the eelgrass mitigation area would be located in Coos Bay, considered to be waters of the State, with the bottom of the bay managed by ODSL. The waterway is zoned "Deep-Draft Navigation Channel," and LNG vessel traffic would be consistent with this use. The access channel and inter-tidal portion of the slip are zoned Development Aquatic; the upland portions of the LNG terminal are zoned Water Dependent Development Shorelands; and the jurisdictional gas processing plant, and non-jurisdictional SORSC and South Dunes Power Plant are zoned as Industrial land. Therefore, the Jordan Cove terminal facilities would be consistent with these water-dependent industrial uses. Jordan Cove and Pacific Connector have received all necessary conditional use permits, and LUCS from the affected counties.

Construction of the LNG terminal, South Dunes Power Plant, SORSC, and associated facilities would affect a total of approximately 297 acres, of which 179 are currently industrial land, 111 acres is forest, 76 acres is open land (including shrubs and grasslands), and 32 acres is open water. The nearest residential structure to the proposed LNG terminal is about 1.1 miles to the southeast, while the closest commercial buildings are part of the existing Roseburg Forest Products industrial operation adjacent to the proposed LNG terminal site.

The LNG terminal and the western 52 miles of the pipeline route would be within Oregon's Designated Coastal Zone. On August 1, 2014, Jordan Cove and Pacific Connector submitted an application to the ODLCD to obtain a coastal zone consistency determination. We recommend that the Commission not allow construction to proceed until after the ODLCD makes a finding that the Project is consistent with the CZMA.

Land ownership along the pipeline route is approximately 31 percent federal, 68 percent private, and 1 percent state lands. About 64 percent of the land that would be crossed is classified as forest, 17 percent is agricultural land, 10 percent is rangelands, and about 7 percent is urban or built-up lands. Seven residences were identified within 50 feet of the pipeline construction right-of-way, and Pacific Connector has proposed site-specific measures to minimize impacts on these residences.

Effects on Federal Lands

The pipeline would cross approximately 31 miles of NFS lands and 40 miles of BLM lands. In addition, the route would cross 26 irrigation facilities under the jurisdiction of Reclamation. On NFS lands, land types affected would include 520 acres of forest, 34 acres of urban-built-up or transportation-utility lands, 21 acres of barren lands or quarries, 16 acres of rangelands, and 1 acre or less of beach, wetlands, and water. On BLM lands, affected land would include approximately 674 acres of forest, 62 acres of rangeland, 61 acres of urban-built-up or transportation-utility lands, 2 acres of barren lands/quarries, 1 acre of water, and 0.8 acres of wetlands.

Construction of the Pacific Connector pipeline would disturb NWFP land allocations, including about 91 acres of Riparian Reserves on BLM and NFS lands, of which an estimated 32 acres would be within LSOG forest. About 369 acres of designated LSRs would be directly affected by the pipeline on NFS lands, and 168 acres on BLM lands. In addition, 43.4 miles of Matrix lands would be crossed.

To make allowance for the pipeline, the BLM and Forest Service are proposing a number of case-specific amendments to their LMPs. Six amendments are proposed on BLM lands (2 for the Coos Bay District, 3 for the BLM Roseburg District, and 1 applicable to all administrative unites), and 16 amendments on NFS lands (6 on the Rogue River National Forest, 4 on the Umpqua National Forest, 5 on the Winema National Forest, and one applicable to all units).

In consultations with the Forest Service and BLM, Pacific Connector developed an extensive off-site mitigation program on federal lands that is included in the proposed action to ensure that the objectives of the affected LMPs are achieved. Measures range from reallocation of Matrix lands to LSRs, to fire suppression, to habitat protection and enhancement.

5.1.2 Geology

The Jordan Cove LNG Terminal is situated within the Pacific Border geomorphic province, on a site mantled by thick dune sheets, underlain by weathered sandstone. Through consultations with DOGAMI, we identified 11 faults located within 150 km of the Jordan Cove terminal; of which the CSZ is the most important. While recently (last 170 years) the Coos Bay area experienced only moderate seismic activity; large megathrust earthquakes have occurred along the CSZ prior to the written historical record. Intense ground shaking, lateral spreading, and subsidence caused by an earthquake pose design issues for the terminal site. A further series of geotechnical studies would be performed during detailed design, and ground improvements would be used to mitigate the liquefaction hazard. We recommend that detailed designs and final geotechnical investigations be submitted for our review and approval prior to construction.

A tsunami generated by a megathrust earthquake on the CSZ would present the greatest inundation risk at the Jordan Cove terminal. However, the site-specific tsunami studies coupled with Jordan Cove's proposed mitigation measures indicate that the site is not unsuitable due to tsunami hazards. Jordan Cove has designed the LNG terminal so that foundations for facilities in the process area would be above the run-up height of the worst-case tsunami wave, and the LNG storage tanks would be surrounded by a storm surge barrier with a peak crest elevation of + 60 feet.

The Pacific Connector pipeline route begins within the Klamath Basin, which is part of the larger Basin and Range physiographic province of the Great Basin; an area characterized by ridges and valleys that are separated by faulting (Burns 1998). The route would then head westward over the High Cascades sub-province, a chain of geologically active volcanoes with high andesitic peaks, and the Western Cascades sub-province, an ancestral range of deeply eroded (extinct) volcanoes. The route then passes through the Klamath Mountains physiographic province, which consists of several complex geological terrains composed of metamorphosed and fractured volcanic and marine sedimentary rocks. The pipeline route would proceed over the Coast Range physiographic province, an area underlain by estuarine and alluvial deposits in lowland areas and sedimentary rocks in the uplands, and terminate at the Oregon Coast. Between the mountain ranges are several valleys, predominantly filled with recent alluvial materials.

With the exception of the CSZ, the pipeline route would cross a series of Quaternary and Holocene age fault zones mostly through the Klamath Basin, between MPs 172 and 213. Prior to pipeline construction, Pacific Connector has committed to engaging a geotechnical firm to evaluate and design the proposed pipeline crossing of the Klamath Graben Fault system, South Klamath Lake Section (near MP 213). Pacific Connector would have the trench examined during construction for evidence of stratigraphic offsets potentially related to ground rupture. If such features are observed, Pacific Connector would implement additional mitigation measures at these locations, including burying the pipe in a wider trench to be backfilled with loose gravel or sand, which would allow for relatively unrestrained movement of the buried pipe within the zone of fault movement.

High liquefaction and/or lateral spreading potential were identified at seven sites (Haynes Inlet, Kentuck Slough, Willanch Slough, Coos River, Willis Creek, Rogue River, and Klamath River) along the pipeline route. Pacific Connector would conduct numerical modeling for these sites prior to construction to estimate the magnitude of liquefaction-induced settlement and lateral spreading that would be expected during an earthquake. If the studies indicate that an earthquake

may result in excessive pipe stress, further mitigation design would be needed, including deeper burial below the liquefiable soils, thicker pipe and/or weighting the pipe with a concrete coating.

The pipeline would cross two moderate-risk rapidly moving landslide sites (at MPs 18.1 to 18.2 on private land, and MP 36.9 on BLM land). Implementation of Pacific Connector's ECRP would minimize or avoid the potential for construction to adversely affect slope stability. We recommend that prior to construction Pacific Connector should file final monitoring protocols and/or mitigation measures for any landslide areas that were not accessible during previous studies.

Fluvial erosion may represent a hazard to the proposed pipeline where streams have the potential to expose the pipe as a result of significant channel migration or scour of the streambed. Pacific Connector would design waterbody crossings for the 50-year channel migration condition, and adjusted the pipeline route in high scour potential areas to avoid these hazards. Implementation of the ECRP and use of trench breakers and trench plugs would mitigate potential impacts. In the case of the crossing of Haynes Inlet, the pipeline would be buried 5 feet deep to avoid scour.

The pipeline would be near mines at 23 locations, including 16 aggregate or quarry-related mines, which are likely to consist of open excavations. The Project should not adversely impact the operation of any quarries or mines.

Effects on Federal Lands

A moderate-risk rapidly moving landslide site could not be avoided at MP 36.9 on BLM Coos District land. Pacific Connector would conduct regular monitoring of the pipeline right-of-way across rugged terrain within BLM and NFS lands, including in this area, for previously unidentified landslides or new landslides.

The pipeline would cross Middle Creek, which has a moderate risk for scour, at MP 27.0 on BLM lands. Pacific Connector would design this crossing to withstand estimated potential scour that could occur during 50-year maximum scour events, which would adequately protect the pipeline at this crossing location.

The proposed route for the pipeline between MPs 108.6 and 110.9 on the Umpqua National Forest avoids the Peavine Quarry. At about MP 150.5, the pipeline would be near the Heppsie Mountain Quarry on BLM land. Based on aerial photograph review of the quarry depths, trends, and distances from the pipeline, it was concluded that the quarry likely would extend into a stable rock outcrop that parallels the route, and therefore the pipeline does not pose a risk to future expansion of the quarry. Between MPs 108.6 and 109.4, within the Umpqua National Forest, the pipeline would be within 200 feet of three historic mercury mines in the vicinity of the East Fork of Cow Creek, but would not cross any adits or workings. Soil samples taken in this area did not contain concentrations of mercury that exceeded human health risk screening criteria. To protect its workers from exposure to unanticipated hazardous materials discovered during construction, Pacific Connector would follow the procedures outlined in its *Contaminated Substances Discovery Plan*.

5.1.3 Soils and Sediments

Waldport Fine Sand, Waldport-Heceta Fine Sands, and Dune Land soils, which make up about 66 percent of the Jordan Cove terminal tract, are susceptible to erosion. Jordan Cove would

minimize the potential for erosion by following the measures outline in the FERC's *Plan* and its own *Erosion and Sediment Control Plan*. Grading of the terminal area would require approximately 2.5 mcy of cut and fill.

The Ingram Yard, where the LNG terminal would be located, was formerly used by Weyerhaeuser to store and sort logs, and to spread boiler ash and wood debris from milling operations, and decant solids from its wastewater treatment facility. In the 1970s, the COE deposited materials it dredged from maintenance of the Coos Bay navigation channel on this parcel. However, testing of the site found that most soil samples contained levels of contaminants below state and federal guidelines. The elevation of the terminal tract would be raised to +30 feet for the base of the LNG storage tank area and +46 feet for the liquefaction processing area, using about 1.9 mcy of fill from the excavation and dredging of the marine slip.

At the area of the South Dune Power Plant, Jordan Cove identified contaminated upland soils resulting from past use of the property as a mill. The ODEQ approved a closure plan for the mill site, and Jordan Cove would cover the area with clean sediments from the marine slip and access channel to raise the elevation for the planned South Dunes Power Plant and associated facilities to about +46 feet. To protect its workers from unanticipated contact with contaminated soils, Jordan Cove developed its *Hazardous Waste Discovery Plan.*

Construction of the LNG terminal would require the dredging of about 5.6 mcy of material for the slip and access channel. Sediments that would be dredged from Coos Bay during the creation of the access channel were found not to be contaminated.

During operation of the LNG terminal, Jordan Cove and the Port would have to conduct regular maintenance dredging of the access channel and slip every 3 years for the first 12 years of operation, and after that about every 5 years. In the first ten years of operation of the terminal about 360,000 cy of material would need to be removed to maintain the proper depth of the access channel and slip, while in the next ten years about 330,000 cy would need to be removed. Jordan Cove would have to obtain a permit from the COE for ocean disposal at Site F of operational maintenance dredged materials.

The Pacific Connector pipeline route would cross about 93.4 miles of soils with a high or severe water erosion potential, and 14.7 miles of soils highly susceptible to wind erosion. The pipeline alignment would cross approximately 72 miles of soils classified as prime farmland or farmland of statewide importance. Topsoil salvaging and segregation would occur in areas of privately-owned land mapped as prime farmland or active crops to minimize potential impacts on farm soils and agricultural productivity. While the soils at the Klamath Compressor Station would be prime farmland if irrigated, the land is not irrigated and is not used to raise crops, other than hay. Potential impacts on soils would be minimized through implementation of the measures specified in the FERC's *Plan* and in Pacific Connector's ECRP.

Effects on Federal Lands

Topsoil would not be segregated on BLM and NFS lands because doing so would increase the corridor width. To reduce erosion and increase soil productivity for revegetation on federal lands, Pacific Connector would fracture the soil to a minimum depth of 20 inches or to a restrictive layer if rocky, treat it with some form of organic soil amendment, and place LWD and slash back on the corridor. Where the Forest Service has found that Pacific Connector would not meet its standards and guideline thresholds for soil disturbance, it has proposed site-specific

amendments to the respective LRMPs for the Umpqua, Rogue River, and Winema National Forests.

5.1.4 Water Resources and Wetlands

There are no EPA-designated sole source aquifers near the Project. There are four existing groundwater wells within the Roseburg Forest Products tract near temporary extra workspace areas to be used by Jordan Cove. We recommend that prior to construction Jordan Cove should file a plan to protect the Roseburg wells. Jordan Cove estimates that it would need a total of approximately 1.7 billion gallons of water for construction and 1.3 million gallons of water per day during operation of the terminal facilities. Water requirements for the LNG terminal would be supplied by the CBNBWB. The CBNBWB has 18 groundwater wells located within the ODNRA to the north of the LNG terminal; however the closest is about 3,500 feet away. To prevent or reduce impacts on groundwater from the accidental release of hazardous materials, Jordan Cove prepared a preliminary SPCCP.

Dredging the access channel and the portion of the slip in Coos Bay would have temporary and localized impacts on water quality. The duration of the dredging in the bay would be 4 to 6 months, with TSS estimated at 500 mg/l at the cutterhead reducing to 14 mg/l by a distance of 200 feet.

