APPENDIX R

Comments on the Draft EIS and Responses

(continued)

"significant," but will likely be audible. The DEIS recommends a full power load noise survey and mitigation measures should noise levels exceed an L_{dn} of 55 dBA.

The most disruptive and annoying source of noise would be pile driving in the Coos Bay area and rock blasting along the Pacific Connector Pipeline. Construction of the terminal is projected to occur 20 hours per day, six days per week with little relief for the community. Predicted maximum levels show an 8-dBA increase over the existing ambient L_{dn}, which will be very disturbing to the residents, a large number of whom live on the south and east end of the town. The incessant pounding will persist well into the evening and nighttime hours when people need to rely on rest and sleep.

Along the proposed pipeline, construction is planned to occur between 7 am and 7 pm for a period of 12 to 18 months, with any specific area impacted for several weeks to a few months. There are more than 100 structures within 150 feet of the right-of-way, and several within 50 feet. The DEIS estimates noise levels of rock blasting as an energy average (L_{eq}) of 95 dBA at 50 feet, 87 dBA at 100 feet, and 74 dBA at 300 feet. These levels will guarantee that nearby residents will be subjected to noise levels exceeding the interiors of some of the noisiest manufacturing facilities in the U.S. In addition, low-flying helicopters involved in clearing the landscape will produce ear-splitting sound levels estimated at 115 dBA at a distance of 50 feet.

The DEIS fails to mention the effects of these noise levels on the hearing of workers, whose exposures are substantially greater because of proximity to the source. These exposures undoubtedly exceed the 85-dBA time-weighted average limit required by OSHA for the initiation of hearing conservation programs.[93] Surveys of noise exposed construction workers show average exposures of 91-99 dBA for workers using loaders and dozers and an average of about 96 dBA for workers in industrial, commercial, and institutional construction.[94] CO28-91

Because these activities will be pursued for 12 hours every day, they give community members little time for respite during the day, and they give workers insufficient opportunity to recover from temporary threshold shifts in hearing. As hearing loss criteria and standards are based on an 8-hour exposure day, five days per week, these long exposures greatly increase the likelihood of hearing damage and necessitate a more conservative approach.[95]

Throughout the DEIS there is far too much reliance on recommended mitigation. Some of the analyses even *presume* mitigation in the estimated noise levels, for example the 98-dBA estimated level at 50 feet for rock blasting. This kind of presumption should not be allowed in an EIS. The DEIS assumes that the company will continuously monitor noise levels at all places. Whenever these levels are out of compliance, the company should stop the activity and implement mitigation measurs, such as erecting a wall or ceasing nighttime activities, and then it should file a report to the Secretary. The DEIS assumes that when designing the compressor station, the company will incorporate "best practices applicable to noise reduction." The DEIS CO28-92

[93] https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_id=9735&p_table=STANDARDS
[94] Suter, A.H. (2002). Construction noise: Exposure, effects, and the potential for remediation, a review and analysis. Am. Ind. Hyg. Assoc. J., 63, 768-787.
[95] Suter, A.H. (2000). Standards and Regulations. In E.H. Berger, L.H. Royster, J.D. Royster, D.P. Driscoll, and M. Layne (Eds.) The Noise Manual. (5th ed.) American Industrial Hygiene Assoc., Fairfax, VA., 639-668.

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CO28-91 The oversight of noise exposure on workers' safety is under the jurisdiction of OSHA and is outside of the scope of the federal EIS. However, Jordan Cove and Pacific Connector must comply with all applicable OSHA worker safety requirements, including implementing hearing conservation programs.

CO28-92 See response to comment IND291-4 above.

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also assumes that mitigation measures would be implemented "to the extent feasible" during construction, but the company can easily claim that such measures would be either technically or economically infeasible. Without rigorous enforcement and substantial penalties, any profit driven company is unlikely for environmental reasons to cease operations or perform any mitigations with the associated costs and delays. Instead, the company will most likely plough ahead regardless of citizen impact or FERC guidelines.

CO28-92 cont.

In the real world mitigation almost never takes place unless it is mandatory, and even then usually not until it is enforced. Most of the mitigation efforts described in the DEIS are only recommendations, using the words "should" or "may," with absolutely no teeth behind them. There is no mention of mandatory requirements or of enforcement, and therefore any assumption of mitigation is misguided.

The impact of noise exposure is based on several factors, the most obvious of which is noise level (perceived as loudness), but other variables, such as frequency (or pitch), complexity, temporal pattern, and meaning also affect the response of individuals and communities. In most instances the DEIS has used cumulative descriptors to measure the noise impact. These descriptors average the noise energy over a period of time, usually the energy average throughout the day, as in L_{eq}, or the average sound level over the day and night, as in L_{dn}, which assigns a 10-dB penalty to nighttime noise levels. Cumulative measures are useful and widely employed in the U.S. to assess community impact for sources such as road traffic noise. For sources like construction noise, however, which is highly intermittent and often impulsive, these metrics should be supplemented by single event measures, such as the L_{max} or maximum level.[96]

CO28-93

While the DEIS has estimated the impact with L_{max} in some instances, it relies too heavily on cumulative measures of noise exposure and too little on single event measures. This is especially true for construction noise involving sources like pile driving, pneumatic drilling and pounding, and impulsive sources like rock blasting. These types of noise are more disturbing than continuous noise, and they are much more likely to produce sleep disruption, stress, and aversive reactions. Moreover, the noise levels for both cumulative and single event estimates for pile driving exceed the FERC criteria at noise sensitive areas.

The intermittent booms occurring during rock blasting provide a good example of the failure of cumulative measures to describe the impact. Averaging the energy of these sources over a 12-hour period does not adequately describe their effects, nor even does the use of a single event measure like L_{max}, since their effects are dependent upon additional factors. The jarring quality of intermittent blasts coupled with the warlike associations of intense helicopter noise are likely to produce stress and behavioral responses[97] in the exposed community. The presence of negative overlay would be a factor in both cases. In addition, helicopter noise, which is predominantly low frequency, would be substantially underestimated using the A-weighted filter incorporated in the descriptors used here. The DEIS does give an estimated maximum level of blasting noise as 98 dBA at 50 feet (buried in Table M-16 but not discussed), but only *after* mitigation has been applied, and, consequently, its actual level will be much higher to an unknown extent.

[96] https://www.nae.edu/35649/Technology-for-a-Quieter-America
[97] Suter, A.H. (1992). Communication and Job Performance in Noise: A Review. ASHA Monographs No. 28. American Speech-Language-Hearing Assoc., Rockville, MD.

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CO28-93 See response to comment IND291-5 above.

The most salient example of the misuse of cumulative measures is the ridiculous Table 4.12.1.4.5, which uses a cumulative descriptor (L_{eq}) for blowdown events, flattening out a single noise event into a number representing the "average" sound level over an 8-hour period. It would be like describing the daily average level of a bomb blast as the sound of a sewing machine. The ear does not operate that way, and neither does the human brain's response to sound. Again, the use of mitigation, in the form of a silencer, is already assumed, leaving the citizens to trust that the company will bother to use it. CO28-93 cont.

This DEIS would allow the construction and operation of a facility that would expose the surrounding community to high levels and prolonged durations of noise. The citizens of Coos Bay would be subjected to an ear-splitting din for the better part of four years and those living along the pipeline would experience noise as if they were working in factories. The workers themselves would be at serious risk of develop hearing loss. Whenever projected noise levels appear to reach or exceed the FERC guidelines, the Agency has allowed the company to fall back on non-mandatory mitigation procedures, for which there is little probability of compliance. Although the DEIS purports to be an "analysis of potential noise impacts on human receptors," there is actually no such analysis, only the degree to which certain standards are met, or in many cases, not met. If the company would prepare a report that did indeed analyze the effect on humans, it would show how disastrously noisy this project would be and it would be roundly rejected. CO28-94

G. Water Quality and Compliance with the Clean Water Act

As discussed more fully below, the FERC may not grant a permit to the applicants because the State of Oregon has determined that this project will violate the state's water quality standards. Indeed, the proposed project would do immense damage to water quality in Oregon by causing significant temperature increases in numerous stream segments, by causing significant decreases in dissolved oxygen levels in Coos Bay, and further degrading stream segments that are already water quality impaired for temperature, dissolved oxygen, pH, turbidity, and sedimentation. CO28-95

The proposed project would violate Oregon's statewide narrative criteria by creating conditions deleterious to aquatic species, including Coho salmon (Oncorhynchus kisutch), green sturgeon (Acipenser medirostris) and eulachon (Thaleichthys pacificus); by permanently converting acres of highly productive intertidal habitat to low productive deep-water habitat; by entraining and killing fish as LNG vessels uptake millions of gallons of engine cooling water; by discharging heated cooling water above ambient temperatures into Coos Bay; by killing and injuring aquatic life through ship-animal collisions (vessel strikes) and beaching (stranding) of animals in the vessels' wakes; and by permanently removing coastal riparian vegetation along Coos Bay that is an essential component of the food chain for fish and aquatic life.

The proposed project would also violate Oregon's water quality standard for temperature by removing riparian vegetation that shades streams, causing stream heating. The proposed project would violate Oregon's water quality standard for turbidity by causing a more than 10% increase in natural turbidity levels in Coos Bay and stream segments impacted by pipeline installations. The proposed action would also impair beneficial uses to be protected in the

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CO28-94 See response to comment IND291-1 above.

CO28-95 Comment noted. As disclosed in section 5 of the EIS, any authorization from the Commission would be conditional on the Applicant acquiring all applicable federal and federally delegated permits.

Rogue, Umpqua and South Coast Basins by engaging in blasting activities that will adversely impact surface water and groundwater used for drinking, and by impairing commercial and recreational fishing in estuaries and adjacent marine waters in the South Coast Basin.

Below, we summarize deficiencies in the discussion of the terminal's impacts on water quality. We separately discuss the pipeline's impacts on water quality in the following sections.

1. The DEIS understates the impacts to Coos Bay

According to the DEIS, the potential impacts associated with the construction of the Jordan Cove LNG Project and the resulting LNG carrier traffic are "related primarily to Project-related dredging, stormwater management, carrier travel, and carrier water use." DEIS at 4-83. Specifically, the project will result in "increases in turbidity, suspended and deposited sediment, bottom and shoreline erosion, toxic substance releases, and water temperature changes." DEIS at 4-83. FERC's analysis and summary of the impacts this project will have on Coos Bay, its water quality, and the plants, fish, and wildlife that rely on the Bay, however, fails to address the scope and significance of the harm this project will cause.

CO28-96

Coos Bay is the extensive estuary of the Coos River. Occupying approximately 20 square miles, the bay is the second largest drowned river valley on the Oregon Coast. Tidelands cover approximately 4,569 acres including 2,738 acres of tidal marsh and 1,400 acres of eelgrass beds. Its primary features include the main, expansive bay, an extensive arch of water around a peninsula, and major arms—South Slough, near the entrance of the bay, Jordan Cove, at the heart of the bay, and Haynes Inlet, which extends northeasterly from the main body of the bay.

The natural environment of the Coos estuary supports a diversity of plants and animals. The extensive shallow tidal flats provide habitat for shellfish as well as feeding and spawning habitat for many native fish. The Coos Bay supports a variety of beneficial uses as designated in the South Coast Basin as a whole.[98] These include fish and aquatic life, wildlife & hunting, fishing, boating, water contact recreation, aesthetic quality, and commercial navigation & transportation.

Coos Bay is central to Oregon's commercial fishing industry, whose economic contribution is equivalent to about 10,000 jobs. Economic contributions from commercial fishing go beyond harvesting and seafood-processing, and include visitors and tourism, boat building and gear manufacturing, safety, research, and education.[99] Recreational fisheries, including shellfish harvest and crabbing, are also important resources in Coos Bay. Several of the most important shellfish beds are located near the LNG transit route along the edge of the North Spit (western side of lower Coos Bay).

Both Coos Bay and the Coos River are water quality impaired for different pollutants, including but not limited to temperature, sedimentation, and toxics such as lead.

[98] *See* Table 300A (OAR 340-041-0300).
[99] *See* Oregon Commercial Fishing Industry Year 2016 Economic Activity Summary at 5 (April 2017).

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CO28-96 The EIS currently makes a "significance call" for impacts to the human and natural environment (see sections 4 and 5).

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Table 3. 303(d) Listings for Streams Crossed by Pacific Connector Pipeline in the South Coast Basin – Coos Subbasin[100]

Waterbody Crossed by Pipeline	Dissolved Oxygen	Habitat Modification	Temperature	Biological Criteria	Sedimentation	Toxics
Coos Bay					X	X
Coos River			X		X	

Coos Bay and the Coos River support salmonid species, including Oregon Coast coho (*Oncorhynchus kisutch*), winter steelhead (*Oncorhynchus mykiss irideus*), fall Chinook salmon (*Oncorhynchus tshawytscha*), and coastal cutthroat trout (*Oncorhynchus clarki clarki*).[101] Coos Bay and the Coos River support ESA-listed species, including but not limited to Oregon Coast coho and green sturgeon.

Construction of the marine slip would require excavating 38-acres from uplands. The slip and access channel combined would equal 60-acres and result in the permanent loss of 14.5-acres of shallow subtidal and intertidal habitat, 0.6-acres of estuarine saltmarsh habitat, and 1.9 acres of submerged aquatic vegetation habitat. Additionally, the applicants propose to dredge 5.7 million cubic yards of material to create the slip basin and access channel. Dredged material would be disposed of at the LNG terminal, Roseburg Forest Products Site, South Dunes Site, or Kentuck Site. Dredging for the temporary berth would require dredging approximately 45,000 cubic yards of material. Dredging of the existing navigation channel would remove 700,000 cubic yards of material and would construct a temporary pipeline on the bottom of the channel over 8.3 miles to remove the dredged material. Widening of the Transpacific Parkway/Highway 101 intersection would require permanently filling in 0.51 acres of intertidal habitat. Future maintenance dredging at the slip, access channel, and navigation channel (NRI areas) would require dredging of between 34,600 – 37,700 cubic yards of material annually and additional dredging of the navigation channel of between 27,900 – 49,800 cubic yards of material every three years.[102]

By constructing the Kentuck mitigation site, applicants propose to reconstruct and enhance 100-acres of tide channels, mudflats, saltmarsh, and freshwater wetlands. At the eelgrass mitigation site, the applicants propose establishing approximately 9-acres of eelgrass beds at different densities.