An LNG vessel at dock at the terminal would discharge approximately 9.2 million gallons of ballast water during the loading cycle to compensate for 50 percent of the mass of LNG cargo loaded. A 148,000 m^3 capacity LNG vessel at the berth would also re-circulate about 6.1 million gallons of water for engine cooling. The discharge of engine cooling water and ballast water is not expected to significantly affect water temperature, salinity, or dissolved oxygen levels in Coos Bay.

While there are no groundwater wells that supply public drinking water systems within 400 feet of the proposed Pacific Connector pipeline construction right-of-way, there are seven wellhead protection areas that would be crossed by the pipeline route. Pacific Connector identified five private wells within 150 feet of the pipeline, but none of these are used for drinking water (irrigation only). Pacific Connector developed a *Groundwater Supply Monitoring and Mitigation Plan* However, we recommend that the plan be revised to identify all wells, springs, and seeps within 150 feet of the construction right-of-way, and outline physical barriers that would be installed to protect groundwater infrastructure. Four public water systems that have surface water intakes within 3 miles downstream of waterbodies that would be crossed by the pipeline. Pacific Connector would provide written notification to the authorities of the surface water supply intakes at least one week before beginning in-water work. To avoid or minimize impacts on groundwater resources, Pacific Connector would follow the measures in its ECRP and SPCCP.

The Pacific Connector pipeline would affect 400 waterbodies, including perennial rivers and streams, intermittent flowing streams, irrigation canals and ditches, stock ponds, and the Coos Bay estuary. The pipeline route would cross 19 fifth-field watersheds within six hydrological subbasins (Coos, Coquille, South Umpqua, Upper Rogue, Upper Klamath, and Lost River). Pacific Connector produced a *Stream Crossing Risk Analysis*, and impacts on waterbodies would be minimized by following the FERC's *Procedures*. Waterbodies would be crossed during low-

flow periods whenever possible and within ODFW recommended in-water construction windows.

Pacific Connector would use conventional bores to cross underneath Kentuck Slough (MP 6.3R), Catching Slough (MP 11.1), and the Medford Aqueduct (MP 133.4). The Coos River (MP 11.1R), Rogue River (MP 122.7), and Klamath River (MP 199.4) would be crossed with HDDs. The western crossing of the South Fork of the Umpqua River would be crossed using DP technologies. The bores, HDD, and DP crossings would eliminate the need for in-water construction activities that could result in sedimentation and turbidity as well as impacts on waterbody banks and beds. Pacific Connector prepared an *HDD Contingency Plan and Failure Procedure* that describes measures to contain an inadvertent release of drilling mud during the HDD process.

Only Haynes Inlet in Coos Bay, between about MPs 1.7 and 4.1, would be crossed with a wet open cut method. Construction of this segment would take less than three weeks, with turbidity models showing that the trenching would result in concentrations of TSS over 50 mg/l with 100 feet. Thus, impacts on the aquatic environment of the bay would be localized, and temporary. Pacific Connector would minimize impacts by following the measures outlined in its *Report on Preliminary Pipeline Study of the Haynes Inlet Water Route*, including keeping the bucket below the water level, following a turbidity monitoring plan, installing turbidity curtains, and fueling and maintaining equipment more than 150 feet from standing water.

Except for the wet crossing of Coos Bay, and the use of bores or HDD under six waterbodies, and DP for the first South Umpqua River crossing, Pacific Connector would use dry open-cut methods (including dam-and-pump and fluming) at the remaining waterbody crossings. Again, impacts from dry crossings would be temporary and localized, with most construction occurring at a single crossing within a 48-hour period, and models predicting TSS levels less than 100 mg/l within 10 m downstream of the crossing.

The proposed pipeline would cross three rivers listed on the Nationwide Rivers Inventory: the North Fork of the Coquille River, the East Fork of the Coquille River, and the South Umpqua River. The Pacific Connector pipeline would cross the North Fork of the Coquille River (at about MP 23) and the East Fork of the Coquille River (at about MP 30) using a dry open-cut method. Pacific Connector proposes to use a DP and diverted open cut, respectively, at the two crossings of the South Umpqua River (at about MPs 71 and 95).

The pipeline route would cross 15 fifth-field watersheds with portions located in the transient snow zone (2,000- to 5,000-foot elevation range), affecting about 2,121 acres within the transient snow zone. Only clearing that permanently alters canopy cover could affect long-term peak flows. When only considering forest clearing within these 15 watersheds, pipeline disturbance to forested vegetation types would represent only 0.07 percent of the total area of these watersheds; which we do not consider to be a significant adverse impact.

Removal of shade by clearing streamside riparian vegetation would not greatly increase water temperatures. The maximum predicted increase was 0.3°F at one 2-foot-wide crossing; and modeling indicated that instream water temperatures would return to ambient conditions within a short distance downstream from all crossings.

During construction, Pacific Connector would use a total of about 75,000 gallons per day of water for dust control; sprayed by five trucks per spread. Dust control water could come from 11 private surface sources, with approvals obtained prior to withdrawal.

After backfilling, the pipeline would be hydrostatically tested using approximately 62 million gallons of water, obtained from 13 commercial or municipal sources or surface water right owners. The pipeline would be tested in approximately 75 sections, each with varying lengths and water volume requirements. Where possible, test water would be released within the same basin from which it was withdrawn. However, cascading water from one test section to another to minimize water withdrawal requirements may make it impractical to release water within the same basin where the water was withdrawn in all cases. Pacific Connector's draft *Hydrostatic Testing Plan* includes measures to prevent the transfer of aquatic invasive species and disease. Pacific Connector does not expect to add any chemicals to the hydrostatic test water, with the possible exception of chlorine. The hydrostatic test water would be treated after it is withdrawn, and sources would be screened. When discharged, the test water would be released at low velocities into a vegetated upland adjacent to the construction right-of-way through an energy dissipating device and a straw bale filter or sediment bag.

Construction and operation of the LNG terminal slip and access channel would result in the permanent loss of approximately 8.1 acres of intertidal habitat, 3.3 acres of shallow subtidal habitat, and 15.4 acres of deep subtidal habitat. About 2.5 acres of SAV (eelgrass) would also be lost. From all jurisdictional and non-jurisdictional facilities proposed by Jordan Cove, a total of 35.6 acres of wetlands would be permanently affected. Jordan Cove would follow the measures in its *Project* C*ompensatory Wetland Mitigation Plan*, including the creation of 7.5 acres of eelgrass in Coos Bay, and the reestablishment of tidal flow to 43.3 acres at the Kentuck Slough site to mitigate for the loss of esturine wetlands. The company would also create and preserve 4.5 acres of new wetlands at the West Jordan Cove and West Bridge sites to mitigate for the loss of freshwater wetlands.

The Pacific Connector pipeline would cross approximately 11.6 miles of wetlands affecting a total of approximately 239 acres. Following pipeline construction, about 5.2 acres of palustrine forested wetlands would be converted to herbaceous wetlands within the 30-foot-wide maintained corridor. Pacific Connector developed a *Compensatory Wetland Mitigation Plan,* whereby about 5.4 acres of forested wetlands would be created at the Kentuck Slough mitigation site. To compensate for impacts on estuarine wetlands affected by the crossing of Haynes Inlet, Pacific Connector developed an *Estuarine Wetland/Open Water Mitigation Plan,* with the goal of establishing a one-to-one on-site restoration of all wetlands affected along the crossing of Coos Bay. Further, the COE would issue permits under the RHA and Section 404 of the CWA for the crossing of waters of the United States, including wetlands, and the ODEQ would issue a Water Quality Certification under Section 401 of the CWA. We recommend that Pacific Connector document consultations with appropriate resource agencies and explain the methodology it used to classify high quality wetlands crossed by the pipeline, and we recommend that construction not begin until all applicable federal permits have been issued.

Effects on Federal Lands

Sixteen watersheds crossed by the Pacific Connector pipeline route include either BLM and/or NFS lands subject to the ACS under the NWFP. The ACS was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands.

The ACS includes two designations for Key Watersheds: Tier 1 contribute directly to conservation of at-risk anadromous salmonids, bull trout, and resident fish species; and Tier 2 that may not contain at-risk fish stocks, but are important sources of high-quality water. Four watersheds that would be crossed by the Pacific Connector pipeline are designated as Key Watersheds: (1) South Umpqua River (Tier 1); (2) North and South Forks Little Butte Creek (Tier 1); (3) Spencer Creek (Tier 1); and (4) Clover Creek (Tier 2). Within the South Umpqua River watershed, the pipeline would affect about 167 acres of federal lands, which represents less than 0.1 percent of all the federal lands within this watershed. Within the Little Butte Creek fifth-field watershed the pipeline would disturb about 277 acres of federal lands, representing just under 0.25 percent of the total amount of federal land within that watershed. Within the Spencer Creek watershed, the pipeline would affect about 94 acres of federal land, representing about 0.2 percent of all the federal land in the watershed.

The Forest Service would require that temporary equipment crossings of any stream channel (whether intermittent or perennial) on NFS lands be accomplished using a bridge, a temporary culvert with temporary road fill to be removed after work is completed, or a low water ford with a rock mat. The Forest Service would require that site-specific approval be obtained by Pacific Connector where it intends to not fill the upper 1 foot of trench backfill in coldwater fisheries on NFS lands with clean gravel or native cobbles. In response to a Forest Service request, Pacific Connector would stabilize intermittent stream crossings (whether flowing or not) on NFS lands with temporary sediment barriers. Streambanks would be revegetated with native species and "armored" as needed with LWD and boulders to ensure stability. Channel breakers would be installed on each side of the trench to ensure that subsurface flows are not captured.

Based on a concern that the South Fork Little Butte Creek crossing consists of basalt and andesite bedrock, Pacific Connector conducted a study that determined that the crossing had high hyporheic sensitivity. BMPs that would be implemented to mitigate for this possible effect include on-site monitoring of trenching and recommendations by a qualified professional of backfill composition, including the use of trench plugs.

On federally managed land, the Pacific Connector pipeline would cross approximately 0.2 miles of wetlands, affecting a total of approximately 3 acres. Permanent wetland vegetation conversion within federally managed lands would occur in approximately 0.1 acres of palustrine forested wetlands as a result of vegetation management on the operational right-of-way. This 0.1 acre of permanent type conversions would occur to two wetlands: wetland CW010 located on lands managed by the BLM Coos Bay District, and wetland AW309 located on lands managed by the BLM Medford District.

5.1.5 Vegetation and Timber

The Jordan Cove Project would result in the permanent removal of about 182 acres of upland vegetation, including about 69 acres of forest and 113 acres of shrubs and grasslands. Jordan Cove would compensate for the loss of vegetative habitat by following the measures of its *Wildlife Habitat Mitigation Plan*, which requires the acquition of a total of 259 acres at three off-site parcels, including the preservation of about 103 acres of forest and about 153 acres of shrubs and grasslands.

Twelve invasive plant species listed by the ODA were encountered during the field surveys of the proposed LNG terminal site. These were gorse, Canada thistle, English ivy, European

beachgrass, Himalayan blackberry, Italian thistle, pennyroyal, poison hemlock, scotch broom, sweet fennel, yellow glandweed, and parrotfeather. To avoid introducing or spreading invasive species, Jordan Cove would follow the recommendations outlined in the Oregon Aquatic Species Management Plan and the Oregon Noxious Weed Strategic Plan.

Construction of the Pacific Connector pipeline and associated facilities would affect about 2,949 acres of forest and woodland, 607 acres of grasslands-shrubland, and 110.5 acres of wetland/riparian vegetation types. Approximately 1,712 acres of large mature trees over 40 years in age and approximately 1,237 acres of small to medium trees under 40 years in age would be harvested during construction of the pipeline. Operation of the pipeline and associated facilities would have permanent impacts on approximately 547 acres of forest vegetation, including approximately 155 acres of LSOG forests, 169 acres of mid-seral forests, and 223 acres of regenerating young forests.

The proposed pipeline would create new direct edge effects for 561 acres of interior forest, while approximately 2,264 acres would be indirectly affected (i.e., would be within 300 feet of newly created edges). The restoration and revegetation of the temporary construction right-of-way (outside of the 30-foot maintenance corridor) would reduce edge effects. To minimize the potential for the spread of wildfires Pacific Connector would implement the measures outlined in its *Fire Prevention and Suppression Plan*.

Multiple noxious weeds were documented along the pipeline route during botanical surveys. Within the region around the proposed pipeline, the western pine beetle and fir engraver are the most prevalent insect or disease pathogens. Pacific Connector developed an *Integrated Pest Management Plan* to minimize the potential spread and infestation of weeds along the construction right-of-way, and handle forest pathogens and insects.

Effects on Federal Lands

On BLM land, there would be approximately 791 acres of construction impact of the pipeline to FOIs (forest land), which includes about 174 acres on the Coos Bay District, 330 acres on the Roseburg District, 270 acres on the Medford District, and 18 acres on the Lakeview District. On NFS lands, there would be approximately 550 acres of impacts during construction to PAGs and plant series, including about 215 acres on the Umpqua National Forest, 280 acres on the Rogue River National Forest, and 56 acres on the Winema National Forest. The Douglas-fir series would be the most heavily impacted, with about 102 acres on the Umpqua National Forest and 36 acres on the Rogue River National Forest. Pacific Connector developed a *Right of Way Clearing Plan for Federal Lands*, which outlines how it would clear timber along the pipeline route. Approximately 8,540 MBF of timber would be harvested on NFS lands and 8,839 MBF on BLM lands. Areas within the permanent 30-foot-wide maintenance corridor would remain cleared of forest and maintained in an herbaceous state in order to facilitate periodic checks of the pipeline. This would result in a permanent loss of timber production for approximately 119 acres on BLM lands and 104 acres on NFS lands. Pacific Connector would compensate the government for this loss in productivity.

In addition, with the assistance from Pacific Connector, BLM and Forest Service would develop projects on federal lands to compensate for impacts associated with proposed amendments to their LMPs. Many of those project would benefit forest health and contribute to the development of LSOG forest, including: conversion of Matrix land to LSRs; acquiring additional timber lands

to replace the converted Matrix land; funding non-commercial silvicultural projects that would create or accelerate the development of old-growth characteristics on federal lands; funding silvicultural projects (pre-commercial or commercial) aimed at reducing fuel loads and minimize the risk of stand-replacing fires; and creating snags to enhance riparian or terrestrial habitat.

5.1.6 Wildlife and Aquatic Resources

The most common marine mammal noted in Coos Bay is the harbor seal. In October 2014, Jordan Cove and Pacific Connector submitted their application for incidental harassment authorization under the MMPA to the NMFS. Piles for berth structures would be driven "in-the-dry" while the terminal slip is separated from by bay by an earthen berm, thus reducing noise impacts on aquatic species. Nevertheless, we recommend that prior to construction Jordan Cove should provide a Monitoring and Adaptive Management Plan for the protection of pinnipeds. The potential for LNG vessel strikes on marine mammals and sea turtles in the waterway during transit to and from the proposed LNG terminal is low, given the speed of the LNG vessels and historic records indicating that vessel strikes of marine animals rarely occur.

Because of the slow speed of LNG vessels in the waterway, and the small size of their wake waves, their transit in the Coos Bay navigation channel is not likely to cause major shoreline erosion. Nor would propeller wash from LNG vessels, tugs, and escort boats cause significant displacement of bottom sediments in the channel. The chance of fish strandings from LNG vessel wakes is also considered unlikely. Given LNG vessel design, on-board spill kits, safety measures, and implementation of the Coast Guard recommendations in its WSR and LOR, the likelihood of a spill of hazardous liquids from an LNG vessel in transit in the waterway that may adversely impact aquatic species is extremely low.

In the waterway for LNG transit to and from the Jordan Cove terminal, we identified EFH for 82 species of groundfish, 5 coastal pelagic species, 3 species of Pacific Coast salmon, and at least 5 highly migratory species that could be affected by the Project. In order to comply with the MSA, we included our EFH assessment with the BA submitted to the FWS and NMFS.

Dredging for the LNG access channel and slip would remove the current benthic population of organisms within the sediments, including clams, ghost shrimp, polychaete worms in the estuarine regions. It has been reported that benthic communities on mud substrates in Coos Bay, when disturbed by dredging, recovered to pre-dredging conditions in about one month. Hydrodynamic and sediment transport modeling for the dredging of the LNG facility showed that the combined background and Project-related suspended sediment concentrations would be well below the lethal level for fish. The dredging would be temporary (lasting not more than 6 months), and impacts would be localized, with TSS concentrations dissipating within 200 feet.

The intake of water for engine cooling by LNG vessels at berth could result in entrainment and impingement of small less-mobile aquatic species. However, the amount of water taken in by LNG vessels at berth (estimated to be about 6.1 million gallons) would be an extremely low percent of the total volume of Coos Bay (2.2 million acre feet discharged at mouth), and the loss of aquatic life due to the operation of the Jordan Cove Project would be low in comparison to natural mortality.

The proposed pipeline would cross 115 waterbodies that may be fish bearing. Most effects from pipeline construction across streams would result in short-term impacts on water temperature,

pH, dissolved oxygen, benthic invertebrate populations, and aquatic species. To improve stream habitat, and mitigate for impacts, Pacific Connector is proposing to install LWD at selected locations.

The pipeline in Hayes Inlet was routed to avoid commercial oyster beds. Between MPs 2.9 to 3.2 commercial oyster beds would be adjacent to the route, and oysters may be affected by turbidity and sedimentation on a short-term basis during construction. Native Olympia oysters can be found in Haynes Inlet, so Pacific Connector developed an *Olympia Oyster Mitigation Plan*.

It is possible that invasive species could be introduced from pipeline construction equipment or through hydrostatic testing bringing water from one basin to another. Therefore, we are recommending that Pacific Connector develop a project-specific *Aquatic Species Nuisance Prevention Plan* to ensure these impacts are minimized.

About 178 species of amphibians, reptiles, birds, and mammals were recorded on or adjacent to the Jordan Cove Project site. The primary impact on terrestrial species would be the removal of habitat. Construction of the Jordan Cove Project facilities would affect a total of about 15 acres of ODFW-defined Category 2 (essential for wildlife, and limited) habitats, 125 acres of Category 3 (essential but not limited) habitats, and 156 acres of Category 4 (important but not essential and not limited) habitats. To mitigate for the loss of those habitats, Jordan Cove would acquire about 259 acres at three off-site parcels, protecting about 294 acres of Category 2 habitats, 37 acres of Category 3, and 70 acres of Category 4. Lighting at the terminal may also affect aquatic species, bats, and birds. We recommend that Jordan Cove document consultations with appropriate resource agencies and develop a final lighting plan that would reduce impacts on wildlife. We also recommend that both Jordan Cove and Pacific Connector file Bird Conservation Plans.

Overall, 47 amphibians and reptiles, 278 birds, and 106 mammal species are known or suspected to occur in upland habitats crossed by the Pacific Connector pipeline route. Most mobile species disturbed during construction would relocate to adjacent habitat. In general, construction related impacts on wildlife would be short-term, and after the pipeline is installed, the right-of-way would be revegetated and habitats restored. Only forest within the 30-foot-wide maintenance corridor would be converted to herbaceous vegetation. Pacific Connector would minimize habitat loss through its ECRP and its *Habitat Mitigation Plan*. To compensate for the loss of cavities and snags within the construction right-of-way, Pacific Connector would top or girdle trees at the edge. Pacific Connector would also put up nesting boxes within riparian areas.

Effects on Federal Lands

The Pacific Connector pipeline would cross 8 perennial and 30 intermittent streams on federal lands. Of these streams, 3 are known or assumed to contain anadromous fish, and 13 known or assumed to contain resident fish species. To ensure that the Pacific Connector Pipeline Project is consistent with the objectives of the ACS, which would in turn aid fish populations on federal land, Pacific Connector would (1) donate LWD to agencies/conservation groups to perform in-stream restoration projects; and/or (2) relocate large boulders greater than 24 inches in diameter for use as fish habitat structures.

Pacific Connector would mitigate for impacts on habitat where the pipeline crosses federal lands, using a plan drafted after consultations with the Forest Service and BLM. Some mitigation measures already identified include decommissioning roads in LSRs that are no longer required

for management; funding the conversion of Matrix lands to LSR; funding non-commercial thinning treatments or other silvicultural projects to create or accelerate development of old-growth characteristics in LSRs and elsewhere on federal land; and creating snags in adjacent habitat.

5.1.7 Threatened, Endangered, and Other Special Status Species

Based on informal consultations with the FWS and NMFS, 32 species protected under the ESA were identified as potentially occurring in the general vicinity of the Project. Within the EEZ and the waterway for LNG marine traffic, there are 7 species of federally listed whales, 1 marine mammal, 1 bird, 4 species of marine turtles, and 3 fish species.

Jordan Cove and Pacific Connector conducted biological surveys to assess the presence of federally listed species or habitats. No federally listed plants or animals were found during surveys of the upland Jordan Cove terminal facilities. In addition to the federally listed fish species in Coos Bay, there are two other fish species that could reside in waterbodies along the Pacific Connector pipeline route. One federally listed invertebrate may occupy habitat near proposed pipe yards and staging areas. Because of concerns about the adequacy of surveys for this invertebrate, we are recommending that Pacific Connector confirm the presence or absence of vernal pool fairy shrimp at all yards with habitat, before use of the yards would be allowed. There are two listed birds along the Pacific Connector pipeline route (MAMU and NSO). While seven federally listed plant species were identified from the literature for the pipeline area, Pacific Connector's botanical surveys located populations of three of those plant species.

The FERC has prepared a draft BA that has been submitted to the NMFS and FWS. That BA provides supporting documentation for our findings, summarized below.

The Project is ***not likely to adversely affect***:

- the endangered gray wolf
- the endangered blue whale;
- the endangered fin whale;
- the endangered killer whale (Eastern North Pacific, Southern Resident stock);
- the endangered humpback whale;
- the endangered sei whale;
- the endangered sperm whale;
- the endangered North Pacific right whale;
- the endangered short-tailed albatross
- the threatened western snowy plover;
- the threatened streaked horned lark;
- the threatened green sturgeon (Southern DPS);
- the threatened Pacific eulachon (Southern DPS);
- the endangered green turtle;
- the endangered leatherback turtle;
- the endangered olive ridley turtle;
- the threatened loggerhead turtle;
- the threatened Oregon spotted frog;
- the endangered western lily;

- the endangered Cook's lomatium; and
- the endangered rough popcornflower.

The Project is ***likely to adversely affect***:

- the threatened MAMU;
- the threatened NSO;
- the threatened coho salmon (SONCC);
- the threatened coho salmon (Oregon Coast ESU);
- the endangered Lost River sucker;
- the endangered shortnose sucker;
- the threatened vernal pool fairy shrimp;
- the endangered Applegate's milk-vetch;
- the endangered Gentner's fritillary;
- the endangered large-flowered meadowfoam; and
- the threatened Kincaid's lupine.

Jordan Cove and Pacific Connector have proposed a CMP to compensate for unavoidable impacts on listed species and their habitats through substitute habitat and/or habitat stewardship. Because some federally listed species and their habitats may be affected, we will request that the FWS and NMFS develop BOs indicating whether or not the proposed Project is likely to jeopardize the continued existence of a listed species or adversely modify designated critical habitat for those species. We are recommending that, should the Commission choose to issue an Order and Certificate for the Project, initiation of Project construction be made contingent upon the outcome of the completed formal ESA consultations and the content of the BOs.

Effects on Federal Lands

Within the Coos Bay and Roseburg BLM Districts, the Pacific Connector pipeline would affect a total of about 39.3 acres of occupied or presumed occupied habitat for MAMU. The pipeline would affect suitable habitat for NSO on federal lands, including 7.2 acres of KOAC.

A total of 49 BLM and Forest Service sensitive species have the potential to be impacted by the Project: 3 mammal, 19 bird, 1 reptile, 1 amphibian, 17 invertebrate, 6 fish, and 2 plant species. In addition, surveys conducted for the Project in and near the project area resulted in numerous observations of S&M species on BLM and NFS lands. These survey results, in combination with results from prior surveys conducted in the vicinity of the project area, were used to identify the S&M species that could be affected by the Project. A total of 78 S&M species could be affected by the Project, including 57 fungi, 13 lichens, 1 bryophyte, 3 vascular plants, 2 mollusks, 1 mammal, and 1 bird. We are recommending that Pacific Connector make minor adjustments to its pipeline route on NFS land to avoid impacting two snail species. We are recommending that Pacific Connector make minor route adjustments on NFS lands to increase buffer distances three fungi: *C. alveolatus, G. abietus,* and *S. pulvinata.*

5.1.8 Recreation and Visual Resources

Construction and operation of the Jordan Cove LNG Terminal would have no direct adverse effects on nearby recreational areas; including the ODNRA and Shorelands SRMA. Noise from the terminal would be audible to people recreating in the immediate vicinity; however, based on

our analysis it would not be significantly louder than existing ambient noise levels in these areas, where there is also ORV use. Impacts of terminal construction traffic on people driving to recreational areas on the North Spit would be mitigated by Jordan Cove following the measures outlined in its traffic assessment.

Recreational boaters using Coos Bay would have to temporarily move out of the way of an LNG vessel as it passes, as they currently do for other deep-draft commercial ships in the navigation channel. During the construction period that includes dredging within Coos Bay, recreational boaters would be redirected away from the access channel and slip, which would pose a temporary inconvenience.

The Pacific Connector pipeline route would not cross or affect any county of state parks or recreation areas. It would cross the Hayes Inlet Water Trail in Coos Bay. We are recommending that Pacific Connector document consultations with the Port, Coos County, City of North Bend, ODSL, ODPR, CRTP, and other interested parties regarding the potential impacts on the Haynes Inlet Water Trail and users of the boat ramp, and file their comments on the *Recreation Management Plan*.

The most visible part of the LNG terminal would be the LNG storage tanks, which would be about 180 feet tall. While the LNG terminal could be seen from western portions of the city of North Bend, and places within the BLM's Shorelands SRMA, visual impacts would be minimized because the terminal would be situated next to an existing industrial facility (Roseburg Forest Products), there is a forested dune behind the terminal, the storage tanks would be surrounded by a 60-foot-high earthen storm barrier, and a reduced lighting plan would be implemented.

The clearing of forest for the pipeline right-of-way and introduction of new aboveground facilities would have long-term visual impacts. However, visual simulations at KOPs show that with implementation of Pacific Connector's *Aesthetics Management Plan* and its ECRP, over time vegetation would grow up within the temporary right-of-way to reduce visual impacts. Visual impacts at the Klamath Compressor Station would be reduced by using a slated fence and planting landscaping around the facility.

Effects on Federal Lands

The pipeline route would not cross any national parks, developed federal recreation areas, national monuments, national landmarks, wilderness areas, wildlife preserves, wild and scenic river segments, or Indian reservations. The two river systems listed on the Nationwide Inventory crossed by the pipeline route are the Coquille River and Umpqua River. While we believe that Pacific Connector's crossing methods would reduce impacts on those rivers, we would address in our final EIS any comments from NPS regarding rivers on the Nationwide Inventory.