Maintenance dredging of the access channel, marine slip, and NRI area will involve dredging between 34,600 cubic yards and 37,700 cubic yards of material from the access channel and slip every year and dredging between 27,900 cubic yards and 49,800 cubic yards of material from the NRI area every three years.

[100] Oregon's 2012 Integrated Report Assessment Database and 303(d) list. Oregon DEQ. https://www.deq.state.or.us/wq/assessment/rpt2012/search.asp.
[101] Salmonids in the Lower Coos Watershed. Partnership for Coastal Watersheds. http://www.partnershipforcoastalwatersheds.org/salmonids-in-the-lower-coos-watershed/.
[102] U.S. Army Corps of Engineers. Public Notice Application for Permit and to Alter Federally Authorized Projects. 60-day notice. NWP-2017-41. 22 May 2018. P. 3-6.

a. Turbidity and Sedimentation

The DEIS acknowledges that "[d]redging and construction activities at the Jordan Cove LNG Project would result in temporary increases in turbidity and sedimentation in Coos Bay." DEIS, 4-83. FERC states that "[d]redging activity, primarily associated with slip, access channel, temporary material barge berth, MOF, and marine waterway modifications would be the major sources of turbidity and suspended sediment in Coos Bay." DEIS, 4-83. Development of the proposed Slip and Access Channel would require the excavation and dredging of approximately 5.70 million cubic yards (mcy) of material. Jordan Cove's Dredge Material Management Plan ("DMMP") describes three potential dredging methodologies, clamshell, hydraulic cutter-head, hydraulic hopper dredging, but acknowledges that the final dredging methods would depend on the equipment availability and the contractors' individual experience. *See* DEIS, 4-84.

According to FERC, Jordan Cove's models to estimate the range of turbidity and suspended sediment that would result from Project-related dredging showed "that constructing the access channel via mechanical dredging would result in a maximum concentration of turbidity of 600 to 6,000 mg/l depending on tidal velocity. " DEIS, 8-84. A second model, addressing suspended sediment concentrations from the proposed dredging operations concludes that "[c]onstructing the slip and access channel would result in suspended sediment that would exceed about 20 mg/l over background levels within about 0.2 to 0.3 mile of the dredging site and exceed about 500 mg/l within about 0.1 mile with either dredging method (clamshell or cutter suction dredge)."

In addition, turbidity models for both construction and maintenance of the four Marine Waterway Modifications areas showed "suspended sediment levels would be similar to those modeled for the access channel, but distribution of sediment plumes would be more extensive." DEIS, 8-84. There, FERC notes that "the overall maximum distribution of areas over background suspended sediment (about 20 mg/l) would . . . average[e] about 1.2 miles from the specific active dredging site of the four channel expansion areas with any dredging methods." DEIS, 8-84 (internal citation omitted). "Turbidity levels and distribution would be similar for both construction or maintenance dredging." DEIS 8-84.

Based on this information, Oregon DEQ concluded that "[t]he modeling confirmed turbidity exceeding 10 NTU above background levels extending a total of more than one mile above and below the Navigational Reliability Improvement dredge locations" and "confirmed elevated but comparatively localized turbidity plumes at the Slip, Access Channel, and eelgrass mitigation dredge locations." As a result, DEQ determined that these activities will violate Oregon's water quality standards.

However, a review of the hydrodynamic and sediment modeling studies reveals that:

> All but one of the studies conducted by Moffat & Nichol rely on the results of two-dimensional model simulations that are inherently incapable of representing the dynamics required to assess impacts on water quality in Coos Bay… All studies were critically

CO28-97

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CO28-97 These models used site-specific data including bay tidal generated currents, bathymetry, sediment composition of the substrate to be dredged, and standard physical parameters to estimate the parameters of suspended sediment generated from project activities. The level of analysis is adequate for the NEPA analysis presented.

limited in temporal scope representing a small subset of the conditions exhibited in the system.[103]

Specifically regarding the potential for increased turbidity and sediment impacts from proposed activities related to construction and operation of the terminal (JCEP), the Turbidity Analysis Memo (M&N 2017c) uses a two-dimensional model with significant limitations. For example, the study conditions were not described, the applicants did not provide the number of sediment size classes, and initial or boundary conditions for the system were not reported. Additionally, model calibration and validation were also not included. FERC cannot rely upon inaccurate and narrow two-dimensional modeling provided by the applicant to assess the impacts to water quality.

CO28-97 cont.

The applicants propose to install pipeline through Coos Bay over a 7-mile section, sidecasting material in the water without proposed turbidity control measures. After the pipeline is placed in the trench, the sidecast material will be used to backfill the trench. This activity in the waters of Coos Bay and the resulting suspension of large volumes of silty material over a long duration, will potentially result in exceedances of Oregon's turbidity standard. The DEIS fails to address these impacts or

CO28-98

The DEIS does not include any discussion of alternative methods for dredging and containment of suspended sediments to meet the turbidity standard and prevent distribution of fine and/or contaminated material. The applicant's response discusses alternatives to the pipeline route, but did not provide a discussion of alternative methods for the pipeline trench dredging and containment of suspended settlement that would meet the turbidity standard or the allowable exceedance.

CO28-99

In addition, FERC fails to adequately address the cumulative impacts of the many other elements of the project that will increase sediment in the Bay. Instead, the DEIS briefly examines each potential source of additional sediment in the Bay from the project and generally concludes that each will not be significant in and of itself. For example, the DEIS notes that "[p]ropeller wash from LNG carriers and tug boats associated with the Project, as well as ship wakes (waves) breaking on shore, could increase erosion along the shoreline and resuspend loose sediment along the shallow shoreline area, resulting in temporary increases of turbidity and sedimentation in the bay, both of which would affect water quality." DEIS, 4-86. The DEIS, however, concludes these impacts would be limited in time or location. DEIS, 4-86. At no point does FERC attempt to quantify the overall effect or otherwise examine the total impact on the Bay from these cumulative increases in sediment and disturbances. As a result, the DEIS effectively dismisses these activities as inconsequential without explaining the overall impact.

CO28-100

[103] Lopez, Jesse. Assessment of hydrodynamic studies by Moffat & Nichol for the Jordan Cove Liquefied Natural Gas Terminal Project. 1 July 2018.

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CO28-98 The Applicant would use HDD crossings in Coos Bay, not open trenching as described in the comment. This would eliminate suspended sediment in the water volume or bottom disruptions.

CO28-99 As indicated in the draft EIS, an assessment of the Project's potential to encounter contaminated sediment from dredging activities in Coos Bay was conducted. Additionally, the *Contaminated Substance Discovery Plan* (Appendix E of the POD) addresses how any unanticipated contamination that was encountered would be treated. See also CO28-98 above.

CO28-100 We considered the sources, duration, locations and level of impacts of the various project related effect to erosion and turbidity in the bay in our overall conclusions of effects of these actions. Cumulative impacts of this project actions with consideration of other known future non-project action impact are addressed in section 4.14.

b. Stormwater Management

Although FERC recognizes that "[p]roject-related fluids that enter Coos Bay could affect state water quality standards" and that stormwater runoff is part of this problem, the DEIS largely fails to address this issue. FERC seems to rely exclusively on the potential state-issued Clean Water Permits that would regulate the discharge of stormwater to avoid addressing the potential impacts of the increased stormwater discharges from the facility. Yet, as FERC notes "stormwater runoff could transport sediment and hazardous materials into Coos Bay" and "[t]he introduction of sediment into Coos Bay would increase turbidity and sedimentation as discussed above and the introduction of hazardous materials would affect local water quality." FERC must address these impacts in the EIS.

Stormwater runoff is one of the largest, if not *the* largest, threats to water quality in Oregon. In addition to carrying "conventional" pollutants (*e.g.*, increased temperature, pH, low dissolved oxygen, and turbidity), stormwater runoff also contains large loads of toxic pollutants such as heavy metals, oil and grease, pesticides, and organic compounds. Stormwater runoff from residential, commercial, and industrial areas is responsible for 21 percent of impaired lakes and 45 percent of impaired estuaries in the United States. These impacts are caused by both the types of materials carried in runoff and the quantity of runoff, as a high volume of flow contributes to erosion and sedimentation, and affects aquatic habitats. CO28-101

First, FERC must address the potential impact stormwater runoff will have during the construction of the terminal and related facilities. Despite the potential, significant impacts FERC appears to dismiss any possible effects from stormwater discharges because such discharges must be covered by a state-issued Clean Water Act permit. This assumption is faulty for three reasons.

To begin with, there is no assurance that the applicants will apply for or be granted such a permit. Indeed, the history of this project shows that the applicant has not demonstrated that it will submit a proper application for the required NPDES 1200-C application. In 2010, the applicant applied for the permit, and DEQ notified the applicants that critical details of long-term stormwater management are required. Specifically, DEQ requested information related to runoff from all impervious areas at terminal and pipeline facilities, docks, structures, pavements, roadways, and access and storage areas. The applicants did not provide an adequately detailed stormwater management plan including specifications for proposed treatment facilities sized to handle runoff from all contributing impervious surfaces. To date, the applicant has not reapplied for a permit.

In addition, given the known and potential soil contamination at various locations that would be disturbed for site construction, a stormwater management plan must be individually developed for each construction location, accounting for contaminants at each site, and adopting measures to ensure that contaminants are not transported to the shoreline or released into the waters of Coos Bay and nearby wetlands. Indeed, there are several highly contaminated areas within the project that warrant specific attention and analysis. CO28-102

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CO28-101 No potential procedures would eliminate all runoff discharges to the bay so we have acknowledged the potential impacts in the analysis. We call out the proposed procedures and plans that would be implemented to reduce these occurrences. The Applicant has developed plans to meet the objects of preventing impacts to Coos Bay water quality. Calling out the permits that are needed to insure these impacts are eliminated or reduced to acceptable levels is a valid approach for the NEPA assessment. If the permitting agency determines that the proposed procedure are not adequate to protect the water resources they can make recommended changes a requirement for obtaining the needed permit.

CO28-102 The Applicant has developed plans (such as the *Framework Contaminated Media Management Plan*) to address the potential runoff. These plans are adequate to address these issues, as discussed in Section 4.2. Additionally, the Applicant has developed a *Contaminated Substances Discovery Plan* that specifies the measures that would be implemented if unanticipated contaminated soil, surface water, or groundwater are encountered during construction.

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Both the Ingram Yard property and the location of the proposed South Dunes site on the former Weyerhaeuser North Bend Containerboard Mill are listed in the DEQ's Environmental Cleanup Site Information (ECSI). The Ingram Yard property (ECSI 4704) was used for spreading of contaminated materials from the late 1970s to 1994 and contains "low levels of potentially bioaccumulating chemicals and must not be placed in waters of the state."[104] More recently, during the construction of the Industrial Wastewater Pipeline by Jordan Cove, the contractor discovered black soils in March 2015 on the site. The results of the sampling confirmed that the black soil contained contaminants, including but not limited to, mercury, arsenic, dioxins, and petroleum products.[105]

CO28-102 cont.

Photo 1. Black soils discovered during construction of the JCEP IWP Phase 1 Project.

IWP Phase 1A & 1B Construction, Black Soil Summary Report, Jordan Cove Energy Project. 15 April 2015. P. 1.

Additionally, the South Dunes site is also listed on the ECSI database (ECSI 1083). This site is also part of the former Weyerhaeuser North Bend Containerboard Mill. A 2007 Environmental Site Assessment commissioned by Jordan Cove found:

"Contaminants were detected at several locations across the site. Samples collected within the black ashy mill waste typically had higher concentrations of contaminants than those taken in sand. VOCs and tributyltin were not detected. Detected levels of PAHs and TPH were below state and federal guidelines. Chromium was detected in one sample in test pit TP-7 above the SSL. Arsenic was detected in all samples analyzed. The level of arsenic is below the background levels with the exception of test pit TP-7. Dioxins and furans were detected throughout the site at levels below the PRG for individual congeners. The TEQ value for test pit TP-10 at a depth of 2 ft is above the equivalent PRG. PES also reported TEQ values above the equivalent PRG. Although the value is above federal guidelines for individual samples, the statistical level for the site is within state requirements."[106]

[104] Oregon Department of Environmental Quality. Weyerhaeuser – Ingram Yard. Environmental Cleanup Site Information Database. Available online at http://www.deq.state.or.us/Webdocs/Forms/Output/FPController.ashx?SourceId=4704&SourceIdType=11.
[105] IWP Phase 1A & 1B Construction, Black Soil Summary Report, Jordan Cove Energy Project. 15 April 2015. Available online at http://www.deq.state.or.us/Webdocs/Controls/Output/PdfHandler.ashx?p=0522588a-0b10-4e07-9705-599d39399d8dpdf&s=Black%20Soil%20Summary%20Report.pdf . P. 2.
[106] Jordan Cove Task Order No. 8 Phase II Environmental Site Assessment Proposed Liquefied Natural Gas Terminal North Bend, Oregon. 16 January 2007. Available online at http://www.deq.state.or.us/Webdocs/Controls/Output/PdfHandler.ashx?p=001761ee-a0de-4084-a735-1098e00fc023.pdf&s=JCEPTaskOrder8GRIPhase2ESA(1-2007).pdf . P. 6.

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According to a 2004 Phase I Environmental Assessment of the site prepared for Weyerhaeuser, the report states that chemicals were used at the mill, including but not limited to biocides, resins, alum, mineral spirits, petroleum distillates, and other cleaning agents. Boiler blowdown containing chemicals may have been discharged into a septic drain field. Compressor condensate may also have been released at the site.[107]

The map below is based on aerial imagery from September 2006 and indicates the area of the site that was not included in DEQ's "no further action" determination.

CO28-102 cont.

Weyerhaeuser North Bend Containerboard Mill. ECSI 1083. Oregon Department of Environmental Quality.

Both the Ingram Yard and South Dunes sites (ECSI 4704 and 1083) are listed as "Partial No Further Action" as of 2006. The DEQ reports acknowledge that the recommendation for no further action is contingent upon there being no "new or previously undisclosed information" becoming available. Further, as demonstrated by the map above, there are also locations within the site that are not included within the "Partial No Further Action" finding that could be impacted by the applicant's proposed activities.

Additionally, on December 16, 2014, Barbara Gimlin, former Environmental Inspector at the Jordan Cove LNG terminal site and employee of SHN Consulting, submitted testimony to FERC regarding the discovery of contaminants at the site during a March 2014 exploratory test program. Ms. Gimlin describes her knowledge of discovery of contaminated soils along the Jordan Cove shoreline during a September 2013 cultural resources survey by Southern Oregon

[107] LEVEL I ENVIRONMENTAL SITE ASSESSMENT WEYERHAEUSER COMPANY HORSEFALL BEACH ROAD NORTH BEND, OREGON DELTA PROJECT NO. E003-627-2. June 2004. Available online at http://www.deq.state.or.us/Webdocs/Controls/Output/PdfHandler.ashx?p=02f102a1-f089-494a-9ca9-dca5d52fdb7dpdf&s=DeltaLevel1ESA(6-2004).pdf . P. 8.

University Laboratory of Anthropology. Ms. Gimlin then describes her personal observations of excavations at the site exposing potential contaminants including "black soils (north to south in Ingram Yard, including near the shoreline), bright yellow granulated/powder found in clumps of varying sizes, gray gummy material found in clumps (likely related to hydraulic drilling conducted by GRI), and the exposure of an underground concrete storage tank punched through by heavy equipment with unknown liquid inside." These exposures occurred during the March 2014 Kiewit test program.[108]

CO28-102 cont.

The information provided by Gimlin, in combination with the documented discovery of "black soils" by Jordan Cove in 2015, should be considered "new or previously undisclosed information" "which warrants further investigation." Given that the project calls for excavating and moving large amounts of soils from one area to another, to be used as fill for the South Dunes site and other construction areas, the extent and condition of the contamination at these sites must be fully investigated, disclosed, and addressed to ensure contaminants do not reach waterways.

Finally, the DEIS fails to address the pollutants that may be discharged even if the applicant applies for, is granted, and operates in compliance with a 1200-C NPDES permit. In general, the 1200-C permit requires permittees to comply with a set of best management practices that will reduce or eliminate the discharge of pollutants during construction. As a result, it is possible that there will be discharges of pollutants that will occur during construction, even if the applicant complies with the permit. The DEIS must address the potential impact of these discharges.

CO28-103

Second, the DEIS fails to address the potential impacts of stormwater discharges from the facility if it is built and operated. Instead, the DEIS devotes two sentences to discussing the possible use of an oil-water separator to minimize the potential discharge of oil from the facility. DEIS, 4-87. The DEIS fails to address the potential pollutants that may be discharged from the facility once in operation. In particular, stormwater runoff from roads, and similar industrial facilities, contains "a complex mixture" of chemical pollutants from motor vehicles "in the form of exhaust, leaking crankcase oil and wearing of [brake pads and tires]." Julann A. Spromberg et al., *Coho salmon spawner mortality in western US urban watersheds: biolinfiltration prevents lethal storm water impacts*, 53 J. Applied Ecology 398, 405 (2016). Pollution from stormwater runoff degrades water quality, impairs beneficial uses, and damages aquatic ecosystems. Of particular concern in Oregon, stormwater runoff from developed areas has been directly linked to recurring, acute mortality events in salmonid populations, the recurrence of which is known as "mortality syndrome" or "urban stream syndrome." Spromberg, *supra*, at 405. A study on the effects of salmonid exposure to highway stormwater runoff revealed that, regardless of variations rainfall conditions and water chemistry, urban highway runoff was "100% lethal to otherwise healthy adult [salmonids]." *Id.* at 402. Adult salmonids exposed to untreated runoff became symptomatic or died within hours of exposure to unfiltered runoff, and those that survived the initial exposure died within 24 hours. *Id.* at 402-404.

CO28-104

Here, During operation, the LNG terminal would cover about 100 acres with impervious surface

[108] Gimlin, Barbara. Public Comment on Jordan Cove Energy Project Draft EIS by Barbara Gimlin. 12 February 2015. FERC Docket No. CP13-483-000.

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CO28-103 The intent of NPDES permits is to ensure that permitted discharges do not cause substantial adverse effects to water and related resources. The Applicant has developed plans and proposed actions with the intention of receiving these required permits. We believe the assessment presented adequately analyses the potential adverse effects to water resources from these discharges.

CO28-104 See response to comment CO28-101.

materials, such as asphalt, concrete, and compacted gravel. FERC must catalog the potential pollutants that may be found at the facility, determine the potential those pollutants will be discharged, and then address the impact of these discharges on the Bay.
Stormwater from the Jordan Cove site will be discharged into Coos Bay. The FEIS says the water will be tested before being discharged, but does not say what contaminants will be tested for and what levels will be allowed to be discharged. There is no indication in the FEIS that FERC recognizes that stormwater carries heavy metals, petroleum products and brake chemicals and compounds that are deleterious to fish and fish habitat.

CO28-104 cont.

NMFS FEIS Comments at 2 (June 8, 2009). The current DEIS, like the previous documents, makes no mention of the potential for heavy metals. The DEIS states that stormwater in areas "potentially contaminated with oil and grease" will be collected, tested, and treated, but nothing indicates that what contaminants will be tested for, whether this testing will include heavy metals, or whether the treatment will be effective for the full range of possible contaminants. *See, e.g.*, 4-87. Nor is there any discussion of whether stormwater that is not potentially contaminated with oil and grease has the potential to be contaminated with other pollutants. Without this analysis the DEIS will not present an accurate picture of the potential impact of the project on Coos Bay.

c. Spills or Leaks of Hazardous Materials

Similarly, the DEIS notes that "an inadvertent release of construction equipment–related fluids (fuel storage, equipment refueling, and equipment maintenance) could adversely affect water quality in Coos Bay." However, the DEIS concludes that "adherence to the SPCC Plan would greatly reduce the likelihood of such impacts, as well as minimize the resulting impacts should a spill occur" and "[a]s such, significant adverse impacts on surface water due to contamination from hazardous material spills or releases are not expected to occur." DEIS, 4-88. This analysis is inadequate for four reasons. First, the DEIS fails to explain what hazardous material will be present, in what amounts, where and how they will be stored, and how and when they will be used during the construction of the terminal that may be spilled. This information is essential to understanding the risk presented by the construction phase of this project. Second, the DEIS fails to provide any explanation of the potential consequences of a spill of these materials. Third, the DEIS fails to offer any explanation of why the proposed SPCC is adequate to mitigate against the risk presented from a potential spill. For example, the DEIS fails to explain why there is any certainty the applicant will, in fact, implement and comply with the proposed plan. Finally, except for a short discussion of risks associated with the spill of LNG, the DEIS is silent concerning the potential for the spill of hazardous materials from the facility if it is constructed and operated. The DEIS must provide a complete analysis of these risks.

CO28-105

d. Invasive Species

The DEIS acknowledges that "[w]hile berthed, LNG carriers would release ballast water and engine cooling water into the marine slip." DEIS 4-88. Without saying so, the DEIS appears to acknowledge that this ballast water could potentially introduce nonnative and invasive species into Coos Bay. Despite this, the DEIS contains no discussion of this potential risk from this project. Instead, the DEIS explains, at length, the standards that may, or may not, apply with

CO28-106

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CO28-105 The details of the procedures that would be in place are contained in the SPCC Plan as well as other plans; these plans spell out the standard practices (which would vary by type of hazardous substances) that would be implemented to ensure proper storage and handled of materials. Actions, as confirmed in these plans, would follow various state and federal laws as to how they are to be dealt with. This details of these plans are beyond what is needed in the EIS text for this analysis; however, these plans are included by reference. There are also procedures for how spills would be handled that would be dependent on what type of spill. Again, how these would be handled and cleaned up are directed by regulations and laws that as stated in these plans and would be followed as cited in the SPCC Plan and other plans. Developing descriptions and assessments of all unplanned and unlikely accidents is not a reasonable analysis for a NEPA assessment. The plans spell out that they would be followed and following these plans would be a requirement in any permit received for these water quality related actions. Also see responses to CO28-101 and -103 above.

CO28-106 See our response to SA2-123.

vessels that will use the terminal. *See* DEIS, 4-88 - 89. What is absent from this discussion is any analysis of whether these measures will prevent the introduction of nonnative or invasive species to the Bay. Also missing from the discussion is any analysis of what species may be introduced, the environmental impact of such release, and the additional steps the applicant could and should take to avoid such a result. Again because the DEIS does not, and likely cannot, conclude that the measures outlined in the discussion will prevent the introduction of nonnative or invasive species, FERC must address the potential consequences of such a release.

CO28-106 cont.

e. Temperature

Jordan Cove states that water will be discharged from engine cooling at 3 degrees C (5.4 degrees F) above ambient water temperatures. Modeling of mixing zones and dissipation of water temperature increases were likewise based on this assumed 3 degrees of increase. DEIS, 4-91. However, Jordan Cove did not provide any information regarding the source of this assumed temperature of cooling water. Nothing in the JPA or FERC filings appears to support the assertion that engine cooling water will be only 3 degrees Celsius higher than the average ambient Coos Bay water temperatures of 10 degrees Celsius. In fact, FERC's FEIS for the Bradwood LNG Project states that:

Cooling water discharged from a 150,000 m3 steam powered LNG carrier could initially be 19.4°F higher than ambient water temperatures" as compared to seasonally ranging ambient temperatures in the Columbia River of 42 to 68°F.[109]

Oregon LNG, also proposed for the Columbia River, estimated that "according to industry sources, the water taken for cooling the vessel's machinery is warmed by 6 to 9 degrees Celsius at the point of discharge" and that the average for diesel-powered LNG vessels would be 8.9°C above ambient water temperatures.[110]And according to EPA, cooling water can reach high temperatures with the "thermal difference between seawater intake and discharge typically ranging from 5°C to 25°C, with maximum temperatures reaching 140°C."[111] Given these widely varying ranges of cooling water discharge temperatures, FERC must address the potential worst-case scenario and analyze the maximum potential temperature increases from diesel and steam powered vessels. FERC must further require that the applicants provide an accurate number of shipments that would occur using 148,000 cubic meter ships (the maximum size that would be allowed to transit Coos Bay) to export the full proposed natural gas export amounts (0.9 Bcf/d according to FERC, 1.2 Bcf/d according to DOE, 1.55 Bcf/d according to NEB and DOE).

CO28-107

f. Dissolved Oxygen

Depletion of DO in waterways is a significant pollution problem, affecting fish and aquatic species in a variety of ways at different life stages and life processes. DO levels can be influenced by several factors, including pH changes, temperature increases, decaying material or algae blooms, and sedimentation.

[109] Bradwood LNG Project FEIS at 4-85 (2008).
[110] Oregon LNG, CH2MHill Technical Memorandum, Appendix F Cooling Water Discharge Analysis, at 2 (Sept. 10, 2008).
[111] EPA, Final 2013 Vessel General Permit Fact Sheet at 133.

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CO28-107 The range of temperature changes that would occur from the LNG carrier sizes and types is addressed in the temperature analysis in section 4.5.2.2. The temperature changes from each vessel is not cumulative in the bay due to large daily tidal exchanges so changes in gas export amount would not substantially change the temperature assessment.

The proposed action involves dredging that will decrease dissolved oxygen in Coos Bay because dredging increases the oxygen demand by disturbing sediments and releasing oxygen-demanding materials (decomposing organic materials contained within the sediments). Oregon DEQ previously expressed strong concerns about lowered dissolved oxygen levels that the proposed action would cause. In its 2008 DEIS comments, DEQ stated:

Total organic carbon, acid volatile sulfides, and nutrient sampling should be conducted to quantify the potential for adverse impact to oxygen levels caused by resuspension of sediments during dredging activities. Impacts should then be evaluated utilizing hydrodynamic modeling which can capture real time tidal conditions and simulate real time tidal exchanges during the period of the project.[112]

The DEIS fails to address the potential impacts to dissolved oxygen levels in the bay from the proposed activities, particularly the dredging and other sediment-disturbing activities. The applicant's hydrodynamic modeling memo concludes that the project will cause changes in currents, but does not evaluate the impacts to oxygen levels caused by dredging or real time tidal exchanges during the project period.[113] As noted in its comments on the 2014 DEIS, "these data should be utilized to quantify the potential for adverse impact to oxygen levels caused by resuspension of sediments during dredging activities."[114]

CO28-108

FERC must perform an independent sediment transport analysis consistent with actual conditions in the Coos Bay estuary. In particular, FERC must consider that construction dredging lowers dissolved oxygen levels in estuarine waters not only by re-suspending sediment, but by deepening an estuarine channel where hypoxic conditions can occur due to reduced circulation in deeper waters. Once the dredging is completed, there also is the potential for reduced circulation in the deeper portions of the approach channel. In combination with other factors, reduced circulation has the potential to result in lower dissolved oxygen levels in the deeper waters. The applicants must prove that actual hydrodynamic conditions in Coos Bay would not result in a 0.1 mg/L decrease in dissolved oxygen levels caused by reduced circulation in the deeper channel.[115]

2. The Application Fails to Incorporate Practicable Steps that will Minimize Potential Adverse Impacts of the Discharge on the Aquatic Ecosystem.

Under 40 C.F.R. § 230.10(d):

[112] State of Oregon 2008 DEIS comments at 63.
[113] Hydrodynamic Modeling Memorandum at 29.
[114] State of Oregon 2015 DEIS comments at 42.
[115] Further, as discussed in more detail in the Assessment of hydrodynamic studies by Moffat & Nichol for the Jordan Cove Liquefied Natural Gas Terminal Project, the applicants rely on two-dimensional models that "are inherently incapable of representing the dynamics required to assess impacts on water quality in Coos Bay." The applicants utilized a salinity study as a proxy for water quality variables including dissolved oxygen, pH, temperature, and turbidity. However, as described in Appendix 1, salinity is inherently different from these other variables.Lopez, Jesse. Assessment of hydrodynamic studies by Moffat & Nichol for the Jordan Cove Liquefied Natural Gas Terminal Project. 1 July 2018. P. 1.