The pipeline route would cross three National Scenic Byways (U.S. Highway 101, State Highway 62, and U.S. Highway 97). The pipeline would be installed under U.S. Highway 101 within the waters of Coos Bay, and Pacific Connector would use HDDs to avoid impacts on State Highway 62 and U.S. Highway 97. These highways would remain open during construction and no vegetation would be removed in the vicinity of the crossings.

The pipeline route would cross the Applegate Branch of the California National Historic Trail in two places. The NPS agrees that remnants of the historic Applegate Trail are no longer extant at

the two pipeline crossing locations, replaced by modern roads. One National Scenic Trail (PCT) would be crossed on NFS lands. Pacific Connector would implement the measures outlined in its *Recreation Management Plan* to minimize impacts on the PCT.

The proposed pipeline would cross about 300 feet within the BLM Coos Bay District Upper Rock Creek ACEC. The BLM has found that this crossing would not adversely affect the Relevant and Important values of the ACEC and would not conflict with management of this area. Pacific Connector developed an *Upper Rock Creek ACEC Crossing Plan* to reduce impacts on that land parcel.

Visually, the Pacific Connector pipeline would meet BLM VRM Class IV objectives, and though the pipeline does not meet VRM Class II objectives in two locations in the short term, plan amendments are not needed because long-term objectives would be met through mitigation in the *Aesthetics Management Plan*.

The pipeline would not meet Forest Service VQO at three locations on Rogue River National Forest and two locations on the Winema National Forest. LMP amendments are proposed in each instance to a longer period for revegatation to need the visual objects at those locations.

5.1.9 Socioeconomics

With the risk management measures recommended by the Coast Guard in its WSR, LNG vessel marine traffic in the waterway is not likely to have significant adverse impacts on commercial fishermen or other commercial ships. There would be temporary delays for other boats while an LNG vessel passes by.

Construction of the LNG terminal is anticipated to last for 42 months. At its peak, about 2,100 people would be employed. Approximately 20 percent of the construction workforce would be expected to commute daily from their homes in the area. The non-local workforce would average about 792 employees over the life of the construction phase and peak at about 1,800 people. There are about 70 hotels, motels, and bed and breakfast inns, 51 mobile home parks, and 69 RV parks or campgrounds within 50 miles of the Jordan Cove LNG Terminal site. While we believe there is an adequate supply of housing available for non-local workers, because of concerns about competition with tourists for rooms, Jordan Cove would construct and operate its North Point complex to house employees. Jordan Cove estimates that operation of the proposed LNG terminal and non-jurisdictional South Dunes Power Plant would require a permanent staff of 145 people.

Construction of the Pacific Connector pipeline would extend over two years, with an average monthly workforce of 1,400 people. Pacific Connector estimates that approximately 50 percent of the construction jobs for the pipeline would be filled by non-local workers, with a peak of 922 people working over five construction spreads. Pacific Connector identified a total of 7,889 hotel and motel rooms, and 21,169 vacant rental houses in the four counties crossed by the pipeline. Factors that would ameliorate the demand for housing by non-local workers include some employees staying in their own RVs and some employees sharing accommodations. Where housing is constrained in one spread, the construction workers would commute greater distances. Existing infrastructure and social services, including police, fire, health facilities, schools, and public utilities are adequate to serve the needs of the Project needs, and handle the temporary influx of non-local workers during construction.

For both projects combined, there would be total direct employment of 7,073 FTEs during the entire period of construction; an indirect impact of an additional 6,120 non-project jobs; and 7,353 induced other jobs. The companies would spend a combined total of $4.5 billion to build both the terminal and pipeline; supporting $1.7 billion; and $974 million in indirect and induced economic output, respectively. The projects would also support a total of $1.7 billion in direct, indirect, and induced GDP in Oregon and Washington over the 4-year construction period.

Jordan Cove estimated that construction of its LNG terminal and related facilities would cost about $3 billion in 2011 dollars. About $2.6 billion would be for materials, equipment, and other expenditures, with $1.4 billion of that amount spent in the states of Oregon and Washington combined. Total wages during construction estimated at about $412 million, with $364 million in wages going to people who reside in the states of Oregon and Washington. It was estimated that the Jordan Cove LNG Terminal would generate about $60.3 million in 2011 dollars in direct expenses during its first year of operation, with $12 million in payroll. Each year during operation of the terminal, Jordan Cove would make contributions through Coos County's Bay Area Enterprise Zone in lieu of taxes, consisting of about $20 million for education and $10 million for urban renewal.

Pacific Connector estimates that it would cost about $1.75 billion to build its facilities. Total construction payroll is estimated to be $240 million. Costs for materials and equipment bought in or brought to Oregon are estimated at about $464 million. About $33 million would be spent during construction for local contracted services, such as logging and hauling, road improvements, and professional services. During its first year of operation, Pacific Connector would be expected to generate an estimated total of $11.1 million in property tax revenues in the four counties combined that the pipeline crosses. We conclude that the Project would have beneficial impacts on the regional economy.

It is possible that the location of a pipeline near a residence could affect property values. Several studies have shown that the location of a pipeline near a residence does not necessarily depress the sales price. The impact a pipeline may have on the value of a tract of land depends on many factors, including the size of the tract, the values of adjacent properties, the presence of other utilities, the current value of the land, and the current land use.

The Pacific Connector pipeline would cross a mostly rural region. More than 80 percent of the population of the four counties crossed by the pipeline are White. People earning below the poverty line varied from 23 percent in Klamath County to 18 percent in Douglas County. Along the route, we were unable to identify communities containing a disproportionally high percentage of minorities, low-income households, elderly, children, non-English speakers, or other vulnerable populations that the Project would adversely affect.

Effects on Federal Lands

Pacific Connector prepared a Financial Efficiency Analysis that assesses the net present value of costs and benefits that would accrue to the federal government as a result of construction and operation of the proposed project. Costs and benefits were projected over a 50-year time period, where appropriate, and discounted using a real discount rate of 4 percent. The analysis identifies two sources of direct government revenue: 1) Pacific Connector's payment for timber that would need to be cut, and 2) Pacific Connector's rental payments for construction access and the pipeline right-of-way. The analysis also identifies three sources of government costs: 1) the

value of lost timber productivity along the new right-of-way, 2) the value of non-merchantable trees that would need to be cut prematurely (lost timber growth), and 3) the incremental cost of future maintenance for existing roads that Pacific Connector may upgrade above their existing federal maintenance level. The projected net present value of the Pacific Connector pipeline based on this analysis is $5.24 million in 2010 dollars.

5.1.10 Transportation

The Port is currently utilized by about 60 deep-draft commercial cargo ships and 50 barges per year, and Coos Bay is the base for about 200 commercial fishing boats. The addition of about 90 LNG vessel calls to the Jordan Cove LNG Terminal would not have significant adverse effects on the other commercial marine traffic using the Port. Boats in Charleston Marina may need to wait about 20 minutes for an LNG vessel to pass. Historically, the Port handled as many as 300 deep-draft commercial cargo ship visits per year.

Peak construction activities would result in 2,009 inbound and outbound worker vehicle trips each day to the LNG terminal, together with 40 material delivery truck trips per day. The only road to the terminal is the Trans-Pacific Parkway. Jordan Cove would make improvements at the parkway's intersection with Highway 101, in accordance with its *Traffic Impact Analysis*, to ease traffic congestion. To reduce traffic impacts, Jordan Cove would have its employees park at off-site satellite lots and transport them to the terminal by bus or rail. In addition, some equipment deliveries would be made by rail or by barge. We are recommending that the *Traffic Impact Analysis* be reviewed by Coos County and the cities of North Bend and Coos Bay.

The Southwest Oregon Regional Airport is located in the city of North Bend, directly across Coos Bay and less than 1 mile from the proposed LNG terminal site. In June, 2013, Jordan Cove submitted to the FAA its *Notice of Proposed Construction or Alteration*, which is currently under review by the FAA. We are recommending that before construction of the LNG terminal begins, Jordan Cove should file documentation of continuing consultations with the FAA and the results of any additional studies conducted by the FAA and copies of any official determination of findings made with respect to the proposed LNG terminal and related facilities.

About 660 existing roads would be used for access during construction of the Pacific Connector pipeline. Pacific Connector has estimated that modifications of 55 existing access roads may be required outside of the existing road bed resulting in about 18 acres of disturbance. In addition Pacific Connector would put in about 14 new TARs during construction, affecting about 5 acres, and would permanently maintain 13 new access roads during operation of the pipeline, impacting a total of about 2.6 acres. All new temporary roads would be decommissioned and the areas restored to preconstruction conditions following completion of construction.

It is projected that 80 percent of the workforce for each pipeline spread would be transported from the contractor yard to and from the right-of-way on crew buses, with the remaining 20 percent using their own vehicles (92 vehicles during peak construction) and moving from site-to-site along the right-of-way using local roads and highways. Pacific Connector developed a TMP for non-federal lands, that outlines measures to reduce impacts on non-Project road users. We are recommending that prior to pipeline construction, Pacific Connector document that it provided its TMP to ODOT and the affected counties, and file the agency comments together with a revised plan.

The pipeline right-of-way could attract unauthorized OHV, snowmobile, and dispersed motorized access. Pacific Connector's *Recreation Management Plan* describes measures to be employed on both public and private lands to control unauthorized OHV use, including barriers.

Effects on Federal Lands

The Pacific Connector pipeline would use all or portions of 138 roads that would cross BLM lands for access to the pipeline right-of-way during construction, 58 roads on NFS lands, and 11 roads under Reclamation jurisdiction. Pacific Connector would need to construct 1 new TAR with a total length of approximately 0.3 mile on BLM land affecting less than 1 acre. They would need to construct 3 new PARs on BLM lands, with a total length of less than 0.1 mile, affecting less than one-quarter acre. No new TARs would be built on NFS lands; however, 2 existing decommissioned roads would be reconstructed as temporary roads and then decommissioned upon completion of use. Pacific Connector developed a federal TMP to reduce impacts on users of existing federal roads.

5.1.11 Cultural Resources

Archaeological investigations for the Jordan Cove Project one site at the marine slip (35CS221), one at the SORSC (35CS227), and one at the Kentuck Slough Wetland Mitigation Area (35CS263). The areas of those sites would need to be monitored or tested during construction.

As of May 2013, about 201 miles of the currently proposed pipeline route were covered by surveys, as well as 92 TEWAs, 6 TEWAs partially surveyed, 475 miles of access road, 26 pipe or contractor yards, 16 rock source or disposal areas, and the proposed locations for compressor and meter stations. The surveys identified 104 archaeological sites and 152 isolated finds. All of the isolated finds, and 21 sites on non-federal lands were determined to not be eligible for the NRHP, and require no further work. There are 19 sites on non-federal lands that can be avoided, or where the Project would have no adverse effects. There are 27 sites on non-federal lands of undetermined eligibility to the NRHP that may be affected by the pipeline project and require additional investigations. Twelve sites on non-federal land are eligible for the NRHP cannot be avoided and require treatment in the form of future data recovery excavations. The FERC reached these determinations of eligibility and effect in consultation with the SHPO.

In 2011 we produced an MOA for resolving adverse effects at the historic properties identified for the Jordan Cove LNG import project and Pacific Connector sendout pipeline proposed under Docket Nos. CP07-441-000 and CP07-443-000. The MOA offered a phased approach to future cultural resources investigations. If the newly proposed LNG export project is authorized, we would seek to amend the MOA to cover the facilities under Docket Nos. CP13-483-000 and CP13-492-000.

The FERC staff and the applicants have contacted Indian tribes that may attach religious or cultural importance to sites in the APE. We have received comments from the Coos Tribes, Cow Creek Tribe, and Klamath Tribes. We are recommending that Jordon Cove file its final MOU with interested Indian tribes, and that Pacific Connector should file documentation of meetings with the Cow Creek Tribe and Klamath Tribes and any agreements reached with the tribes.

We have not yet completed the process of complying with the NHPA for this Project. Cultural resources inventories have not yet been completed for the entire APE for either Jordan Cove or Pacific Connector. Jordan Cove has not yet documented a survey that covers the proposed North

Pont construction workers camp, the West Jordan Cove Mitigation Area, and the West Bridge Wetland Mitigation Area. In addition, Pacific Connector has about 31 miles left of the currently proposed pipeline route to survey, and intends to conduct deep geoarchaeological testing at the three river crossings where HDDs would be used. We are recommending that Jordan Cove and Pacific Connector not construct or use any of their proposed facilities, including related ancillary areas for staging, storage, temporary work areas, and new or to-be-improved access roads, until we have completed all studies and consultations necessary to complete compliance with the NHPA.

Effects on Federal Lands

Eighteen archaeological sites are on BLM lands. Twelve of these have been evaluated as not eligible for the NRHP and require no further work. One site should be avoided. Five sites are eligible for the NRHP and cannot be avoided. Those five historic properties would require data recovery excavations.

Six sites are on NFS lands. Two sites are evaluated as not eligible for the NRHP and require no further work. Three sites should be avoided. One site (historic Dead Indian Memorial Highway) is eligible for the NRHP, but crossing it would have no adverse effects.

One site, a historic irrigation system, is administered by Reclamation. The Klamath Project has been determined eligible for the NRHP, however, the SHPO believes the pipeline would have no adverse effects on the system, because Pacific Connector proposes to cross irrigation ditches in the Klamath Basin during the low water period of the winter, and would restore all canals back to their previous condition after construction.

5.1.12 Air Quality and Noise

Air pollutants would be emitted as a result of both construction and operation of marine vessels on the waterway for LNG marine traffic, the LNG terminal and South Dune Power Plant, the Pacific Connector pipeline and aboveground facilities. The location of the Jordan Cove terminal is within an air basin in attainment with federal air quality standards.