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CO28-108 Given the rapid flushing of the bay including a residence time of about 3 days, naturally high dissolved oxygen levels in the bay, and very low organic matter in the sediment of areas dredged, as well as models indicating no substantial changes in tide level and current velocities, the Project would not change dissolved oxygen levels in ways that could affect resources of concern. While potential changes in dissolved oxygen have not been directly modeled, the Applicant has developed models addressing tidal hydraulic changes as a result of all dredging activities being proposed (*Hydrodynamic studies - Hydrodynamic Analysis*, Moffat and Nichol, Nov. 29, 2017). These models found no marked changes in current velocity or tidal level changes at any site modeled along the main channel and the bay mouth except at the immediate access channel area. This suggest the dynamics most affecting dissolved oxygen from the ocean would remain unchanged. Additionally, a model analysis of a much greater channel modification being considered (expanding the navigation channel from 300 to 450 feet wide and deepening it from 37 to 45 feet along its length) found only slight maximum changes of less than 0.1 mg/l in the upper bay. Additionally, the lowest dissolved oxygen levels that occurred still remained above 7.7 mg/l, which is well above state minimum levels to protect aquatic resources (Oregon International Port of Coos Bay and U.S. Army Corps of Engineers 2019). Therefore, considering the small changes in the main channel from current conditions that are slight compared to the model of much more extensive channel changes, no measurable changes would occur in dissolved oxygen from proposed Project actions and no additional models are needed. See also response to SA2-180.

Except as provided under section 404(b)(2), no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken which will minimize potential adverse impacts of the discharge on the aquatic ecosystem.

a. Failure to Avoid Impacts

First and foremost, the application fails to demonstrate what efforts have been made to avoid impacts to wetlands. Instead, the DEIS focuses on explaining mitigation efforts to address impacts to wetlands and waters of the U.S.

EPA describes the mitigation sequencing as follows:

> In 1990, the Environmental Protection Agency (EPA) and the Department of Army entered into a Memorandum of Agreement (MOA) to clarify the type and level of mitigation required under Section 404 regulations. The agencies established a three-part process, known as mitigation sequencing to help guide mitigation decisions:
> 1. Avoid - Adverse impacts are to be avoided and no discharge shall be permitted if there is a practicable alternative with less adverse impact.
> 2. Minimize - If impacts cannot be avoided, appropriate and practicable steps to minimize adverse impacts must be taken.
> 3. Compensate - Appropriate and practicable compensatory mitigation is required for unavoidable adverse impacts which remain.

CO28-109

EPA, *Wetlands Compensatory Mitigation*, available at http://www.epa.gov/owow/wetlands/pdf/CMitigation.pdf.

The 1990 Memorandum of Agreement Between the Department of the Army and the Environmental Protection Agency describes the legal requirements:

Avoidance. Section 230.10(a) allows permit issuance for only the least environmentally damaging practicable alternative. The thrust of this section on alternatives is avoidance of impacts. Section 230.10(a) requires that *no discharge shall be permitted if there is a practicable alternative* to the proposed discharge which would have less adverse impact to the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences. In addition, Section *230.10(a)(3) sets forth rebuttable presumptions* that 1) alternatives for non-water dependent activities that do not involve special aquatic sites are available and 2) alternatives that do not involve special aquatic sites have less adverse impact on the aquatic environment. *Compensatory mitigation may not be used as a method to reduce environmental impacts* in the evaluation of the least environmentally damaging practicable alternatives for the purposes of requirements under Section 230.10(a).

MOA, 1990 (emphasis added).

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CO28-109 As discussed in the EIS, avoidance and minimization measures have been included in the project design (see sections 2 and 4.3 of the EIS).

Jordan Cove flips this sequence on its head by siting the terminal and pipeline where it will have tremendous adverse impacts, but then attempting to mitigate those impacts. As the MOA states, compensatory mitigation may not be used as a method to reduce environmental impacts. CO28-109 cont.

b. Failure to Adequately Identify and Explain Mitigation Plans

Second, the DEIS does not describe or explain proposed minimization and mitigation measures. FERC and the public must be able to identify the final plan for mitigation in order to evaluate its components. The public cannot possibly evaluate the effectiveness of any mitigation plans proposed by Jordan Cove without the specifics of the plans. Simply stating that Best Management Practices ("BMPs") will be used is insufficient for evaluation of mitigation measures specific to each site. This listing of BMPs to be used is inadequate for a proper analysis of the effectiveness of the proposed sediment control measures. CO28-110

The mitigation plans lack, among other things:

- Specific information regarding the water quality and habitat impacts of the improvements to roads;
- Design specifics used to justify the incomplete ESC;
- An assessment of increase in impervious surfaces resulting from road improvements, and how surface flow runoff will be affected by said road improvements. The FERC should evaluate the effects of greater impervious areas and changes in storm water drainage dynamics resulting from road widening and construction, and also evaluate the potential from increased pollutants entering Henderson Marsh and Coos Bay from resulting increased storm water runoff;
- Analysis of the potential for releasing contaminants from the soil during road construction. The FERC should require Jordan Cove to provide a plan on dealing with any soil contaminants encountered during road construction activities and analyze the possible environmental effects from the release of any such contaminants.

The description of a general BMP without site-specific considerations is worthless to the public, and the FERC, for proper evaluation of the measures to be used for mitigation of environmental impacts caused by construction activities.

c. Failure to Compensate for Impacts to Wetlands

Third, even if Jordan Cove were properly avoiding adverse impacts, the mitigation does not adequately compensate for the damage. The prime estuarine salmon habitat that would be destroyed are irreplaceable. In addition, adequate mitigation must replace habitat values with "in-kind" and "in-place" habitat. The MOA states: CO28-111

Generally, in-kind compensatory mitigation is preferable to out-of-kind. There is continued uncertainty regarding the success of wetland creation or other habitat development. Therefore, in determining the nature and extent of habitat development of this type, careful consideration should be given to its likelihood of success.

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CO28-110 The EIS contains a description of the mitigation plans and Best Management Practices. Some plans have not been fully developed or finalized; if the Project is approved, the Commission's Order would contain a condition that federal permits and federally designated authorizations (including the associated mitigation plans) be acquired by the Applicant.

CO28-111 The scope and suitability of wetland mitigation is determined by the COE. Therefore, the Commission and the EIS defers this decision to the COE.

MOA, 1990.

H. Impacts to the Oregon Dunes ecosystem.

1. Groundwater impacts

The Jordan Cove proposed LNG Terminal and Power Plant will require a tremendous amount of water for construction and operation, with 75,000 gallons per day for dust control and 595.5 million gallons of water for various other construction activities, including hydrostatic testing, as well as 71.5 million gallons of water annually for terminal operations. DEIS at 2-8. The DEIS confirms that Jordan Cove would need "a total of about 667 million gallons of water for construction and operation of the Jordan Cove LNG Project." *Id.* at 4-75. This water would be drawn from the aquifer that underlies the Oregon dunes ecosystem, which could adversely affect groundwater resources for the region:

Constructing and operating the Jordan Cove LNG Project could affect groundwater, because of the shallow depth to groundwater and the permeability of the overlying sands and gravels across the site. Site stabilization, excavation, pile driving, and the installation of permanent aboveground facilities could all affect groundwater. In addition to the permanent modification of site topography which could affect underlying groundwater characteristics (quantity, flow, and quality); an inadvertent release of equipment-related fluids, such as lubricating oil, gasoline, and diesel fuel, could affect groundwater. Installing piles to support the Jordan Cove LNG Project could create vertical conduits further affecting underlying groundwater characteristics. Additionally, these conduits could also transmit contaminants.

DEIS at 4-76. Furthermore, runoff from the construction and impervious surfaces of the site could introduce contaminants into the groundwater, causing further harm to this important public trust resource:

During operation, the LNG terminal would cover about 100 acres with impervious surface materials, such as asphalt, concrete, and compacted gravel. The conversion of pervious surface to impervious surface can typically cause a decrease in the local recharge of shallow groundwater (by converting infiltration to runoff); however, Jordan Cove would capture most runoff for infiltration into the ground on-site with only high flows expected to run off directly to the bay. Additionally, in comparison to the total 12,480-acre area of the Dune-Sand Aquifer, this 0.8 percent area reduction would not likely result in an adverse effect on the level of groundwater in the area. Through use of the measures discussed above, we conclude that impacts on groundwater resources at the Jordan Cove LNG Project would be minimized to the extent practicable and would not be significant.

DEIS at 4-77. However, while the DEIS acknowledges the potential for groundwater reduction and contamination, it does not provide an analysis of the environmental harm that is likely to occur from these impacts. There is, for example, no analysis of the harm to species from the loss of wetland and lake habitat from groundwater withdrawals, and no discussion of the long-term impacts that contamination of the groundwater would have on sensitive coastal species, or to the Coos Bay community (including fisheries). The DEIS therefore does not provide the hard look

CO28-112

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CO28-112 Information has added to section 4.3.1.1: Groundwater withdrawal rates for construction and operation are within the capacity of the CBNBWB well field with minimal drawdown of surface waters modeled.

that NEPA requires, nor does it appear to provide an analysis of alternatives, including ways to reduce water use and avoid groundwater contamination.

Importantly, while the 2015 DEIS for the project stated that "Water levels at the [Coos Bay North Bend Water Board] well that is closest to the LNG terminal (well #46 located 3,500 feet north) may drop as much as 0.5 feet," 2015 DEIS 4-347, the current DEIS continues to state that the closest well would be 3,500 feet away, but fails to acknowledge the potential for a reduction in the water level of that well, and fails to consider what that drop would do to local lakes and wetlands, including the wetlands in the proposed mitigation site close to the well. In scoping, FERC was asked to consider the impact of using these wells on the Oregon Dunes ecosystem, but the DEIS failed to address this issue, in clear violation of NEPA.

2. Impacts to species from water withdrawals

CO28-112 cont.

Water withdrawal from the coastal Dunes-Sands aquifer for the project will likely cause harm to species in the area, which the DEIS failed to adequately address. Importantly, this project is immediately adjacent to the Oregon Dunes National Recreation Area, which is a sensitive ecosystem that contains Globally Significant Plant Communities, including rare vegetation dependent on wetlands, pools and lakes. The water withdrawals for the adjacent Jordan Cove project will adversely impact the Dune's plant, fish and wildlife ecosystems.

Studies of the Oregon Dunes have found that groundwater wells near the southern edge of the Dunes could be drying up the natural lakes and wetlands in the Dunes. FERC failed to consider the findings of this study, even though it was submitted during scoping:

The well field in the Horsefall area, at the south end of the Recreation Area, is being studied to monitor changes in groundwater levels, and its potential effects on wetlands. Sustained pumping of groundwater may alter extent and composition of seasonal or perennially-flooded wetlands. If dewatering is sustained over a period of years, shallow lakes may be replaced by dry or seasonally-wet associations typical of deflation plains. Because sand is highly permeable, excessive pumping may also cause pollution of groundwater by infiltration of salt water, sewage, fertilizers and pulp mill wastes.[116]

The "south end of the Recreation Area" is adjacent to the proposed Jordan Cove terminal. Horsfall area is less than one-mile north of Jordan Cove. Horsfall and Beale Lake are protected specifically for wildlife within the Dunes, yet groundwater used to supply the water needs of this project could degrade these important habitat areas.

The Dune Plant Study details some valuable plants that could be lost:

These lakes are unique because of their large size and extensive aquatic bed and emergent plant associations, dominated by pond lily, floating-leaved pondweed, water-shield and hardstem bulrush. Several lakes contain water clubrush, an uncommon plant species, and extensive

[116] USDA Forest Service, Plant Associations of the Oregon Dunes National Recreation Area at 13 (1998) (available at https://ecoshare.info/uploads/publications/PlantAssociationsOfTheOregonDunes.pdf) (the "Dune Plant Study").

populations of the insectivorous bladderwort. The lakes host large concentrations of waterfowl during the migration season.[117]

The Dune Plant Study warns: "Groundwater pumping in the wellfield in the Horsfall area may be lowering the water table, threatening the long-term viability of these lakes." This area would be used for to supply the Jordan Cove Project. The study further notes:

The groundwater drains into lakes, streams, North Slough and the ocean. Winter precipitation elevates the watertable… The seasonal rise in water table also causes vernal pools to form… These pools are teeming with invertebrates and are temporary sources of food and breeding grounds for amphibians and migrating waterfowl…. Groundwater pumping on the North Spit of Coos Bay has raised concerns about year-round depression of the water table, dewatering valuable wildlife habitat and possibly altering plant succession at these sites.

CO28-112 cont.

The DEIS, however, fails to address the impacts to invertebrates, amphibians and migrating waterfowl from the groundwater pumping attributable to Jordan Cove. While the study recommends that "Groundwater pumping in the vicinity of Horsfall Lake and Beale Lake needs to be monitored to determine if it is detrimental to the plant associations there," no monitoring was offered in the DEIS. As such, FERC has clearly failed to provide the hard look that NEPA requires.

The Dune Plant Study further emphasizes that "Pumping of groundwater for municipal use may be causing the water table to drop in some areas of the Recreation Area, and may hasten invasion of upland species." Therefore, the millions of gallons needed for the Jordan Cove project will further exacerbate the invasion of upland species, yet the DEIS makes no mention of this adverse environmental impact.

Moreover, the proposed mitigation for impacts to the dune ecosystem is inadequate. While the prior 2015 DEIS included a Wildlife Habitat Mitigation Plan, no such plan appears to have been included with the current DEIS. It therefore remains unclear whether Jordan Cove will still purchase 105 acres of Dunes to provide mitigation for the project, as was previously proposed. Further, even if Jordan Cove does purchase lands for mitigation, it previously failed to ensure that it would restrict motorized recreation on the site. This is incredibly important, since most wildlife at the terminal site is threatened by motorized recreation. It also remains unclear whether Jordan Cove would allow for herbicides to be applied on mitigation parcels to control European beachgrass and Scotch boom and return areas to an unvegetated state. This method has the potential to pollute wetland sites, and to impact wildlife if not applied with the correct method and time of year. The DEIS failed to provide these details.

CO28-113

In sum, the Oregon Dunes is a critically important and unique habitat for plants and wildlife. The Dunes support rare and important plant communities, including some of the rarest and most endangered plant communities in Oregon. Large and intact examples of these plant communities are quite rare, with some ranked as threatened throughout their range. The Dune Plant Study study described several lakes, vernal pools, and native plant associations that are in danger due to groundwater pumping. Since the LNG Terminal and Power plant will use the groundwater from

[117] *Id.* at 8.

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CO28-113 There is not legal requirement under the NEPA to mitigate all impacts from a Project. Information related to mitigation that is being proposed by the Applicant or required by the agencies is disclosed in the EIS.

As discussed in the EIS, the Applicant would be required to adhere to our Plan and Procedures, and all applicable federal, state, and local requirements related to herbicide use would be required. Standard measures to avoid or minimize effects on wildlife, such as those presented in the ECRP and *Integrated Pest Management Plan*, would also apply to actions taken at mitigation sites.

this area, the DEIS should have considered the impacts to these very sensitive, rare, and unique ecosystems adjacent to the Jordon Cove site. The failure to do so is a clear violation of NEPA. CO28-112 cont.