During construction, a temporary reduction in ambient air quality may result from emissions and fugitive dust generated by construction equipment. Emissions from equipment during construction would be temporary and would not result in a significant impact on regional air quality or result in any violation of applicable ambient air quality standard.

In March 2013, Jordan Cove submitted an air quality permit application to the ODEQ. The Project's PSD permit application demonstrates that applicable requirements have been met. For all pollutants, the combined impacts at the points of highest concentration during operation of the Jordan Cove facilities are well below the applicable NAAQS and the PSD increments. Therefore, we conclude that the Project would have no significant impacts to regional air quality.

The Klamath Compressor Station and approximately 4 miles of pipeline would be located within the Klamath Falls $PM_{2.5}$ nonattainment area, and approximately 300 feet of pipeline route would be located within the PM_{10} maintenance area. Pacific Connector has not yet filed an air permit application; however, ODEQ would only issue the Project a permit if the applicant can demonstrate compliance with applicable PSD increments and NAAQS to ODEQ's satisfaction. The compressor station could have 1-hour NO_2 impacts that approach the NAAQS; however, the

screening model is highly conservative and the applicant would be required to address this issue as part of the air permitting process.

The NSAs closest to the LNG terminal are single-family homes in the city of North Bend (NSA1) about 1.4 miles south of the center of the proposed LNG terminal site. Noise from construction would range from 32 dBA to 42 dBA at NSA1. Given existing noise levels in the area, the LNG terminal construction noise would not have significant impact on NSAs.

Noise from operation of the LNG terminal is predicted to have a L_{dn} sound level of about 51.4 dBA at an NSA. This would be below the FERC standard of an L_{dn} of 55 dBA. However, we are recommending that Jordan Cove document that its facilities meet our noise standards by filing the results of a noise survey during operation.

Sound levels from equipment during construction of the Pacific Connector pipeline are predicted to be 93 dBA 50 feet away, and would attenuate to 72 dBA at 300 feet. Pipeline construction activities generally would be limited to daytime hours. Due to the assembly-line nature of pipeline construction, activities in any area could occur intermittently over a period lasting from several weeks to a few months. Noise from HDD drilling activities may be above our standard of 55 dBA at some NSAs without mitigation. To make certain that the mitigation measures implemented at the HDD locations are reducing noise at nearby NSAs, were are recommending that Pacific Connector file the results of noise surveys during the drilling activities.

Operation of the Klamath Compressor Station is predicted to generate L_{dn} levels between 46.7 and 56.1 dBA at the closest NSAs. Pacific Connector would implement mitigation measures to reduce noise from the compressor station. To ensure that actual operational noise is at or below the predicted noise, and that there would be no significant impact to noise quality at the nearest NSAs, we are recommending that Pacific Connector file the results of a noise survey no later than 60 days after the compressor station is placed in service to demonstrate that noise at nearby NSAs does not exceed 55 dBA L_{dn}. If that level is exceeded, Pacific Connector would need to install additional noise controls to meet the level within 1 year of the in-service date.

Effects on Federal Lands

The nearest federal PSD Class I areas to any of the proposed Jordan Cove facilities are more than 100 km away, and impacts from Project air emissions at these locations would be minimal and well within compliance with federal standards. Air pollution regulations treat other (Class II) federal lands in the same manner as non-federal Class II lands. The nearest federal lands to the Jordan Cove LNG Terminal include the Shorelands SRMA and the ODNRA. Air quality impacts at these locations would be less than the maximum Class II impact.

The pipeline construction corridor would pass closest to the Mountain Lakes Wilderness Class I area; at its closest point it would be only 4.5 miles away. This is within construction spread 4. Potential air quality impacts on Mountain Lakes would decrease as the distance between construction spread activity and Mountain Lakes increases. Emissions would be below applicable screening criteria. Overall, analyses indicate the pipeline would not adversely affect air quality on federal lands.

During pile driving for installation of LNG terminal berth facilities, predicted noise levels at the BLM boat ramp would exceed 55 dBA, and would be noticeable to users of the BLM boat ramp. This impact would be a temporary annoyance during terminal construction. Predicted noise from

operation of the LNG terminal would be below 55 dBA at the BLM boat ramp, which would be below a noise level that would interfere or be an annoyance for users of the boat ramp.

During construction of the Pacific Connector pipeline, there would be temporary noise impacts on federal lands crossed by the pipeline or crossed by construction access roads. Construction noise could have localized and temporary impact on recreational users and wildlife within federal lands. During operation of the pipeline, there would be no noise generated from the buried pipeline. Three aboveground MLVs would be located within BLM lands, and sound is sometimes detectable within several feet of MLVs; however, this noise level would not be humanly perceptible beyond the operational right-of-way.

5.1.13 Reliability and Safety

As part of the NEPA review, Commission staff must assess whether the proposed facilities would be able to operate safely and securely. As a result of our technical review of the preliminary engineering design and our recommended mitigation, we believe that the facility design proposed by Jordan Cove includes acceptable layers of protection or safeguards which would reduce the risk of a potentially hazardous scenario from developing into an event that could impact the off-site public.

As a cooperating agency, DOT assisted FERC staff in evaluating whether Jordan Cove's proposed design would meet the DOT siting requirements. On June 18, 2014, DOT provided a letter to the FERC staff stating that DOT had no objection to Jordan Cove's methodology for determining the single accidental leakage sources for candidate design spills to be used in establishing the Part 193 siting requirements for the proposed LNG liquefaction facilities. Based on the hazardous area calculations we reviewed, we conclude that potential hazards from the siting of the facility at this location would not have a significant impact on public safety. The areas impacted by these design spills also appear to meet the DOT's exclusion zone requirements by either being within the facility property boundary, within land controlled by Jordan Cove, or over a navigable body of water. If the facility is constructed and becomes operational, the facility would be subject to DOT's inspection and enforcement program. Final determination of whether a facility is in compliance with the requirements of 49 CFR 193 would be made by DOT staff.

As a cooperating agency, the Coast Guard analyzed the suitability of the waterway for LNG marine traffic. Based on its review and its own independent risk assessment, the Coast Guard has determined that the waterway could be made suitable for the type and frequency of LNG marine traffic associated with the proposed Jordan Cove LNG facility. This opinion was contingent upon the availability of additional measures necessary to responsibly manage the maritime safety and security risks. If appropriate resources are not in place prior to LNG vessel movement along the waterway, then the Coast Guard would consider at that time what, if any, vessel traffic and/or facility control measures would be appropriate to adequately address navigational safety and maritime security considerations.

Pacific Connector's pipeline would be built and inspected according to DOT standards. These standards ensure pipeline safety.

Effects on Federal Lands

Locating the pipeline in non-populated areas minimizes the chance for unauthorized public access to the right-of-way. Pacific Connector has proposed mitigation measures to protect the

public from construction activity. The BLM and Forest Service can require Pacific Connector to incorporate additional specific public safety measures into the POD as a condition of a Right-of-Way Grant for use of federal lands. Federal land management agencies may also issue temporary closure orders during periods of active construction when necessary to protect public health and safety.

5.1.14 Cumulative Impacts

Construction of the Project, in addition to other projects within the same watersheds crossed by the pipeline during the same timeframe, would have cumulative impacts on a range of environmental resources, as discussed in section 4.14. We provided information about project-related impacts and mitigation measures for specific environmental resources, and were able to make some general assumptions about other federal projects identified in table 4.14.2.3-1. For the federal projects, there are laws and regulations in place that protect waterbodies and wetlands, threatened and endangered species, and historic properties, and limit impacts from air and noise pollution. Federal land-managing agencies, such as the BLM and Forest Service, have requirements in their LMPs to protect resources on the lands they manage. We do not have good information about potential or foreseeable private projects in the region. For some resources, there are also state laws and regulations that apply to private projects. The analysis area is vast; the 19 watersheds crossed by the Project include more than two million acres. While there would be cumulative impacts on resources when all of the foreseeable projects are combined, the magnitude of that impact would be minimal at the landscape scale. Given the Project BMPs and design features, mitigation measures that would be implemented, federal and state laws and regulations protecting resources, and permitting requirements, we conclude that when added to other past, present, and reasonably foreseeable future actions, the Project would not have significant adverse cumulative impacts on environmental resources within the watersheds crossed by the Pacific Connector pipeline route.

5.2 FERC STAFF'S RECOMMENDED MITIGATION

If the Commission approves the proposed Project, we recommend that the Commission's authorizations include the measures recommended below to further mitigate the environmental impacts associated with the construction and operation of the proposed Project.

1. Jordan Cove and Pacific Connector shall follow the construction procedures and mitigation measures described in their respective applications, supplemental filings (including responses to staff data requests), and as identified in the EIS, unless modified by the Order. Jordan Cove and Pacific Connector must:
    a. request any modification to these procedures, measures, or conditions in a filing with the Secretary;
    b. justify each modification relative to site-specific conditions;
    c. explain how that modification provides an equal or greater level of environmental protection than the original measure; and
    d. receive approval in writing from the Director of the OEP **before using that modification**.
2. **For LNG facilities**, the Director of OEP has delegated authority to take all steps necessary to ensure the protection of life, health, property, and the environment during construction and operation of the Project. This authority shall include:
    a. stop-work authority and authority to cease operation; and
    b. the design and implementation of any additional measures deemed necessary to assure continued compliance with the intent of the conditions of the Order.
3. The Director of OEP has delegated authority to take whatever steps are necessary to ensure the protection of all environmental resources during construction and operation of the Project. This authority shall allow:
    a. the modification of conditions of the Order; and
    b. the design and implementation of any additional measures deemed necessary (including stop work authority) to assure continued compliance with the intent of the environmental conditions as well as the avoidance or mitigation of adverse environmental impact resulting from Project construction and operation.
4. **Before any construction of the LNG terminal and the pipeline**, Jordan Cove and Pacific Connector shall each file an affirmative statement with the Secretary, certified by a senior company official, that all company personnel, EIs, and contractor personnel will be informed of the EI's authority and have been or will be trained on the implementation of the environmental mitigation measures appropriate to their jobs **before** becoming involved with construction and restoration activities.
5. The authorized facility locations shall be as shown in the EIS, as supplemented by filed alignment sheets. **As soon as they are available, and before the start of construction for the LNG terminal and the pipeline**, Jordan Cove and Pacific Connector shall each file with the Secretary any revised detailed maps or survey alignment sheets at a scale not smaller than 1:6,000 with station positions for all facilities approved by the Order. All

requests for modifications of environmental conditions of the Order or site-specific clearances must be written and must reference locations designated on these maps/alignment sheets.

Pacific Connector's exercise of eminent domain authority granted under NGA section 7(h) in any condemnation proceedings related to the Order must be consistent with these authorized facilities and locations. Pacific Connector's right of eminent domain granted under NGA section 7(h) does not authorize it to increase the size of its natural gas pipeline or facilities to accommodate future needs or to acquire a right-of-way for a pipeline to transport a commodity other than natural gas.

6. Jordan Cove and Pacific Connector shall each file with the Secretary detailed maps or alignment sheets and aerial photographs at a scale not smaller than 1:6,000 identifying all route realignments or facility relocations, and staging areas, pipe storage yards, new access roads, and other areas that would be used or disturbed and have not been previously identified in filings with the Secretary. Approval for each of these areas must be explicitly requested in writing. For each area, the request must include a description of the existing land use/cover type, and documentation of landowner approval, whether any cultural resources or federally listed threatened or endangered species would be affected, and whether any other environmentally sensitive areas are within or abutting the area. All areas shall be clearly identified on the maps/sheets/aerial photographs. Each area must be approved in writing by the Director of OEP **before construction in or near that area**.

   This requirement does not apply to extra workspace allowed by FERC's *Plan*, minor field realignments per landowner needs, and requirements which do not affect other landowners or sensitive environmental areas such as wetlands.

   Examples of alterations requiring approval include all route realignments and facility location changes resulting from:

   a. implementation of cultural resources mitigation measures;

   b. implementation of endangered, threatened, or special concern species mitigation measures;

   c. recommendations by state regulatory authorities; and

   d. agreements with individual landowners that affect other landowners or could affect sensitive environmental areas.

7. **Within 60 days of the acceptance of the Order**, and before construction of the LNG terminal and the pipeline begins, Jordan Cove and Pacific Connector shall each file an Implementation Plan with the Secretary for review and written approval by the Director of OEP. Jordan Cove and Pacific Connector must file revisions to their respective plan as schedules change. The plans shall identify:

   a. how Jordan Cove and Pacific Connector will implement the construction procedures and mitigation measures described in their applications and supplements (including responses to staff data requests), identified in the EIS, and required by the Order;

b. how Jordan Cove and Pacific Connector would incorporate these requirements into the contract bid documents, construction contracts (especially penalty clauses and specifications), and construction drawings so that the mitigation required at each site is clear to on-site construction and inspection personnel;

c. the number of EIs assigned per spread, and how the company will ensure that sufficient personnel are available to implement the environmental mitigation;

d. company personnel, including EIs and contractors, who will receive copies of the appropriate material;

e. the location of the environmental compliance training Jordan Cove and Pacific Connector will give to all personnel involved with construction and restoration (initial and refresher training as the Project progresses and personnel change), with the opportunity for OEP staff to participate in the training sessions;

f. the company personnel (if known) and specific portion of Jordan Cove and Pacific Connector's organization having responsibility for compliance;

g. the procedures (including use of contract penalties) Jordan Cove and Pacific Connector will follow if noncompliance occurs; and

h. for each discrete facility, a Gantt or PERT chart (or similar project scheduling diagram), and dates for:

(1) the completion of all required surveys and reports;

(2) the environmental compliance training of on-site personnel;

(3) the start of construction; and

(4) the start and completion of restoration.