3. Impacts to species from construction activities in the Dunes

Construction activities in the Oregon dune ecosystem will also harm species that rely on habitat in the area around Jordan Cove, including existing snowy plover habitat, a bird species protected under the Endangered Species Act.[118] The DEIS failed to address this harm.

According to the County land use applications for Jordan Cove, the proposed construction activities include stripping vegetation and placement of open sand along a portion of the backside of the ocean foredune in the northwest corner of Parcel W, as well as removal of invasive species (primarily Scotch broom) by hand or machinery along the access roads at the north end of the parcel. Land Use Application at 15-16.[119] These activities, along with the use of vehicles to access Parcel W, have the potential to harm snowy plovers and result in the loss of habitat if efforts are not undertaken to avoid disturbance of this sensitive species. Therefore, a snowy plover habitat mitigation plan must be submitted, which explains precisely how such activities will be undertaken, and what efforts will be made to minimize and mitigate any impacts to plover habitat. In fact, the Coos County Land Use Code makes it clear that "[a]ll permitted uses and activities must be consistent with a Snowy Plover habitat mitigation plan." *See* GC #5. While the Applicant has proposed activities that may affect snowy plover habitat, no such mitigation plan has been provided, and this issue was not addressed in the DEIS. CO28-114

Of the Oregon sites surveyed in 2010, the Coos Bay North spit critical habitat unit had the highest number of documented adult plovers and the second highest number of breeding birds.[120] Clearly, this area is key to snowy plover conservation. Elements of habitat essential to the conservation of the snowy plover include sparsely vegetated interdune flats, sandy beach areas above and below the high-tide line with occasional surf-cast wrack supporting small invertebrates for plover foraging, and close proximity to tidally influenced estuarine areas.[121]

Threats to snowy plover habitat include disturbance by humans, vehicles and pets in important nesting and foraging areas, and encroachment of non-native invasive European beach grass on available nesting and foraging habitat.[122] In addition, the species is threatened by climate change induced sea-level rise and significant industrial development in Coos Bay generally, and specifically on the north spit. This habitat is incredibly important as a heavily used both historic and currently occupied habitat area. However, the habitat faces significant threats requiring special management. As the Fish and Wildlife Service has noted "small changes in the adult survival rate can have relatively large effects on population stability so the maintenance of quality overwintering habitat is important to conservation."[123]

[118] Listed as threatened on March 5, 1993. 58 Fed. Reg. 12,864.
[119] *See* County File Nos. HBCU-15-05/FP-15-09/CD-15-152
[120] Lauten, D.J., K.A. Castelein, J.D. Farrar, A.A. Kotaich, and E.P. Gaines. *The Distribution and Reproductive Success of the Western Snowy Plover along the Oregon Coast – 2012* at 27, Table 3. Oregon Biodiversity Information Center (Dec. 21, 2012).
[121] 76 Fed. Reg. at 16,066.
[122] *Id.*
[123] 76 Fed. Reg. 16,048 (citing Nur et al. 1999 p.14).

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CO28-114 The described activities are not proposed by this Applicant for this Project, and have no bearing on the current Project being assessed in the NEPA document. The currently proposed actions have been included in EIS per available information.

The proposed activities on Parcel W (which is not discussed in the DEIS) have the potential to cause disturbance to plover habitat. The use of vehicles and machinery for vegetation management can result in loss of habitat through disturbance, and may introduce non-native beach grasses depending on the protocols employed to ensure that the equipment does not contain seeds. A snowy plover habitat mitigation plan is required to ensure that these impacts do not result in take of the species or the loss of plover habitat, and these impacts must be fully analyzed by FERC in order to provide the "hard look" that NEPA requires.

CO28-114 cont.

I. Impacts to Fish, Wildlife, and Sensitive Species

1. Harm from Tanker Traffic

At least 110-120 LNG carriers would visit the terminal each year, resulting in up to 240 tanker trip per year for the project. DEIS, 1-4. This is an increase over the prior proposal for Jordan Cove, and therefore the impacts of LNG tanker traffic will be even greater. Movement of these massive vessels will injure fish and aquatic life by ship-animal collisions (vessel strikes), beaching (stranding) of animals in the vessels' wakes, increased noise pollution, fish entrainment and cooling water discharge. The increase in tanker traffic, and the impacts it will have on species, including species listed under the ESA, are a direct and/or indirect consequence of the project, which must be fully considered by FERC in the EIS. *See Sierra Club v. Mainella*, 459 F.Supp.2d 76, 105 (D.D.C.2006) (holding that agencies must examine the indirect impacts of their actions where the impacts are "functionally inseparable" from activities for which the agency is granting the permit because they "may not take place" without the agency's approval of the permit). As set forth below, the DEIS fails to provide the "hard look" that NEPA requires on these impacts. *See Balt. Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. 87, 97 (1983) (NEPA obligates federal agencies to take a "hard look" at the environmental consequences of its actions).[124]

CO28-115

2. Strikes and Strandings by LNG Vessels

Ship strikes are a major cause of death for numerous marine species, including ESA-listed whales and turtles that would be affected by tanker traffic for Jordan Cove. While the DEIS acknowledges the risk of ship strikes, it fails to provide the rigorous analysis of the impacts to marine species that NEPA requires.

A 2003 report identified 292 confirmed or possible ship-whale strikes between 1975 and 2002, finding fin and humpback whales are the species most commonly found struck.[125] Sea turtles,

[124] As part of this review, the agency must examine the indirect effects of a proposed project. 40 C.F.R. § 1508.8. "Indirect effects" are those that are "later in time or farther removed in distance," yet "reasonably foreseeable." *Dep't of Transp. v. Pub. Citizen*, 541 U.S. 752, 764 (2004), and include those "effects related to induced changes in … water and other natural systems, including ecosystems." 40 C.F.R. § 1508.8(b).

[125] Jensen. A.S. and G.K. Silber. 2003. Large Whale Ship Strike Database. U.S. Department of Commerce, NOAA Technical Memorandum. NMFS-OPR-25, 37 pp. Available at: https://www.greateratlantic.fisheries.noaa.gov/shipstrike/news/shipstrike03.pdf.

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CO28-115 Potential effects on species from increased LNG carrier traffic are described in sections 4.5 and 4.6.

including protected Leatherback (Dermochelys coriacea),[126] Pacific green *sea turtles* (Chelonia mydas) and olive ridley *sea turtles* (Lepidochelys olivacea), are also struck by ships, though due to their small size there are few estimates of mortality. In its most recent Stock Assessment Report, National Marine Fisheries Service documented numerous vessel-related mortalities and serious injuries for humpback whales, fin whales, killer whales, and other species on the West Coast, including some off of Oregon and Washington.[127] However, the number of documented ship strikes grossly underestimates actual incident and mortality numbers, as many of these animals sink, are scavenged, or are otherwise never seen.[128] Recent studies have estimated that only 2 percent of cetaceans killed are ever recovered, and thus mortality estimates based on stranded animals may vastly underestimate actual mortality.[129] Based on annual census records of Southern Resident killer whales, carcasses from confirmed deaths of known individuals are recovered only 6% of the time.[130]

CO28-115 cont.

Ship strikes involving large vessels are the "principal source of severe injuries to whales."[131] Most ship strikes to large whales result in death.[132] Ship strike-related mortality is a documented threat to endangered Pacific coast populations of endangered fin, humpback, blue, sperm, and killer whales, all of which may be harmed by LNG tanker traffic serving Jordan Cove.

In recent years, ship strikes have become an increasing problem for these critically endangered species along the Pacific Coast. For example, between 2001 and 2010, 12 blue whales were reported stranded due to vessel collisions.[133] And, in 1998, NMFS identified ship strikes as one of the primary threats to the endangered blue whale in the Pacific.[134]

Fin whales, which are routinely sighted in waters off the U.S. Pacific coast, were the most frequently struck species in the analysis conducted by Jensen and Silber (75 confirmed strikes,

[126] In 2012, NMFS designated critical habitat for the leatherback, including nearshore areas around Coos Bay and areas that are part of the proposed LNG tanker routes. 77 Fed Reg 4170 (Jan. 2012).
[127] Caretta, J.V. et al. 2017. U.S. Pacific Marine Mammal Stock Assessments: 2016. Available at: https://repository.library.noaa.gov/view/noaa/14915.
[128] *Id.*
[129] Williams, R. et al. 2011. Underestimating the damage: interpreting cetacean carcass recoveries in the context of the *Deepwater Horizon*/BP incident, Conservation Letters, Vol. 4, Issue 3, pp. 288-233 (June/July 2011) DOI:10.1111/j.1755-263X.2011.00168.x. Available at https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1755-263X.2011.00168.x
[130] Fisheries and Oceans Canada. 2008. Recovery strategy for the northern and southern resident killer whales (Orcinus orca) in Canada. Fisheries and Oceans Canada. Ottawa, Canada. Available at: www.cbc.ca/bc/news/bc-081009-killer-whale-recovery-strategy.pdf; *see also* Kraus, S.D. et al. 2005. North Atlantic right whales in crisis. *Science* 309:561-562. Available at: http://www.sciencemag.org/content/309/5734/561 (estimating that only approximately 17 percent of ship struck North Atlantic right whale are actually detected).
[131] Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S. and Podesta, M., 2001, Collisions between ships and whales, *Marine Mammal Science*, 17(1): 35-75. Available at file:///C:/Users/JMargolis/Desktop/ORLNG/Attachments%20for%20DSL/shipstrike.pdf
[132] Jensen, A.S. and Silber, G.K., 2004, Large Whale Ship Strike Database. U.S. Department of Commerce, *NOAA Technical Memorandum*. NMFS-OPR-25. Available at https://www.greateratlantic.fisheries.noaa.gov/shipstrike/news/shipstrike03.pdf
[133] National Marine Fisheries Service. 2010. Southwest Regional Office, California Marine Mammal Stranding Network Database.
[134] National Marine Fisheries Service. 1998. Recovery plan for the blue whale (*Balaenoptera musculus*). Prepared by Reeves R.R., P.J. Clapham, R.L. Brownell, Jr., and G.K. Silber for the National Marine Fisheries Service, Silver Spring, MD.

26 percent of total strikes).[135] At least 18 fin whale mortalities and injuries due to ship strikes were conclusively documented off the coasts of California, Oregon, and Washington between 1993 and 2008.[136] In their examination of 130 whale strandings in Washington State from 1980-2006, Douglas *et al.* (2008) similarly found fin whales to be very susceptible to ship strikes.[137] The final NMFS recovery plan for fin whales ranks the threat posed by ship strikes as "potentially high."[138]

A spatial risk assessment was conducted in 2004 to identify areas where fin, humpback, and killer whales encounter areas of high shipping intensity.[139] The study found that relative risk was highest in confined areas (geographic bottlenecks), such as the mouth of the Coos Bay estuary where vessels would have to enter to reach the proposed facility. The study further found that the few known cases of collisions involving fin whales suggest that mortality due to ship strike for this species may already be approaching or even exceeding mortality limits under the most risk-averse management objectives.[140]

CO28-115 cont.

Other species, however, are also facing increased risk of harm from ship strikes. For example, the NMFS draft recovery plan for southern resident killer whales documents rare but increasing cases of collisions between ships and individuals of that distinct population segment,[141] which was listed as endangered in 2005.[142]

The DEIS, however, fails to provide a sufficient analysis of the potential harm from ship strikes. While it acknowledges the potential for harm, stating that "Potential direct effects of the Project could include injury and/or mortality due to ship-strikes," it provides no actual analysis of the potential harm, but rather states that "additional details on whale densities and potential for ship strikes will be provided in the pending BA." This is insufficient. Pursuant to 40 C.F.R. §1502.25(a), "[t]o the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with environmental impact analysis and related surveys and studies required by the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), the National Historic Preservation Act of 1966 (16 U.S.C. 470 et seq.), the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), and other environmental review laws and executive orders." The concurrency requirement for the NEPA and ESA process is essential for public involvement. There is no opportunity for public comment on the development of a Biological Assessment or Biological Opinion; therefore, it is only through the NEPA process that the public

CO28-116

[135] Jensen, A.S. and G.K. Silber, *supra* note 37.
[136] National Marine Fisheries Service. 2010. Recovery plan for the fin whale (*Balaenoptera physalus*). National Marine Fisheries Service, Silver Spring, MD.
[137] Douglas, Annie B., *et al.*, 2008, Incidence of ship strikes of large whales in Washington State, *Journal of the Marine Biological Association of the United Kingdom.* doi:10.1017/S0025315408000295 (available at https://www.cascadiaresearch.org/files/publications/Douglas_et_al_2008-Incidence_of_ship_strikes_of_large_whales.pdf).
[138] National Marine Fisheries Service. 2010. Recovery plan for the fin whale (*Balaenoptera physalus*). National Marine Fisheries Service, Silver Spring, MD. at I-26.
[139] Williams, R, O'Hara, P.J., 2010. Modelling ship strike risk to fin, humpback and killer whales in British Columbia, Canada, *Journal of Cetacean Research and Management*, 11:1-8.
[140] *Id.*
[141] National Marine Fisheries Service (NMFS). 2008. Recovery Plan for Southern Resident Killer Whales (*Orcinus orca*). National Marine Fisheries Service, Northwest Region, Protected Resources Division, Seattle, Washington.
[142] 70 Fed. Reg. 69903 (Nov. 18, 2005).

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CO28-116 There is no legal requirement for the public to review the BA or BO, and these documents are not regulated by the NEPA (they are under the Endangered Species Act). However, the BA has been provided to the public, and the BO would become publicly available once the Services have finalized it.

may comment on the impacts to listed species. Furthermore, in order to fully assess the cumulative impacts of the proposal as NEPA requires, all impacts must be fully vetted in the NEPA documents. *See Sierra Club v. FERC*, 867 F.3d 1357, 1374 (D.C. Cir. 2017) ("[T]he existence of permit requirements overseen by another federal agency or state permitting authority cannot substitute for a proper NEPA analysis."). FERC has therefore violated NEPA by failing to fully analyze these issues in the DEIS.

CO28-116 cont.

While the BA may eventually provide further information, that does not change the fact that the DEIS disregards and/or underestimates this increased risk to marine mammals, including protected species. The analysis in the DEIS fails to provide an accurate estimate of the risk by species per year and cumulatively over the life of the project. Rather, the DEIS merely claims that the project is not likely to adversely affect federally-listed whale species because ship strikes are "thought to be infrequent" and "though to be discountable" based on a 2018 study by Rockwood et al.[143]; however, that study found that "Mortality from collisions with vessels is one of the main human causes of death for large whales," and that "ship strikes are rarely witnessed and the distribution of strike risk and estimates of mortality remain uncertain at best." This is the *only* reference provided in the DEIS' to support these specious claims, and it clearly does not support FERC's conclusion. The DEIS has therefore failed to provide sufficient information on this important adverse impact of the proposed project, rendering it woefully inadequate.

CO28-115 cont.

The only mitigation mentioned in the DEIS is that "Jordan Cove would provide a ship strike avoidance measures package to LNG carrier operators transporting cargo from the LNG terminal that would consist of multiple measures to avoid striking marine mammals"; however that "avoidance measure package" has not been provided for public review and comment, so it remains entirely unclear what Jordan Cove is actually proposing. In order to meet the requirements of NEPA, all such materials must be provided, and the DEIS is therefore inadequate.

Regardless, it is clear from other Jordan Cove materials that the Applicant is not undertaking sufficient efforts to prevent ship strikes, and the "avoidance measure package" is inadequate. Jordan Cove previously explained, in Resource Report 3 attached to the FERC application materials, that recent research into whale/ship strike interactions has identified a "sound shadow" that is created by the vessel's hull blocking engine noise, so that whales are unaware of the vessel's presence until it is often too late to avoid strikes. It notes that technology has been developed "in the form of a submerged directional array that can be deployed at the vessel's bow to fill the acoustical shadow with sounds detectible by marine mammals and thus avoid a ship strike." It goes on, however, to state that "the use of sound projection within the bow shadow is currently not required," and the use of a directional array to prevent strikes is not included in the list of measures being undertaken to avoid harming marine mammals. Jordan Cove clearly has no intention of taking the measures necessary to protect these species from harm. None of that information was included in the DEIS.

CO28-117

[143] The DEIS fails to provide the full citation for this article, but is appears to reference Rockwood RC, Calambokidis J, Jahncke J (2018) Correction: High mortality of blue, humpback and fin whales from modeling of vessel collisions on the U.S. West Coast suggests population impacts and insufficient protection. PLOS ONE 13(7): e0201080. https://doi.org/10.1371/journal.pone.0201080

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CO28-117 The EIS discloses the potential effects of ship strike in the absence of ship strike avoidance measures. We do not have authority to impose additional measures on international LNG carriers.

Moreover, the DEIS provides insufficient analysis of LNG tanker speeds, and the effects on ship strikes. While the DEIS claims that LNG carriers would travel at speeds of about 12 knots in the open ocean prior to entering Coos Bay, it provides no evidence to support this statement. DEIS, 4-233. Rather, according to the International Group of Liquefied Natural Gas Importer, LNG carriers typically travel at almost 20 knots at ocean speeds.[144] And, an analysis by LNG World Shipping "shows that while LNGCs engaged on long- or medium-term charters sail at an average speed of 19.5 knots, those same vessels re-let into the spot market or on short-term contracts are only sailing at an average speed of 14.5 knots."[145] This is well more than the 12 knots that is claimed in the DEIS, and the difference is important: Research has shown a direct correlation between vessel speed and ship strikes resulting in whale mortality, including "clear evidence of a sharp rise in mortality and serious injury rate with increasing vessel speed."[146] For example, studies have found that the vast majority of lethal and serious whale ship strikes involved vessels exceeding 14 knots. Specifically, Pace and Silber (2005) found that probability of serious injury or mortality increased from 45 percent at 10 knots to 75 percent at 14 knots, exceeding 90 percent at 17 knots. Therefore, the potential for strikes to occur from LNG tankers serving the Jordan Cove project is higher than the DEIS would suggest. CO28-118

Furthermore, as stated above these tanker ships pose a risk of strikes to not only whales, but to other marine creatures, including sea turtles, yet the DEIS fails entirely to address this potential harm. Multiple ESA-listed turtles are present in the area, including the green turtle, leatherback, olive ridley, and loggerhead. In 2012, NMFS designated critical habitat for the leatherback, which includes nearshore areas around Coos Bay and areas part of the LNG tanker routes. 77 Fed Reg 4170 (Jan. 2012). The failure to address this harm renders the DEIS entirely inadequate. CO28-119

In sum, many ESA-listed species, as well as non-ESA-listed species, in the project area will be adversely affected by LNG tanker traffic associated with the proposed project. By omitting any discussion of the anticipated indirect adverse effects associated with tanker traffic, the indirect effects analysis both excludes key features that must be considered under NEPA, *see* 40 C.F.R. § 1508.8(b), and deprives the public of the opportunity to assess the complete environmental picture, in contravention of NEPA's "twin aims" of ensuring that agencies "consider every significant aspect of the environmental impact of a proposed action" and "inform the public that it has indeed considered environmental concerns in its decisionmaking process." *Balt. Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. 87, 97 (1983) (internal quotation omitted). CO28-120

[144] *See* IGLNGI, LNG Information Paper No. 3 (available at https://giignl.org/sites/default/files/PUBLIC_AREA/About_LNG/4_LNG_Basics/lng_3_-_lng_ships_7.3.09-aacomments-aug09.pdf)
[145] LNG World Shipping, LNG Top-Table Session in the Sun (Aug. 14, 2018), available at https://www.lngworldshipping.com/news/view,lng-toptable-session-in-the-sun_53892.htm
[146] Pace, R.M. and Silber, G.K. 2005. Abstract: Simple Analyses of ship and large whale collisions: Does speed kill? Sixteenth Biennial Conference on the Biology of Marine Mammals. San Diego. December 2005; Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S. and Podesta, M. 2001. Collisions between ships and whales. Marine Mammal Science 17(1): 35-75; Vanderlaan, A.S.M. and Taggart, C.T. 2007. Vessel Collisions with Whales: The probability of lethal injury based on vessel speed. Marine Mammal Science 23(1): 144-156.

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CO28-118 The draft EIS provides a summary of potential impacts to marine mammals, including ship strikes and noise (see section 4.5 and 4.6). A more detailed assessment of ship strike and acoustic modeling is found in the Biological Assessment (BA) prepared for this project and currently under review by NMFS and FWS (i.e., Services). The BA discusses numerous conservation measures for NMFS to consider and would be implemented per the Service's Biological Opinion. Conservation measures to reduce impacts on whales, and other marine wildlife, would be implemented. These include:

- During the 96-hour pre-notification process required of all LNG carriers calling on the LNG terminal, the LNG carriers would consult the Local Notice to Mariners (issued by the Coast Guard) and U.S. Coast Pilot to understand seasonal migration patterns, times, and routes and obtain current information on whale sightings in the waters off Coos Bay and the latest recommendations and advisories from the NMFS and Coast Guard. The LNG Carrier Master would take this into account and adjust the vessel speed and route accordingly. In addition, three tractor tugs would guide the LNG carrier from a point approximately 5 nmi offshore of the entrance to Coos Bay and on to the LNG terminal.
- The LNG carrier operators would be required to consult the current whale sightings in the continental shelf waters near Coos Bay, prior to transiting to or from the LNG terminal. Vessel operations would be required to be aware of the blue whale distributions in the continental shelf waters near Coos Bay, and adjust operations accordingly to avoid aggregations of blue whales as navigably possible. Vessels transiting to and from the LNG terminal would be required to post a watch for marine mammals for the duration of the vessels' transit across the continental shelf and have the information relayed directly to the vessel master.
- LNG carriers would be required to reduce speed to 10 knots or less when cow-calf pairs, or large groups are observed near an underway LNG carrier, when navigably possible. LNG carriers would also be requested to route around and maintain a 100-yard distance from the whales observed and to avoid crossing in front of the whales and maintain a parallel route, when navigably possible. In addition, for safety of the vessel and crew, course adjustments would need to be made gradually away from the whales' location or direction of travel. Lastly, the LNG carrier operators would be encouraged to review and adopt when possible guidelines to reduce underwater noise from commercial ships (International Maritime Organization [IMO] 2014).

To further increase the awareness of local marine mammal species and risk factors, Jordan Cove would provide a Ship Strike Avoidance Measures Package to shippers calling on the LNG terminal in Coos Bay. This package would include:

- Training to LNG carrier bridge crews, including the use of a reference guide such as the Marine Mammals of the Pacific Northwest, including Oregon, Washington, British Columbia and South Alaska (Folkens 2001). This is a pamphlet that would be provided to LNG carriers calling on the terminal and would be included as part of the terminal use agreement to the shippers.

- A copy of *A Prudent Mariner's Guide to Right Whale Protection* (NMFS 2009b) or *Mariners Guide to Whales, Dolphins and Porpoises of Western Canada* [CORI 2017]. *A Prudent Mariner's Guide to Right Whale Protection* is specific to right whales, but NMFS has stated that the guidance and avoidance measures are also applicable to fin, humpback, and sperm whales. *A Mariners Guide to Whales, Dolphins and Porpoises of Western Canada* focuses on Pacific Ocean species. In the event, that a U.S.-based Pacific guide is developed before operations commence, this guide would be used.
- Measures discussed in the 2010 workshop in California ("Reducing Vessel Strikes of Large Whales in California" [DeAngelis 2010]) as relevant for the species expected in coastal Oregon.
- Sightings of marine mammals are to be documented and reported to a central database. This would be arranged with consultation of NMFS and the Oregon Institute of Marine Biology. This reporting would assist in understanding patterns of distribution and occupancy in the continental shelf waters of Oregon by blue whales. Written guidance on expectations regarding:
  - Active watch for marine mammals.
  - Sightings data documentation, and reporting procedures.
  - Vessel speeds of 10 knots or less when mother-calf pairs or groups are sighted.
  - Maintenance of a minimum distance of 100 yards from whales, when navigably possible. This is particularly relevant if advance notice of whales locations are provided by NMFS.
  - Maintenance of a parallel course to the whale(s) and avoidance of excessive speed or abrupt course changes until the vessel and whale are no longer proximal.
  - When whales are sighted in a ship's path or in proximity to a moving ship, reduce speed to 10 knots or less or shift the engine to neutral until whales are clear of the area or path of the ship, as navigably possible.

LNG carrier masters would also be asked to report sightings of any injured or dead whales as soon as is practicable, regardless of whether the injury or death is caused by the ship. If the injury or death is caused by collision with the ship, within the U.S. the appropriate regulatory agency (e.g., NMFS) would be notified within 24 hours of the incident. Information to be provided would include the date and location (latitude/longitude) of the strike, the ship name, the species, or a description of the animal, if possible.

CO28-119 Section 4.6 describes potential effects to listed sea turtles and leatherback critical habitat near Coos Bay.

CO28-120 See response to similar comments from the Western Environmental Law Center.

3. Injury Caused by Noise from LNG Vessels and Marine Slip Construction

The proposed Project would substantially increase the amount of ship-related noise in the waters around Coos Bay and off the coast of Oregon, posing a risk of harm to fish and marine mammals. The DEIS has failed to provide the "hard look" that NEPA requires on the impacts of this noise on species, including species listed under the ESA.

Increased noise from LNG ship traffic creates conditions that are deleterious to fish or other aquatic life. The noise emitted from LNG ships is above the NMFS's noise threshold for physical harm to fish. LNG ships are considered cargo vessels and cargo vessels are known to emit high levels of low frequency sound (6.8 to 7.7 hertz (Hz) at 181 to 190 dB, re: 1 µPa) capable of traveling long distances (Richardson et al., 1995). *See* Bradwood Landing LNG Terminal DEIS at 4-224. The NMFS' current noise thresholds for fish are a peak pressure of 180 dB re: 1 µPa for physical harm and an impulse pressure, or root mean square (rms), of 150 dBrms re: 1 µPa for behavioral disruption. Therefore, noise from LNG vessels can adversely affect whales and other marine mammals, yet the DEIS fails to adequately address this important adverse environmental impact in violation of NEPA. *Balt. Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. 87, 97 (1983) (NEPA obligates federal agencies to take a "hard look" at the environmental consequences of its actions).

CO28-121

Sound is the key sense for dolphins and whales to find their way around, detect predators, find food and communicate. The sound frequency range within which whales communicate and echolocate corresponds to the frequency range of ship noise. Ships hundreds and even thousands of miles away interfere with the acoustic space of these animals. With more ship traffic, the ability for whales and dolphins to communicate, search for prey, and avoid predators will be compromised.

Ocean noise pollution, predominantly from large shipping vessels, has created an "omnipresent hum" in our ocean.[147] Large commercial shipping vessels are the primary source of anthropogenic low-frequency sound contributing to ambient (background) noise in the ocean. Because very loud low-frequency sound can travel great distances in the deep ocean, increasing noise impacts areas far beyond the source of the noise.[148] The DEIS, however, has failed to adequately account for the adverse impacts that ship noise associated with the project would have on marine species.

[147] For example, tests conducted near San Nicolas Island, one of the Channel Islands just south of the Channel Islands NMS, indicate that ambient noise pollution in that area has increased by 10-12 decibels over the past 40 years. McDonald *et al.* suggest that this increase, potentially reflected throughout the Northeast Pacific, is most likely due to changes in commercial shipping. McDonald, M.A., Hildebrand, J. and Wiggins, S.M., 2006, Increases in deep ocean ambient noise in the Northeast Pacific west of San Nicolas Island, California. *Journal of the Acoustical Society America,* 120(2): 711-718. Available at http://cetus.ucsd.edu/Publications/Publications/PAPERS/McDonaldJASA2006.pdf

[148] Hildebrand, J. 2005. Impacts of anthropogenic sound, In: Marine Mammal Research: Conservation Beyond Crisis. Edited by: J.E. Reynolds III, W.F. Perrin, R.R. Reeves, S. Montgomery and T.J. Ragen. Johns Hopkins University Press, Baltimore, Maryland, pp. 101-124. Available at http://www.cetus.ucsd.edu/sio133/PDF/HildebrandJHU-MMR2005.pdf

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CO28-121 Effects of noise on listed fish and marine mammals are discussed in section 4.6.