8. Jordan Cove and Pacific Connector shall employ a team of EIs, including at least one EI at the LNG terminal and two or more per pipeline spread. The EIs shall be:

a. responsible for monitoring and ensuring compliance with all mitigation measures required by the Order and other grants, permits, certificates, or other authorizing documents;

b. responsible for evaluating the construction contractor's implementation of the environmental mitigation measures required in the contract (see condition 7 above) and any other authorizing document;

c. empowered to order correction of acts that violate the environmental conditions of the Order, and any other authorizing document;

d. a full-time position, separate from all other activity inspectors;

e. responsible for documenting compliance with the environmental conditions of the Order, as well as any environmental conditions/permit requirements imposed by other federal, state, or local agencies; and

f. responsible for maintaining status reports.

9. Pacific Connector shall develop and implement an environmental compliance resolution procedure. The procedure shall provide landowners with clear and simple directions for identifying and resolving their environmental mitigation problems/concerns during construction of the Project and restoration of the right-of-way. **Prior to construction**, Pacific Connector shall mail the complaint procedures to each landowner whose property would be crossed or affected by the pipeline.

    a. In its letter to affected landowners, Pacific Connector shall:

        (1) provide a local contact that the landowners shall call first with their concerns; the letter shall indicate how soon a landowner should expect a response;

        (2) instruct the landowners that, if they are not satisfied with the response, they shall call Pacific Connector's Hotline; the letter shall indicate how soon to expect a response; and

        (3) instruct the landowners that, if they are still not satisfied with the response from Pacific Connector's Hotline, they shall contact the Commission's Dispute Resolution Division Helpline at 877-337-2237 or at ferc.adr@ferc.gov.

    b. In addition, Pacific Connector shall include in its weekly status report a copy of a table that contains the following information for each problem/concern:

        (1) the identity of the caller and date of the call;

        (2) the location by milepost and identification number from the authorized alignment sheets of the affected property;

        (3) the description of the problem/concern; and

        (4) an explanation of how and when the problem was resolved, will be resolved, or why it has not been resolved.

10. Beginning with the filing of their Implementation Plans, Jordan Cove and Pacific Connector shall file updated status reports with the Secretary on a **weekly** basis until all construction and restoration activities are complete. On request, these status reports will also be provided to other federal and state agencies with authorization or permitting responsibilities. Status reports shall include:

    a. an update on Jordan Cove and Pacific Connector's efforts to obtain the necessary federal authorizations;

    b. the construction status of the LNG terminal or pipeline, work planned for the following reporting period, and any schedule changes for stream crossings or work in other environmentally sensitive areas;

    c. a listing of all problems encountered and each instance of noncompliance observed by the EI(s) during the reporting period (both for the conditions imposed by the Commission and any environmental conditions/permit requirements imposed by other federal, state, or local agencies);

d. a description of the corrective actions implemented in response to all instances of noncompliance, and their cost;

e. the effectiveness of all corrective actions implemented;

f. a description of any landowner/resident complaints which may relate to compliance with the requirements of the Order, and the measures taken to satisfy their concerns; and

g. copies of any correspondence received by Jordan Cove or Pacific Connector from other federal, state or local permitting agencies concerning instances of noncompliance, and Jordan Cove and Pacific Connector's response.

11. **Prior to receiving written authorization from the Director of OEP to commence construction of any Project facilities**, Jordan Cove and Pacific Connector, individually, shall file with the Secretary documentation that each company has received all applicable authorizations required under federal law (or evidence of waiver thereof).

12. Jordan Cove and Pacific Connector must each receive written authorization from the Director of OEP **before commencing service** of the Project facilities. Such authorization will only be granted following a determination that the LNG facility and the pipeline and associated facilities have been constructed in accordance with Commission approval and applicable standards, can be expected to operate safely as designed, and the rehabilitation and restoration of areas disturbed by construction are proceeding satisfactorily.

13. **Within 30 days of placing the authorized facilities in service**, Jordan Cove and Pacific Connector shall each file an affirmative statement with the Secretary, certified by a senior company official:

    a. that the facilities have been constructed in compliance with all applicable conditions, and that continuing activities will be consistent with all applicable conditions; or

    b. identifying which of the conditions of the Order Jordan Cove and Pacific Connector has complied with or will comply with. This statement shall also identify any areas affected by the Project where compliance measures were not properly implemented, if not previously identified in filed status reports, and the reason for noncompliance.

Recommendation 14 shall apply to both the LNG terminal and the pipeline, and shall be addressed by Jordan Cove and Pacific Connector before the end of the comment period on the draft EIS.

14. **Prior to the end of the comment period on the draft EIS**, Jordan Cove and Pacific Connector shall each file with the Secretary a copy of their *Migratory Bird Conservation Plan*, and documentation that the plans were developed in consultations with the FWS. (*EIS sections 4.6.1.1*)

Recommendations 15 through 16 shall apply only to the LNG terminal, and shall be addressed by Jordan Cove before the end of the comment period on the draft EIS.

15. **Prior to the end of the comment period on the draft EIS**, Jordan Cove shall file with the Secretary its final Spill Plan. (*EIS section 4.4.1.1*)

16. **Prior to the end of the comment period on the draft EIS**, Jordan Cove shall file with the Secretary its final SPCCP. (*EIS section 4.4.1.1*)

Recommendations 17 through 26 shall apply only to the pipeline, and shall be addressed by Pacific Connector before the end of the comment period on the draft EIS.

17. **Prior to the end of the comment period on the draft EIS**, Pacific Connector shall file with the Secretary documentation that it has realigned the pipeline route to adopt the minor route variations recommended by the BLM between MPs 119.5 and 119.8, at MP 126.0, and at MP 131.5. (*EIS section 3.4.4.1*)

18. **Prior to the end of the comment period on the draft EIS**, Pacific Connector shall file with the Secretary documentation that it has realigned the pipeline route to adopt the minor route variations recommended by the Forest Service between MPs 154.7 and 155.1, MPs 157.1 and 158.7, and MPs 171.2 and 173.0. (*EIS section 3.4.4.1*)

19. **Prior to the end of the comment period on the draft EIS**, Pacific Connector shall develop a plan detailing how it would either avoid or remove contaminants at the five ECSI sites proposed for use during construction. The plan shall include:

    a. the location of the contaminants on each site relative to Project impacts;

    b. a discussion of how the contaminated areas would be avoided or the contaminants safely removed; and

    c. a discussion of how human health, worker safety, and the environment would be protected. (*EIS section 4.3.2.3*)

17. **Prior to the end of the comment period on the draft EIS**, Pacific Connector shall file with the Secretary its final MLV locations, including the new location for MLV #9 that Pacific Connector has agreed to move off of NFS land. This filing shall include updated locations of temporary and permanent access roads as a result of any changes in MLV location. (*EIS section 4.1.2.2*)

18. **Prior to the end of the comment period on the draft EIS**, Pacific Connector shall file with the Secretary a description and location of any new electrical service needs on federal lands, including electrical service required for the cathodic protection system. (*EIS section 4.1.3.1*)

19. **Prior to the end of the comment period on the draft EIS**, Pacific Connector shall file with the Secretary a revised SPCCP that includes the use of secondary containment structures for all fuel storage tanks and hazardous materials containers. (*EIS section 4.4.1.2*)

20. **Prior to the end of the comment period on the draft EIS**, Pacific Connector shall file with the Secretary the methodology it used to classify high quality wetlands crossed by the pipeline, including documentation of consultations with the COE and ODSL about the design of the methodology. (*EIS section 4.4.3.2*)

21. **Prior to the end of comment period on the draft EIS,** Pacific Connector shall file with the Secretary its *Habitat Mitigation Plan* for impacts on non-federal lands, together with documentation that the plan was formulated in consultation with appropriate resource agencies such as the ODFW. (*EIS section 4.6.1.2*)

22. **Prior to the end of the comment period on the draft EIS**, Pacific Connector shall file with the Secretary the specific methods that would be used at each road crossing of a stream that could potentially support fish. Pacific Connector shall describe how each crossing method would meet ODFW fish passage standards. (*EIS section 4.6.2.3*)

23. **Prior to the end of the comment period on the draft EIS,** Pacific Connector shall file with the Secretary individual stream crossing designs for stream crossings that:

    a. support or are assumed to support federally listed fish species and are rated by the FWS matrix evaluation methods as having either a high stream response potential and moderate project impact potential, or a moderate stream response potential and high project impact potential; or

    b. are of special concern to the BLM and Forest Service for stream crossing construction effects.

    The designs shall be based on site-specific information for each of these crossings including stream characteristics, bank conditions, and riparian habitat. (*EIS section 4.6.2.3*)

24. **Prior to the end of the comment period on the draft EIS**, Pacific Connector shall file with the Secretary a stream crossing monitoring plan to be implemented during operation of the pipeline. The plan shall include the rationale for scheduling the timing of stream monitoring, monitoring locations, and the specific criteria Pacific Connector would use to determine whether stream stability and bank conditions are being maintained, as well as remediation actions what would occur should crossing not meet the criteria. The plan shall include documentation of Pacific Connector's consultation with the appropriate agencies in developing the plan. (*EIS section 4.6.2.3*)

25. **Prior to the end of the comment period on the draft EIS,** Pacific Connector shall file with the Secretary minor pipeline route adjustments on NFS lands to avoid or minimize impacts on the traveling sideband and Siskiyou hesperian, and documentation that the route adjustments were developed in consultations with the Forest Service. (*EIS section 4.7.4.2*)

26. **Prior to the end of the comment period on the draft EIS,** Pacific Connector shall file with the Secretary minor pipeline route adjustments on NFS lands to create buffer distances for *C. alveolatus, G. abietus,* and *S. pulvinata,* and documentation that the route adjustments were developed in consultations with the Forest Service. (*EIS section 4.7.4.3*)

Recommendations 27 through 29 apply to both the LNG terminal and pipeline, and shall be addressed by Jordan Cove and Pacific Connector prior to the start of construction.

27. Jordan Cove and Pacific Connector **shall not begin construction of their respective Project facilities** until the companies each file with the Secretary a copy of the ODLCD's determination of consistency with the CZMA. (*EIS section 4.1.1.2*)

28. Jordan Cove and Pacific Connector **shall not begin construction of facilities and/or use** of all staging, storage, or temporary work areas and new or to-be-improved access roads **until**:

    a. Jordan Cove and Pacific Connector each file with the Secretary:

(1) remaining cultural resources inventory reports for areas not previously surveyed;

(2) site evaluation and monitoring reports, as necessary;

(3) avoidance and treatment plans, as required, and a final HPMP; and

(4) comments on the cultural resources reports and plans from the SHPO, applicable federal land managing agencies, and interested Indian tribes.

b. the FERC amends the Project MOA, and affords the ACHP an opportunity to comment; and

c. the FERC staff reviews and the Director of OEP approves all cultural resources reports and plans, and notifies Jordan Cove and Pacific Connector in writing that treatment plans may be implemented and/or construction may proceed.

All materials filed with the Commission containing **location, character, and ownership information** about cultural resources must have the cover and any relevant pages therein clearly labeled in bold lettering: "**CONTAINS PRIVILEGED INFORMATION – DO NOT RELEASE**." (*EIS section 4.11.5*)

29. Jordan Cove and Pacific Connector **shall not construct or use** any of their facilities, including related ancillary areas for staging, storage, temporary work areas, and new or to-be-improved access roads, **until**:

a. the Commission staff completes formal consultations with the NMFS and FWS; and

b. Jordan Cove and Pacific Connector have received written notification from the Director of OEP that construction and/or implementation of conservation measures may begin. (*EIS section 4.7.5*)

Recommendations 30 through 47 apply only to the LNG terminal, and shall be addressed by Jordan Cove prior to commencing final design, prior to procurement, prior to initial site preparation, prior to the start of construction, or no later than 60 days after placing the plant into service.

30. **Prior to construction**, Jordan Cove shall file with the Secretary, for review and approval by the Director of OEP, a plan to protect the four groundwater wells located on Roseburg Forest Products property from physical damage during construction of the LNG terminal. (*EIS section 4.4.1.1*)

31. **Prior to construction,** Jordan Cove shall complete consultations with the ODSL, ODEQ, COE, and other appropriate resource agencies, and file with the Secretary its final *Wetland Mitigation Plan*, together with the agencies' comments on the plan. (*EIS section 4.4.3.1*)

32. **Prior to construction,** Jordan Cove shall file its final lighting plan with the Secretary, for the review and approval by the Director of OEP, together with documentation that the plan was developed in consultation with appropriate resource agencies, including the FWS, NMFS, and ODFW, to include measures that would reduce lighting impacts on wildlife. (*EIS section 4.6.1.1*)

33. **Prior to construction,** Jordan Cove shall file with the Secretary, for review and approval by the Director of OEP, a *Monitoring and Adaptive Management Plan* for the protection of pinnipeds, and documentation that the plan was formulated in consultation with the NMFS. (*EIS section 4.6.2.2*)

34. **Prior to construction,** Jordan Cove shall file with the Secretary, for review and approval by the Director of OEP, a revised *Transportation Impact Analysis* that addresses the use of off-site satellite parking lots, and the transportation of construction workers from those lots to the terminal by bus or rail. Jordan Cove shall document that it provided copies of the revised study to the ODOT, Coos County, and City of North Bend, and file the comments of the agencies. (*EIS section 4.10.1.2*)

35. **Prior to construction,** Jordan Cove shall file with the Secretary documentation of its consultations with the FAA, and the results of any aeronautical studies conducted under Federal Aviation Regulations Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace, together with copies of any official determinations made by the FAA with respect to the LNG terminal and related facilities. (*EIS section 4.10.1.4*)

36. **Prior to construction**, Jordan Cove shall file with the Secretary a copy of its final MOU with interested Indian tribes. The MOU shall outline procedures for future archaeological test excavations and monitoring at the LNG terminal facilities, and include the participation of representatives from interested Indian tribes. (*EIS section 4.11.1.2*)

37. **Prior to construction**, Jordan Cove shall file with the Secretary documentation that it would employ a special inspector during construction to perform duties described in Section 6 of NBSIR84-2833, Data Requirements for the Seismic Review of LNG Facilities. (*EIS section 4.2.1.4*)

38. **Prior to commencing final design of the LNG terminal**, Jordan Cove shall file with the Secretary, stamped and sealed by the professional engineer-of-record, the following:

    a. final geotechnical investigations necessary to support all final foundation designs in satisfying the criteria stated in the application and subsequent data request responses. These investigations would include how the identified potential zones of liquefaction at the terminal site would be mitigated and the details of the liquefaction mitigation method(s), procedures, plan extent, and verification methods proposed to verify mitigation of liquefaction potential;

    b. detailed calculations of seismic slope stability and lateral movements anticipated after the liquefaction mitigation is implemented to verify the stability of critical structures for the LNG terminal design earthquake motions;

    c. final foundation design recommendations, including foundation design and/or liquefaction mitigation measures for all structures including the LNG storage tanks;

    d. final Seismic Design Criteria for all Seismic Design Category I and II structures, systems, and components that satisfy the criteria stated in the application and subsequent data request responses;

    e. a final list of Seismic Category assignments for all structures, systems, and components; and

f. final Quality Control and Quality Assurance procedures to be used for design. (*EIS section 4.2.1.4*)

39. **Prior to commencing final design of the LNG storage tanks,** Jordan Cove shall file with the Secretary, stamped and sealed by the professional engineer-of-record, the following information:

a. non-linear response history analysis of the LNG tank and isolation system. The analysis would simultaneously include all three components of ground motion. The response spectra of the time history vertical component of motion envelope the site-specific vertical design response spectra developed for the Project facilities. The horizontal components should be rotated so that one of the components for each set of motions is the maximum component of response at the isolated period of the tank and isolation system;

b. non-linear analyses for both maximum and minimum design liquid levels of the LNG tanks;

c. separate non-linear analysis to account for variations of design stiffness, minimum values of friction, and other properties as required by Sections 17.5 ASCE 7-05; and

d. documentation that the lateral displacement capacity of the seismic isolation bearings is not less than 24 inches. (*EIS section 4.2.1.4*)

40. **Prior to commencing with procurement, fabrication, or construction**, Jordan Cove shall file with the Secretary, stamped and sealed by the professional engineer-of-record, the following information:

a. final seismic specifications to be used in conjunction with the procuring Seismic Design Category I and II equipment;

b. site preparation drawings and specifications;

c. final and construction documents (drawings, calculations, specifications, etc.) for Seismic Category I and II structures, systems and components including the LNG storage tanks and Seismic Isolation Peer Review Report; and

d. final Quality Control and Quality Assurance procedures to be used for procurement, fabrication and construction. (*EIS section 4.2.1.6*)

41. Jordan Cove shall file a full load noise survey for the LNG terminal **no later than 60 days after placing the plant into service**. If a full load noise survey is not possible, Jordan Cove shall file an interim survey at the maximum possible operation **within 60 days of placing the LNG terminal into service** and **file the full operational surveys within 6 months**. If the noise attributable to the operation of all the equipment of the LNG terminal at full operation exceeds 55 dBA L_{dn} at any nearby NSAs, Jordan Cove shall install additional noise controls to meet the level **within 6 months of the in-service date**. Jordan Cove shall confirm compliance with this requirement by filing a second full power noise survey with the Secretary **no later than 60 days after it installs the additional noise controls**. (*EIS section 4.12.2.4*)

42. **Prior to construction**, Jordan Cove shall file with the Secretary, for review and approval by the Director of OEP, information/revisions pertaining to Jordan Cove's response

numbers 17(b), 17(d), 27, 43, 46, 59, 61, 66, 91, 95, 103, 111, and 112 of its October 3, 2013 filing, which indicated features to be included or considered in the final design. (*EIS section 4.13.3*)

43. **Prior to construction**, Jordan Cove shall file with the Secretary, for review and approval by the Director of OEP, certification that the final design is consistent with the information provided to DOT as described in the design spill determination letter dated June 18, 2014 (Accession Number 20140619-4001). In the event that any modifications to the design alters the candidate design spills on which the Title 49 CFR Part 193 siting analysis was based, Jordan Cove shall consult with DOT on any actions necessary to comply with Part 193. (*EIS section 4.13.5.2*)

44. **Prior to construction**, Jordan Cove shall file with the Secretary, for review and written approval by the Director of OEP, the details of the vapor barriers as well as procedures to maintain and inspect the vapor barriers provided to meet the siting provisions of 49 CFR § 193.2059. This information shall be filed **a minimum of 30 days before approval to proceed is requested**. (*EIS section 4.13.5.3*)

45. **Prior to initial site preparation**, Jordan Cove shall file with the Secretary, for review and written approval by the Director of OEP, concurrence from PHMSA that the Safety Zone Easement Option language satisfies the exclusion zone requirements of 49 CFR 193.2059. This information shall be filed **a minimum of 30 days before approval to proceed is requested**. (*EIS section 4.13.5.3*)

46. **Prior to initial site preparation**, Jordan Cove shall file with the Secretary, for review and written approval by the Director of OEP, an Emergency Response Plan. The Emergency Response Plan should include evacuation procedures. Jordan Cove shall coordinate procedures with the Coast Guard; state, county, and local emergency planning groups; fire departments; state, county, and local law enforcement; and appropriate federal agencies. This plan shall include at a minimum:

    a. designated contacts with state and local emergency response agencies;

    b. scalable procedures for the prompt notification of appropriate local officials and emergency response agencies based on the level and severity of potential incidents;

    c. procedures for notifying residents and recreational users within areas of potential hazard;

    d. evacuation routes/methods for residents and other public use areas that are within any transient hazard areas along the route of the LNG marine traffic;

    e. locations of permanent sirens and other warning devices; and

    f. an "emergency coordinator" on each LNG vessel to activate sirens and other warning devices.

    The Emergency Response Plan shall include consideration of a tsunami event. Jordan Cove shall notify the FERC staff of all planning meetings in advance and should report progress on the development of its Emergency Response Plan at **3-month intervals**. (*EIS section 4.13.7*)

47. **Prior to initial site preparation**, Jordan Cove shall file with the Secretary, for review and written approval by the Director of OEP, a Cost-Sharing Plan to be included in its Emergency Response Plan. The Cost-Sharing Plan shall identify the mechanisms for funding all project-specific security/emergency management costs that would be imposed on state and local agencies. In addition to the funding of direct transit-related security/emergency management costs, this comprehensive plan shall include funding mechanisms for the capital costs associated with any necessary security/emergency management equipment and personnel base. (*EIS section 4.13.7*)

Recommendations 48 through 55 apply only to the pipeline, and shall be addressed by Pacific Connector prior to the start of construction.

48. **Prior to construction**, Pacific Connector shall file with the Secretary, stamped and sealed by the professional engineer-of-record, the final monitoring protocols and/or mitigation measures for all landslide areas that were not accessible during previous studies, to evaluate slope stability conditions. (*EIS section 4.2.2.2*)

49. **Prior to construction**, Pacific Connector shall file with the Secretary, for review and approval by the Director of OEP, a revised *Groundwater Supply Monitoring and Mitigation Plan* that identifies the location by MP of all wells, springs, and seeps within 150 feet of the construction right-of-way, including direction and distance (in feet) from the pipeline centerline, and outlines measures that would be implemented to avoid or reduce impacts on those features. (*EIS section 4.4.1.2*)

50. **Prior to construction,** Pacific Connector shall file with the Secretary a revised *Integrated Pest Management Plan* that addresses BLM and Forest Service requirements related to monitoring of invasive plant species on federally managed lands, and documentation that the revised plan was found acceptable by the BLM and Forest Service. (*EIS section 4.5.1.3*)

51. **Prior to construction**, Pacific Connector shall file with the Secretary, for review and approval by the Director of OEP, a project-specific *Aquatic Species Nuisance Treatment Plan*, and documentation that the plan was developed in consultation with appropriate resource agencies. (*EIS section 4.6.2.3*)

52. **Prior to construction**, Pacific Connector shall file with the Secretary, for review and approval by the Director of OEP, a plan to avoid both direct and indirect impacts on vernal pool fairy shrimp habitat at the Medford Industrial Park yard and the pipeline route between MPs 145.3 and 145.4. (*EIS section 4.7.1.5*)

53. **Prior to construction**, Pacific Connector shall file with the Secretary documentation of consultations with the Port, Coos County, City of North Bend, ODSL, ODPR, CRTP, and other interested parties regarding potential impacts on the Haynes Inlet Water Trail and users of the boat ramp along North Bay Drive. The documentation shall include their comments on Pacific Connector's *Recreation Management Plan*. (*EIS section 4.8.1.2*)

54. **Prior to construction,** Pacific Connector shall file with the Secretary documentation that it consulted with ODOT and the counties crossed by the pipeline route regarding Project-related impacts on non-federal roads, and comments from the agencies on its *Transportation Management Plan for Non-Federal Lands*. Substantial comments from

agencies shall be addressed in a revised plan, filed with the Secretary for review and approval by the Director of OEP. (*EIS section 4.10.2.3*)

55. **Prior to construction**, Pacific Connector shall file with the Secretary documentation of meetings with the Cow Creek Tribe and the Klamath Tribes, and copies of any agreements reached with the tribes. (*EIS section 4.11.1.2*)

Recommendations 56 through 57 apply to the pipeline, and shall be addressed by Pacific Connector during construction or after the commencement of service.

56. Pacific Connector shall include in its **weekly construction status reports** (see condition 10 above) the following information for the HDD/DP entry points of the Coos River, South Umpqua River, Roque River, and Klamath River:

    a. noise measurements from the nearest NSA, obtained at **the start of drilling operations**;

    b. noise mitigation Pacific Connector implemented at **the start of drilling operations**; and

    c. any additional mitigation measures that Pacific Connector would implement if the initial noise measurements attributable to drilling operations exceeded an L_{dn} of 55 dBA at the nearest NSA. (*EIS section 4.12.2.4*)

57. Pacific Connector shall file a noise survey with the Secretary **no later than 60 days after placing the Klamath Compressor Station in service**. If a full load condition noise survey is not possible, Pacific Connector shall provide an interim survey at the maximum possible horsepower load and provide the full load survey **within 6 months**. If the noise attributable to the operation of all of the equipment at the Klamath Compressor Station under interim or full horsepower load conditions exceeds an L_{dn} of 55 dBA at any nearby NSAs, Pacific Connector shall file a report on what changes are needed and shall install the additional noise controls to meet the level **within 1 year** of the in-service date. Pacific Connector shall confirm compliance with the above requirement by filing a second noise survey with the Secretary **no later than 60 days** after it installs the additional noise controls. (*EIS section 4.12.2.4*)

The following measures shall apply to the Jordan Cove Project. Information pertaining to these specific recommendations shall be filed with the Secretary for review and written approval by the Director of OEP either: prior to initial site preparation; prior to construction of final design; prior to commissioning; prior to introduction of hazardous fluids; or prior to commencement of service, as indicated by each specific condition. Specific engineering, vulnerability, or detailed design information meeting the criteria specified in Order No. 683 (Docket No. RM06-24-000), including security information, shall be submitted as critical energy infrastructure information (CEII) pursuant to 18 CFR 388.112. See Critical Energy Infrastructure Information, Order No. 683, 71 Fed. Reg. 58,273 (October 3, 2006), FERC Stats. & Regs. ¶ 31,228 (2006). Information pertaining to items such as offsite emergency response; procedures for public notification and evacuation; and construction and operating reporting requirements will be subject to public disclosure. All information shall be filed a minimum of 30 days before approval to proceed is required.