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NOAA has recently begun mapping marine noise levels using its SoundMap and CetMap mapping tools.[149] These maps show that human-caused cumulative and ambient ocean noise pollution has increased ambient sound levels to over 100 decibels (dB) over the majority of the Pacific and Atlantic oceans.[150] This sound level is equivalent to attending a live rock concert or standing next to a running chainsaw.[151]

Evidence exists that ship noise is associated with chronic stress in whales.[152] Past studies have identified the effect of vessels and associated noise on Southern Resident Killer whales specifically, particularly as it negatively affects foraging efficiency.[153] Houghton et al. (2015) measured the noise levels that whales received while collecting location data for all vessels within 1,000m of the whale. This allowed a comparison of vessel traffic to the ambient noise received by the Southern Residents.[154] Vessel speed was found to be the only significant predictor of noise levels; thus, the scientists concluded that vessel speed was most important in predicting noise levels received by Southern Residents.[155] As discussed above, the DEIS erroneously claims that LNG tankers would be travelling at only 12 knots in the open ocean, when it is readily apparent that such ships routinely travel above 14 knots, and even to 20 knots. FERC must therefore assess the potential for impacts to marine species from noise at these speeds.

CO28-121 cont.

Anthropogenic noise pollution can mask marine mammal communications at almost all frequencies these mammals use.[156] "Masking" is a "reduction in an animal's ability to detect relevant sounds in the presence of other sounds."[157] Marine mammals use different song, chirp, and whistle frequencies for a variety of purposes, including echolocation for feeding, long-

[149] *See* http://cetsound.noaa.gov/

[150] *Summed Outputs—Sound Field Data Availability*, NOAA, http://cetsound.noaa.gov/SoundMaps/NorthAtlantic/Basin/Chronic/NA_OceanBasin_Chronic_Sum/NorthAtlantic_Sum_ThirdOctave/Atl_Sum_0050Hz_0005m_ThrdOct.png (last accessed Oct. 29, 2014) (Atlantic Ocean noise pollution levels); *Summed Outputs—Sound Field Data Availability*, NOAA, http://cetsound.noaa.gov/SoundMaps/NorthPacific/Basin/Chronic/NP_OceanBasin_Chronic_Sum/NorthPacific_Sum_ThirdOctave/Pac_Sum_0050Hz_0005m_ThrdOct.png (last accessed Oct. 29, 2014) (Pacific Ocean noise pollution levels).

[151] *See Comparative Examples of Noise Levels*, INDUSTRIAL NOISE CONTROL, INC. (Feb. 2000), http://www.industrialnoisecontrol.com/comparative-noise-examples.htm.

[152] Rosalind M. Rolland et al., Evidence that ship noise increases stress in right whales. 279 *Proceedings of the Royal Society B: Biological Sciences* (2012) (available at http://doi.org/10.1098/rspb.2011.2429).

[153] Lusseau et al. 2009, Vessel traffic disrupts the foraging behavior of southern resident killer whales Orcinus orca. Endangered Species Research, Vol. 6: 211–221, 2009 (*available at* https://www.int-res.com/articles/esr2008/6/n006p211.pdf); Noren, D. P. and D. D. W. Hauser. 2016. Surface-Based Observation Can Be Used to Assess Behavior and Fine-Scale Habitat Use by an Endangered Killer Whale (Orcinus orca) Population. Aquatic Mammals. Volume 42 (Issue 2), pages 168 to 183.

[154] Houghton J, Holt MM, Giles DA, Hanson MB, Emmons CK, Hogan JT, et al. (2015). The Relationship between Vessel Traffic and Noise Levels Received by Killer Whales (*Orcinus orca*). PLoS ONE 10(12): e0140119. Available at https://doi.org/10.1371/journal.pone.0140119.

[155] *Id.*

[156] *See, e.g.*, Hildebrand, J.A., *Impacts of Anthropogenic Sound, supra* note 50; Weilgart, L., 2007, The Impacts of Anthropogenic Ocean Noise on Cetaceans and Implications for Management. 85 CANADIAN J. ZOOLOGY 1091-1116 (2007).

[157] OCEAN NOISE AND MARINE MAMMALS, *supra* note 59, at 96.

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distance communication, environmental imaging, individual identification, and breeding.[158] Odontocetes, or toothed mammals such as dolphins and killer whales, produce broad-spectrum clicks and whistles that can range between 1 and 200 kilohertz (kHz).[159] Mysticites, or baleen whales such as blue and right whales, have much lower-frequency calls, ranging between 0.2 and 10 kHz.[160]

CO28-121 cont.

Ambient ship noise can cover important frequencies these animals use for more complex communications.[161] Some species, such as the highly endangered right whale, are especially vulnerable to masking.[162] Ship noise can completely and continuously mask right whale sounds at all frequencies.[163] NOAA has recognized that this masking may affect marine mammal survival and reproduction by decreasing these animals' ability to "[a]ttract mates, [d]efend territories or resources, [e]stablish social relationships, [c]oordinate feeding, [i]nteract with parents, or offspring, [and] [a]void predators or threats."[164] Studies have also found that chronic exposure to boat traffic and noise can cause whales to reduce their time spent feeding.[165]

In addition to masking effects, marine mammals have displayed a suite of stress-related responses from increased ambient and local noise levels. These include "rapid swimming away from [] ship[s] for distances up to 80 km; changes in surfacing, breathing, and diving patterns; changes in group composition; and changes in vocalizations."[166] Some avoidance responses to localized marine sounds may even lead to individual or mass strandings.[167] Louder anthropogenic sounds may also lead to permanent hearing loss in marine mammals.[168]

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[158] *Id.* at 42-44; Jason Gedamke, *Ocean Sound & Ocean Noise: Increasing Knowledge Through Research Partnerships*, NOAA 2 (2014), *available at* http://cetsound.noaa.gov/Assets/cetsound/documents/MMC%20Annual%20Meeting%20Intro.pdf; Clark, C.W. et al., *Acoustic Masking in Marine Ecosystems as a Function of Anthropogenic Sound Sources*, *available at* https://www.academia.edu/5100506/Acoustic_Masking_in_Marine_Ecosystems_as_a_Function_of_Anthropogenic_Sound_Sources.

[159] OCEAN NOISE AND MARINE MAMMALS, NAT'L RES. COUNCIL 41-42 (2003), *available at* http://www.nap.edu/openbook.php?record_id=10564&page=R1.

[160] *Id.* at 42.

[161] *Id.* at 42, 100 ("An even higher level, an understanding threshold" may be necessary for an animal to glean all information from complex signals").

[162] Clark, C.W. at al., *Acoustic Masking in Marine Ecosystems: Intuitions, Analysis, and Implication*, 395 MARINE ECOLOGY PROGRESS SERIES 201, 218-19 (2009), available at http://www.int-res.com/articles/theme/m395p201.pdf.

[163] *Id.* (showing anthropogenic noise masking 100 percent of the frequencies right whales used over the majority of a six-hour study).

[164] Jason Gedamke, *supra* note 58, at 2; Clark, C.W. *et al.*, *supra* note 64, at *3.

[165] *See i.e.* Williams, R. D., et al., 2006, Estimating relative energetic costs of human disturbance to killer whales (*Orcinus orca*), *Biological Conservation*, 133: 301-311. Available at http://www.oceansinitiative.org/wp-content/uploads/2010/11/williamsetal2006_energeticcostdisturbance.pdf

[166] OCEAN NOISE AND MARINE MAMMALS, *supra* note 59, at 94.

[167] *Id.* at 132; BRANDON L. SOUTHALL ET AL., FINAL REPORT OF THE INDEPENDENT SCIENTIFIC REVIEW PANEL INVESTIGATING POTENTIAL CONTRIBUTING FACTORS TO A 2008 MASS STRANDING OF MELON-HEADED WHALES 3 (*PEPONOCEPHALA ELECTRA*) IN ANTSOHIHY, MADAGASCAR, INT'L WHALING COMM'N 4 (2013), *available at* http://www.cascadiaresearch.org/oldsite/Hawaii/Madagascar_ISRP_Final_report.pdf.

[168] Kastak, D. et al., 2008, *Noise-Induced Permanent Threshold Shift in a Harbor Seal*, 123 J. ACOUSTICAL SOC'Y OF AM. 2986; Kujawa, S.G. & Liberman, M.C., 2009, *Adding Insult to Injury: Cochlear Nerve Degeneration After "Temporary" Noise-Induced Hearing Loss*, 29 J. NEUROSCIENCE 14,077, available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2812055/pdf/nihms163964.pdf.

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NOAA and legislative leaders have recognized the threat to ocean species posed by increased anthropogenic ocean noise levels.[169] On the issue of ocean noise, NOAA has stated:

Rising noise levels can negatively impact ocean animals and ecosystems in complex ways. Higher noise levels can reduce the ability of animals to communicate with potential mates, other group members, their offspring, or feeding partners. Noise can reduce an ocean animal's ability to hear environmental cues that are vital for survival, including those key to avoiding predators, finding food, and navigation among preferred habitats.

NOAA's approach to managing ocean noise aims to reduce negative physical and behavioral impacts to trust species, as well as conserve the quality of acoustic habitats.[170]

CO28-121 cont.

Though difficult to detect, noise-induced stress is a serious threat for cetaceans.[171] In a noise exposure study using a captive beluga whale, increased levels of stress hormones were documented.[172] Stress due to noise can lead to long-term health problems, and may pose increased health risks for populations by weakening the immune system and potentially affecting fertility, growth rates and mortality.[173]

Many species are already threatened by increasing ocean noise. The NMFS recovery plan for Southern resident killer whales (*Orcinus orca*) describes the disturbance from vessel traffic and the associated noise pollution as a potential threat to the species, since population numbers have fallen to below 100 individuals despite its protection under the ESA since 2005.[174] The population has, in fact, been in an alarming decline in recent years. As of December 31, 2016, there were only 78 Southern Resident killer whales remaining.[175] A recent study by Vélez-Espino et al. (2014), analyzing 25 years of monitoring data from 1987 to 2011, showed that the population has declined at a rate of 0.91% per year.[176] Under current conditions and at a 0.91% annual decline in growth rate, the Southern Resident killer whale population is expected to reach 75 individuals in a generation, with an extinction risk of 49% and a minimum abundance of 15

[169] *See Phase 2-NOAA's Ocean Noise Strategy* (http://cetsound.noaa.gov/cetsound); *Congressional Briefing on Marine Mammal Health and Stranding* (Sept. 24, 2014), http://www.mmc.gov/special_events/capitalhill_briefing/capitalhill_briefing_summary.shtml; *see generally* Jason Gedamke, *supra* Note 58.
[170] *Underwater Noise and Marine Life*, NOAA, http://cetsound.noaa.gov/index.
[171] Weilgart, L., 2007, The Impacts of Anthropogenic Ocean Noise on Cetaceans and Implications for Management, 85 CANADIAN J. ZOOLOGY 1091-1116 (2007).
[172] Romano, T.A. *et al.*, 2004, Anthropogenic sound and marine mammal health: measures of the nervous and immune systems before and after intense sound exposure, *Canadian Journal of Aquatic Science*, 61: 1124-1134. Available at https://www.researchgate.net/publication/255588954_Anthropogenic_sound_and_marine_mammal_health_Measures_of_the_nervous_and_immune_systems_before_and_after_intense_sound_exposure/download
[173] *Id.*
[174] National Marine Fisheries Service (NMFS). 2008. Recovery Plan for Southern Resident Killer Whales (*Orcinus orca*). National Marine Fisheries Service, Northwest Region, Protected Resources Division, Seattle, Washington.
[175] As of December 2016, the southern resident killer whale population totals 78 individuals (J Pod=24, K Pod=19, L Pod=35) CENTER FOR WHALE RESEARCH, http://www.whaleresearch.com/orca-population.
[176] Vélez-Espino et al. 2014. Relative importance of chinook salmon abundance on resident killer whale population growth and viability. Aquatic Conserv: Mar. Freshw. Ecosyst. (2014). Available at https://cdn.shopify.com/s/files/1/0249/1083/files/Velez-Espino_etal_2014_AQC_doi.pdf?12878

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individuals expected during a 100-year period.[177] NMFS likewise projects a downward trend in population growth over the next 50 years, and has found that the loss of even one Southern Resident killer whale every seven years would keep it from reaching optimum sustainable population.[178] The recovery plan identifies "sound and disturbance from vessel traffic" as factors that currently pose a risk for this population of Southern resident killer whales.[179]

Vessel presence modifies Southern Resident killer whale foraging behavior by hunting substantially less and increasing traveling activities.[180] In addition to causing physical disturbance, anthropogenic noise from the vessels can impair the Southern Resident killer whale's highly developed acoustic sensory system used to navigate, and communicate with kin, mates and other conspecifics.[181] Noise can mask communications, disrupt vocal learning, mask echolocation signals, and permanently damage hearing sensitivity.[182] Noise can also impair the Southern Resident killer whale's ability to locate food. Recent studies demonstrate that food unavailability and poor nutrition can lead to increased physiological stress and reproductive loss.[183]

CO28-121
cont.

Killer whales rely on their highly developed acoustic sensory system for navigating, locating prey, and communicating with other individuals. Increased levels of anthropogenic sound have the potential to mask echolocation and other signals used by the species, as well as to temporarily or permanently damage hearing sensitivity. Exposure to sound may therefore be detrimental to survival by impairing foraging and other behavior.[184] The DEIS has failed to discuss any of this, and has ignored the potentially devastating harm that increased tanker traffic could have on this highly imperiled species, in violation of NEPA.

Other species that communicate over vast distances in the ocean, such as blue and fin whales, will increasingly have trouble hearing one another as the ambient noise level continues to rise. The masking of reproductive calls may prevent widely distributed mates from finding each other and reproduction rates may fall as a consequence.[185] This could have a significant impact on the survival of these imperiled species, which the DEIS failed to adequately address.

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[177] Vélez-Espino, L.A., Ford, J.K.B., Araujo, H.A., Ellis, G., Parken, C.K., and Balcomb, K.C. 2014. Comparative demography and viability of northeastern Pacific resident killer whale populations at risk. Can. Tech. Rep. Fish. Aquat. Sci. 3084: v + 58 p. Available at https://cdn.shopify.com/s/files/1/0249/1083/files/TR3084_Velez-Espino_Resident_Killer_Whale_Populations_at_Risk.pdf?12882

[178] Carretta, J.V. et al., U.S. Pacific Marine Mammal Stock Assessments 2016: Killer Whale (*Orcinus orca*): Eastern North Pacific Southern Resident Stock (Mar. 13, 2017), NOAA-TM-NMFS-SWFSC-577.