58. **Prior to initial site preparation**, Jordan Cove shall provide procedures for controlling access during construction. (*EIS section 4.13.3*)

59. **Prior to initial site preparation**, Jordan Cove shall file the quality assurance and quality control procedures for construction activities. (*EIS section 4.13.3*)

60. **Prior to initial site preparation**, Jordan Cove shall file a plot plan of the final design showing all major equipment, structures, buildings, and impoundment systems. (*EIS section 4.13.3*)

61. The **final design** shall vent the seal gas from the pressure regulator and bursting disc to the flare, and the seal gas drum drain shall be piped to a safe location for containment instead of draining to grade. (*EIS section 4.13.3*)

62. The **final design** shall specify the operating temperature of the hot gas injection nozzle to Refrigerant Suction Drum, 30-V-0101, consistent with the design temperature of the first stage refrigerant compressor discharge. (*EIS section 4.13.3*)

63. The **final design** shall provide provisions for the future installation of LNG transfer pumps for the BOG Compressor Suction Drums. (*EIS section 4.13.3*)

64. The **final design** of the electrical seal interface between a flammable fluid and electrical cable shall comply with the requirements of NFPA 59A (2001 edition), Section 7. (*EIS section 4.13.3*)

65. The **final design** of the Marine Area and the Process Area Impoundment Basins shall include low temperature detectors that shutdown and prevent the start-up of the storm water pumps. (*EIS section 4.13.3*)

66. The **final design** shall include procedures that require the equipment to be completely shut down and depressurized during maintenance. (*EIS section 4.13.3*)

67. The **final design** shall provide coarse mesh strainers in the bottom outlet piping of the adsorbers to prevent support material and molecular sieve migrating from the Mole Sieve Gas Dehydrators to the piping system and switching valves. (*EIS section 4.13.3*)

68. The **final design** shall provide drainage piping to the flare system from the Heavies Separator bottom outlet piping upstream of the shutoff valve. (*EIS section 4.13.3*)

69. The **final design** shall include a flow transmitter with low flow alarm in the cooling water inlet line to each refrigerant compressor motor cooling system. (*EIS section 4.13.3*)

70. The **final design** shall include a plant-wide shutdown initiated by low instrument air pressure. The setting shall be above the minimum required to maintain stable operation. (*EIS section 4.13.3*)

71. The **final design** shall provide provisions for the future installation of transfer pumps for the Flare Knockout (KO) Drums. (*EIS section 4.13.3*)

72. The **final design** shall consider design features necessary to prevent liquid from the flare KO drums overflowing into the flare piping system in the event of releases into these drums when they are operating with high liquid levels, or when a plant shutdown has been initiated by high-high liquid level in a flare KO drum. (*EIS section 4.13.3*)

73. The **final design** shall include change logs that list and explain any changes made from the Front-End Engineering Design provided in Jordan Cove's application and filings. A list of all changes with an explanation for the design alteration shall be provided and all changes shall be clearly indicated on all diagrams and drawings. (*EIS section 4.13.3*)

74. The **final design** shall provide up-to-date Process Flow Diagrams with heat and material balances and P&IDs, which include the following information:

    a. equipment tag number, name, size, duty, capacity, and design conditions;

    b. equipment insulation type and thickness;

    c. storage tank pipe penetration size and nozzle schedule;

    d. valve high pressure side and internal and external vent locations;

    e. piping with line number, piping class specification, size, and insulation type and thickness;

    f. piping specification breaks and insulation limits;

    g. all control and manual valves numbered;

    h. relief valves with set points; and

    i. drawing revision number and date. *(EIS section 4.13.3)*

75. The **final design** shall provide an up-to-date complete equipment list, process and mechanical data sheets, and specifications. (*EIS section 4.13.3*)

76. The **final design** shall provide complete drawings and a list of the hazard detection equipment. The drawings shall clearly show the location and elevation of all detection equipment. The list shall include the instrument tag number, type and location, alarm indication locations, and shutdown functions of the hazard detection equipment. (*EIS section 4.13.3*)

77. The **final design** shall provide complete plan drawings and a list of the fixed and wheeled dry-chemical, hand-held fire extinguishers, and other hazard control equipment. Drawings shall clearly show the location by tag number of all fixed, wheeled, and hand-held extinguishers. The list shall include the equipment tag number, type, capacity, equipment covered, discharge rate, and automatic and manual remote signals initiating discharge of the units. (*EIS section 4.13.3*)

78. The **final design** shall provide facility plans and drawings that show the location of the firewater and foam systems. Drawings shall clearly show: firewater and foam piping; post indicator valves; and the location, and area covered by, each monitor, hydrant, deluge system, foam system, water-mist system, and sprinkler. The drawings shall also include piping and instrumentation diagrams of the firewater and foam system. (*EIS section 4.13.3*)

79. The **final design** shall include an updated fire protection evaluation of the facilities carried out in accordance with the requirements of NFPA 59A 2001, chapter 9.1.2 as required by 49 CFR Part 193. A copy of the evaluation, a list of recommendations and supporting justifications, and actions taken on the recommendations shall be filed. (*EIS section 4.13.3*)

80. The **final design** shall specify that for hazardous fluids, piping and piping nipples 2 inches or less in diameter are to be no less than schedule 160 for carbon steel and no less than schedule 80 for stainless steel, and are designed to withstand external loads, including vibrational loads in the vicinity of rotating equipment and operator live loads in areas accessible by operators. (*EIS section 4.13.3*)

81. The **final design** shall include drawings and details of how process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system meet the requirements of NFPA 59A. (*EIS section 4.13.3*)

82. The **final design** shall provide an air gap or vent installed downstream of process seals or isolations installed at the interface between a flammable fluid system and an electrical conduit or wiring system. Each air gap shall vent to a safe location and be equipped with a leak detection device that: shall continuously monitor for the presence of a flammable fluid; shall alarm the hazardous condition; and shall shutdown the appropriate systems. (*EIS section 4.13.3*)

83. The **final design** shall provide electrical area classification drawings. (*EIS section 4.13.3*)

84. The **final design** shall provide spill containment system drawings with dimensions and slopes of curbing, trenches, and impoundments. (*EIS section 4.13.3*)

85. The **final design** of the hazard detectors shall account for the calibration gas when determining the LFL set points for methane, propane, ethylene, and isopentane. (*EIS section 4.13.3*)

86. The **final design** shall include a hazard and operability review of the completed design **prior to issuing the P&IDs for construction**. A copy of the review, a list of recommendations, and actions taken on the recommendations, shall be filed. (*EIS section 4.13.3*)

87. The **final design** shall include the cause-and-effect matrices for the process instrumentation, fire and gas detection system, and emergency shutdown system. The cause-and-effect matrices shall include alarms and shutdown functions, details of the voting and shutdown logic, and setpoints. (*EIS section 4.13.3*)

88. The **final design** shall include a drawing showing the location of the emergency shutdown (ESD) buttons. ESD buttons shall be easily accessible, conspicuously labeled, and located in an area which would be accessible during an emergency. (*EIS section 4.13.3*)

89. The **final design** shall include a plan for clean-out, dry-out, purging, and tightness testing. This plan shall address the requirements of the American Gas Association's Purging Principles and Practice required by 49 CFR 193, and shall provide justification if not using an inert or non-flammable gas for cleanout, dry-out, purging, and tightness testing. (*EIS section 4.13.3*)

90. The **final design** shall include the sizing basis and capacity for the final design of pressure and vacuum relief valves for major process equipment, vessels, storage tanks, and vent stacks. (*EIS section 4.13.3*)

91. The **final design** shall provide the procedures for pressure/leak tests which address the requirements of ASME VIII and ASME B31.3, as required by 49 CFR 193. (*EIS section 4.13.3*)

92. **Prior to commissioning**, Jordan Cove shall file plans and detailed procedures for: testing the integrity of on-site mechanical installation; functional tests; introduction of hazardous fluids; operational tests; and placing the equipment into service. (*EIS section 4.13.3*)

93. **Prior to commissioning**, Jordan Cove shall provide a detailed schedule for commissioning through equipment startup. The schedule shall include milestones for all procedures and tests to be completed: prior to introduction of hazardous fluids; and during commissioning and startup. Jordan Cove shall file documentation certifying that each of these milestones has been completed before authorization to commence the next phase of commissioning and startup would be issued. (*EIS section 4.13.3*)

94. **Prior to commissioning**, Jordan Cove shall provide results of the LNG storage tank hydrostatic test and foundation settlement results. (*EIS section 4.13.3*)

95. **Prior to commissioning**, Jordan Cove shall tag all equipment, instrumentation, and valves in the field, including drain valves, vent valves, main valves, and car-sealed or locked valves. (*EIS section 4.13.3*)

96. **Prior to commissioning**, Jordan Cove shall file a tabulated list and drawings of the proposed hand-held fire extinguishers. The list shall include the equipment tag number, extinguishing agent type, capacity, number, and location. The drawings shall show the extinguishing agent type, capacity, and tag number of all hand-held fire extinguishers. (*EIS section 4.13.3*)

97. **Prior to commissioning**, Jordan Cove shall file the operation and maintenance procedures and manuals, as well as safety procedures. (*EIS section 4.13.3*)

98. **Prior to commissioning**, Jordan Cove shall maintain a detailed training log to demonstrate that operating staff has completed the required training. (*EIS section 4.13.3*)

99. **Prior to introduction of hazardous fluids**, Jordan Cove shall complete a firewater pump acceptance test and firewater monitor and hydrant coverage test. The actual coverage area from each monitor and hydrant shall be shown on facility plot plan(s). (*EIS section 4.13.3*)

100. **Prior to introduction of hazardous fluids**, Jordan Cove shall complete all pertinent tests (Factory Acceptance Tests, Site Acceptance Tests, Site Integration Tests) associated with the Distributed Control System and the Safety Instrumented System that demonstrates full functionality and operability of the system. (*EIS section 4.13.3*)

101. **Prior to commencement of service**, Jordan Cove shall label piping with fluid service and direction of flow in the field in addition to the pipe labeling requirements of NFPA 59A. (*EIS section 4.13.3*)

102. **Prior to commencement of service**, progress on the construction of the proposed systems shall be reported in monthly reports filed with the Secretary. Details shall include a summary of activities, problems encountered, contractor non conformance/deficiency logs, remedial actions taken, and current project schedule.

Problems of significant magnitude shall be reported to the FERC within 24 hours. (*EIS section 4.13.3*)

103. **Prior to commencement of service**, Jordan Cove shall receive written authorization from the Director of OEP. Prior to issuing such authorization, the Director of OEP will consult with the Coast Guard COTP to confirm that appropriate measures to ensure the safety and security of the facility and the waterway have been put into place by Jordan Cove or other appropriate parties. (*EIS section 4.13.6.4*)

In addition, we recommend that the following measures shall apply throughout the life of the LNG facility:

104. The facility shall be subject to regular FERC staff technical reviews and site inspections on at least an annual basis or more frequently as circumstances indicate. **Prior to each FERC staff technical review and site inspection**, Jordan Cove shall respond to a specific data request, including information relating to possible design and operating conditions that may have been imposed by other agencies or organizations. Up-to-date detailed piping and instrumentation diagrams reflecting facility modifications and provision of other pertinent information not included in the semi-annual reports described below, including facility events that have taken place since the previously submitted semi-annual report, shall be submitted. (*EIS section 4.13.3*)

105. Semi-annual operational reports shall be filed with the Secretary to identify changes in facility design and operating conditions, abnormal operating experiences, activities (including ship arrivals, quantity and composition of imported and exported LNG, liquefied and vaporized quantities, boil-off/flash gas, etc.), plant modifications, including future plans and progress thereof. Abnormalities shall include, but not be limited to: unloading/loading/shipping problems, potential hazardous conditions from off-site vessels, storage tank stratification or rollover, geysering, storage tank pressure excursions, cold spots on the storage tanks, storage tank vibrations and/or vibrations in associated cryogenic piping, storage tank settlement, significant equipment or instrumentation malfunctions or failures, non-scheduled maintenance or repair (and reasons therefore), relative movement of storage tank inner vessels, hazardous fluids releases, fires involving hazardous fluids and/or from other sources, negative pressure (vacuum) within a storage tank and higher than predicted boil-off rates. Adverse weather conditions and the effect on the facility also shall be reported. Reports shall be submitted within 45 days after each period ending June 30 and December 31. In addition to the above items, a section entitled "Significant Plant Modifications Proposed for the Next 12 Months (dates)" also shall be included in the semi-annual operational reports. Such information would provide FERC staff with early notice of anticipated future construction/maintenance projects at the LNG facility. (*EIS section 4.13.3*)

106. Significant non-scheduled events, including safety-related incidents (e.g., LNG, condensate, refrigerant, or natural gas releases, fires, explosions, mechanical failures, unusual over pressurization, and major injuries) and security-related incidents (e.g., attempts to enter site, suspicious activities) shall be reported to FERC staff. In the event an abnormality is of significant magnitude to threaten public or employee safety, cause significant property damage, or interrupt service, **notification shall be made immediately**, without unduly interfering with any necessary or appropriate emergency repair, alarm, or other emergency procedure. In all instances, notification shall be made

to FERC staff **within 24 hours**. This notification practice shall be incorporated into the LNG facility's emergency plan. Examples of reportable hazardous fluids related incidents include:

a. fire;

b. explosion;

c. estimated property damage of $50,000 or more;

d. death or personal injury necessitating in-patient hospitalization;

e. release of hazardous fluids for five minutes or more;

f. unintended movement or abnormal loading by environmental causes, such as an earthquake, landslide, or flood, that impairs the serviceability, structural integrity, or reliability of an LNG facility that contains, controls, or processes hazardous fluids;

g. any crack or other material defect that impairs the structural integrity or reliability of an LNG facility that contains, controls, or processes hazardous fluids;

h. any malfunction or operating error that causes the pressure of a pipeline or LNG facility that contains or processes hazardous fluids to rise above its maximum allowable operating pressure (or working pressure for LNG facilities) plus the build-up allowed for operation of pressure limiting or control devices;

i. a leak in an LNG facility that contains or processes hazardous fluids that constitutes an emergency;

j. inner tank leakage, ineffective insulation, or frost heave that impairs the structural integrity of an LNG storage tank;

k. any safety-related condition that could lead to an imminent hazard and cause (either directly or indirectly by remedial action of the operator), for purposes other than abandonment, a 20 percent reduction in operating pressure or shutdown of operation of a pipeline or an LNG facility that contains or processes hazardous fluids;

l. safety-related incidents to hazardous fluids vessels occurring at or en route to and from the LNG facility; or

m. an event that is significant in the judgment of the operator and/or management even though it did not meet the above criteria or the guidelines set forth in an LNG facility's incident management plan.

In the event of an incident, the Director of OEP has delegated authority to take whatever steps are necessary to ensure operational reliability and to protect human life, health, property or the environment, including authority to direct the LNG facility to cease operations. Following the initial company notification, FERC staff would determine the need for a separate follow-up report or follow-up in the upcoming semi-annual operational report. All company follow-up reports shall include investigation results and recommendations to minimize a reoccurrence of the incident. (*EIS section 4.13.3*)