[179] *Id.*

[180] NOAA Fisheries, SOUTHERN RESIDENT KILLER WHALES: TEN YEARS OF RESEARCH AND CONSERVATION (2014). Available at https://www.nwfsc.noaa.gov/research/divisions/cb/ecosystem/marinemammal/documents/bigreport10814.pdf

[181] Nat'l Marine Fisheries Serv., *Recovery Plan for Southern Resident Killer Whales (Orcinus orca)* II-104 (2008).

[182] *Id.*

[183] Wasser et al., POPULATION GROWTH IS LIMITED BY NUTRITIONAL IMPACTS ON PREGNANCY SUCCESS IN ENDANGERED SOUTHERN RESIDENT KILLER WHALES (ORCINUS ORCA), 16 (2017).

[184] *Id.*

[185] Weilgart, L., 2007. The impacts of anthropogenic ocean noise on cetaceans and implication for management. *Canadian Journal of Zoology*, 85 CANADIAN J. ZOOLOGY 1091-1116. Available at http://whitelab.biology.dal.ca/lw/publications/Weilgart%202007%20CJZ%20noise%20review.pdf

Hearing loss, classified as either "temporary threshold shift" or "permanent threshold shift," is also a concern for animals exposed to the intense noise pollution produced by human activities. Hearing loss reduces the range in which communication can occur, interferes with foraging efforts and increases vulnerability to predators. Hearing loss may also change behaviors with respect to migration and mating and it may cause animals to strand, which is often fatal. For marine mammals such as whales and dolphins that rely heavily on their acoustic senses, both permanent and temporary hearing loss should be regarded as a serious threat.[186]

Furthermore, noise impacts to marine mammals are predicted to increase with global climate change, wherein the absorption of carbon dioxide by the ocean could create noisier oceans.[187] When greenhouse gas reacts in the ocean, it lowers pH, creating more acidic waters. The more acidic the water, the less that sound waves are absorbed. Keith Hester, a researcher with the Monterey Bay Aquarium Research Institute, predicts sounds will travel 70% further by 2050 because of increased carbon dioxide acidifying our oceans.[188] A louder ocean will negatively affect cetaceans that rely on sound to navigate, communicate, find food, and avoid predators. The DEIS fails entirely to discuss or account for the increased harm from noise associated with the project in light of climate change. CO28-122

The greatest source of human-caused marine noise by far is ship propeller cavitation—the sound poorly designed propellers make as they spin through the water.[189] Cavitation accounts for as much as 85 percent of human caused noise in the world's oceans.[190] Cavitation may also increase due to hull designs that create non-homogenous wake fields behind ships.[191] And even well-designed propellers and hulls may begin to cavitate if they are not regularly cleaned and smoothed.[192] The DEIS does not discuss this issue, and fails to address whether propellers for the LNG tankers associated with the project would be routinely cleaned and smoothed. CO28-123

Another significant source of anthropogenic marine noise is on-board machinery, especially diesel engines.[193] Other onboard machines may also cause vibrations that migrate underwater.[194] Finally, ship noise increases at higher speeds, as this increases the degree and volume of cavitation and onboard machine sounds.[195] The DEIS has failed to discuss any of these sources of marine noise, and is therefore entirely inadequate. CO28-124

[186] Hildebrand, J., 2005, Impacts of anthropogenic sound, *supra* note 50.
[187] Hester, K. C., *et al.*, 2008, Unanticipated consequences of ocean acidification: A noisier ocean at lower pH. *Geophysical Research Letters*, 35:31. Available at https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2008GL034913
[188] *Id.*
[189] Joseph J. Cox, *Evolving Noise Reduction Requirements in the Marine Environment*, MARINE MAMMAL COMM'N: CONGRESSIONAL BRIEFING ON OCEAN NOISE, at 12 (2014), *available at* https://www.mmc.gov/wp-content/uploads/cox_capitalhill_briefing_0914.pdf; GUIDELINES FOR THE REDUCTION OF UNDERWATER NOISE FROM COMMERCIAL SHIPPING TO ADDRESS ADVERSE IMPACTS ON MARINE LIFE, INT'L MARITIME ORGANIZATION 1-2 (2014) (definition of cavitation) [hereinafter GUIDELINES] (available at https://www.ascobans.org/sites/default/files/document/AC21_Inf_3.2.1_IMO_NoiseGuidelines.pdf).
[190] Joseph J. Cox, *supra* note 91, at 12.
[191] *Id* at 4.
[192] *Id* at 5.
[193] *Id* at 4.
[194] *Id.*
[195] *Id* at 5.

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CO28-122 Noise impacts and underwater acoustic modeling are discussed in more detail in the Biological Assessment prepared for this project and currently under review by NMFS and FWS (i.e., Services). Should NMFS decide this should be reviewed in more detail, it would be addressed in their Biological Opinion.

CO28-123 The Biological Assessment addresses noise in detail and includes measures to reduce impacts to marine mammals. See response to comment CO28-118.

CO28-124 The Biological Assessment addresses noise in detail and includes measures to reduce impacts to marine mammals. See response to comment CO28-118.

In addition, noise from construction of the marine slip (including pile driving) may adversely impact marine species, including pinnipeds. Jordan Cove would install hundreds of steel piles for the LNG vessel berth (marine facility). This pile driving could exceed NMFS noise criteria and cause adverse impacts to marine mammals. According to the applicant's modeling, sound levels greater than 180 dB will extend several hundred feet from pile driving operations. DEIS, 4-253. Jordan Cove has not yet developed a plan to protect marine mammals from noise impacts associated with the construction of the marine slip and berth, and admits that "methods for wood pile installation are unknown." *Id.* The DEIS acknowledges, however, that "There is some risk of cumulative noise levels associated with wood pile-driving." FERC must consider whether these potential impacts can be adequately addressed, and the DEIS fails to provide the "hard look" that NEPA requires on this issue.

CO28-125

Regardless, it is clear that the increased noise impacts associated with the proposed Project would result in "take" of federally-protected species. Congress intended the term "take" to be defined in the "broadest possible manner to include every conceivable way" in which a person could harm or kill wildlife.[196] The term "take" is defined in the statute to include "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."[197] The implementing regulations for the Act define "harm" to include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering."[198] The term "harass" is defined to mean "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering."[199]

CO28-126

The DEIS, however, states that these issues will be addressed in the forthcoming BA. That is not sufficient. As discussed above, pursuant to 40 C.F.R. §1502.25(a), "[t]o the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with environmental impact analysis and related surveys and studies required by the Fish and Wildlife Coordination Act (16 U.S.C. 661 et seq.), the National Historic Preservation Act of 1966 (16 U.S.C. 470 et seq.), the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.), and other environmental review laws and executive orders." The concurrency requirement for the NEPA and ESA process is essential for public involvement, and FERC cannot ignore these important adverse impacts in its NEPA analysis.

4. Stranding and Entrainment of Fish by LNG Vessels

Vessel traffic will also cause wake stranding of juvenile salmon and other fish. Wake stranding will increase greatly due to the additional deep draft ships. Further, turning of the LNG tankers with high thrust tugs will increase wake stranding and disorientation of salmon. These impacts were not addressed in the DEIS.

CO28-127

[196] S. Rep. No. 93-307, 93d Cong., 1st Sess. 1, reprinted in 1973 USCAAN 2989, 2995.
[197] 16 U.S.C. § 1532(18).
[198] 50 C.F.R. § 17.3.
[199] *Id.* § 17.3.

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CO28-125 We believe that noise impacts from pile driving (underwater and air) were analyzed in sufficient detail for marine mammals , fish, and birds. The Biological Assessment (BA) discusses in-water pile driving activities, whether vibratory or impact driven, and the noise thresholds or potential injury to marine mammals, fish, marbled murrelet, Coastal marten, and snowy plover. Sound exposure distances vary based on the installation method used and by species; however, the Project used the NMFS pile driving effects calculator, to determine harassment thresholds. The BA identifies measures that would avoid or reduce potential impacts to marine species from noise associated with the installation of sheet piles.

CO28-126 See response to similar comments from the Western Environmental Law Center.

CO28-127 Additional discussion of potential stranding was added to the final EIS.

The LNG vessels that would dock in the new marine slip under the proposed action would also take in large amounts of bay water from the slip to cool vessel engines. The DEIS acknowledges that this will harm fish, (*See e.g.* DEIS, 4-332 "Entrainment and impingement of coho salmon could occur in LNG carriers' cooling water intake port during LNG carrier loading and possibly dredging") but fails to take the required hard look at the effects this impact will have on endangered, threatened, and sensitive species.

In fact, the DEIS summarily concludes that "entrainment and impingement from LNG carrier water intakes at the terminal would not have substantial adverse effects on any marine phase of aquatic resources (e.g., the juvenile stage of salmonids) or their food sources," without reference to any specific study, analysis or facts to substantiate that claim. DEIS, 5-5. The DEIS therefore does not meet the basic requirements of NEPA.

CO28-128

Moreover, the measures that Jordan Cove has proposed to deal with these problems are unproven and inadequate, as NMFS itself has noted in its comments for the prior DEIS and FEIS. In fact, many of the criticisms NMFS previously levied against the project apply to the current proposal as well. For example, for the prior DEIS for Jordan Cove, NMFS specifically noted problems with the lack of fish screens to prevent entrainment of threatened and endangered species:

> Jordan Cove no longer proposes to include fish exclusion screens with a fixed water delivery system to the hulls of the ships. NMFS maintains that screening ballast and engine cooling water is the most effective method to minimize adverse effects to the aquatic resources. While the U.S. Coast Guard has identified some regulatory difficulties with the original screening design proposed in the DEIS, those difficulties do not preclude its implementation.

NMFS FEIS Comments at 2 (June 8, 2009). The DEIS for the current export project indicates that this problem has not been remedied: the DEIS notes that the current proposal is to use ship-mounted screens that do meet NMFS criteria. DEIS, 4-256. The DEIS acknowledges that "The result is likely to be that fish at fry and larger juvenile size salmonids near the intakes may be entrained or impinged during cooling water intake," and that "smaller marine and estuarine fish, juvenile stages of crab and shrimp, as well as other zooplankton and eggs and larvae fish could also be entrained." *Id.* The DEIS further admits that "Some estuarine organisms potentially including juvenile salmonids would be removed from Coos Bay with this process during every loading cycle. It is expected that a high portion of juvenile larval stages of fish and invertebrates entrained or impinged would result in mortality." *Id.*

Nevertheless, as with the prior DEIS that NMFS found was insufficient as to fish entrainment, the current DEIS concludes that entrainment impacts are minimal because "natural mortality of these early life stages is extremely high." *Id.* In other words, because many juvenile and larval aquatic organisms die, the additional mortality caused by entrainment is not significant. This defies logic. Simply because juvenile fish already suffer high mortality is no reason to discount the additional mortality caused by entrainment in LNG vessels via cooling water uptake. This ignores the cumulative impacts of increased mortality, and does not provide the "hard look" that NEPA requires.

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CO28-128 The analysis of the effects of entrainment is adequately addressed the in the EIS (see section 4.5.2). The effects to ESA listed species is addressed in the Biological Assessment as well as section 4.6 of the EIS.

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Moreover, the analysis that is provided in the DEIS completely misses the mark. The DEIS provides a comparison of fish entrainment in LNG vessels with the loss of marine organisms from the Coos Bay estuary due to tidal influence, but the two are not comparable. While this analysis may suggest that the LNG tankers would only be removing a small percentage of the food sources in Coos Bay, it says nothing about the cumulative impacts of increased mortality on fish species, particularly those that are listed under the ESA, such as Coho salmon. These fish would not merely be removed from the bay, as with tides, but would be killed by the LNG vessels, thereby reducing the population in violation of the ESA.

The DEIS attempts to downplay this fish mortality through LNG entrainment by claiming that the overall increase in loss from the early life stages to adult survival is relatively small. However, it acknowledges that "Loss of juvenile salmonids from entrainment or impingements could also reduce adult returns," DEIS at 4-259, yet does not provide any analysis as to how this loss might affect the species. Rather than analyze the actual impacts, the DEIS asserts that "due to the extremely small portion of total water intake relative to the volume of Coos Bay, likely intake locations (30 feet deep, in the back of the isolated slip) likely away from concentrations of juvenile salmonids, the relative portion of juvenile salmonids that would be entrained and suffer direct mortality would be small." *Id.* This reliance on the volume of water, rather than the likely number of fish that would be taken through entrainment, is inconsistent with the requirements of the ESA (*see* 50 C.F.R. § 402.14(i)(1)(i) (requiring FWS to specify the amount or extent of incidental take), and does not provide the "hard look" that NEPA requires.

CO28-128 cont.

Furthermore, the DEIS fails to explain how the data regarding overall juvenile fish mortality is relevant to the specific conditions of Coos Bay and its ESA and EFH species and benthic communities. As NMFS previously explained:

In fact, it is more likely that the abundance of organisms, including OC Coho salmon juveniles and southern DPS green sturgeon, especially smaller life stages, may be greater in the slip area as they use it for refuge from the higher velocities of the main channel. Secondly, the FERC analysis minimizes the potential for effects to resources based on the percentage of Coos Bay water that will be taken aboard ships. The analysis incorrectly assumes that resources are evenly distributed throughout the bay. Provide an effects analysis that incorporates the likely heterogeneity of resources in the estuarine environment.

NMFS 2008 DEIS comments at 2. Clearly FERC has continued to ignore NMFS on this important issue, and the DEIS remains inadequate. Additional analysis is necessary to provide the public with adequate information about the fish exclusion technology to be used, complete with an analysis of the effectiveness of the plan.

5. Temperature Impacts from Discharge of Cooling Water

The DEIS states that water will be discharged from LNG tankers for engine cooling at 2 to 3 degrees C (3.6 to 5.4 degrees F) above ambient water temperatures. DEIS at 4-91. Modeling of mixing zones and dissipation of water temperature increases were likewise based on this

CO28-129

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CO28-129 The analysis is based on modeled results of changes in temperature. The results meet the needs of the NEPA analysis.

assumed 3 degrees increase. However, Jordan Cove did not provide any information regarding the source of this assumed temperature of cooling water. The only reference provided is to a 2017 hydrodynamic model conducted by Moffat and Nichol; however, this study has not been included with the DEIS materials, and further appears to have been conducted on behalf of the applicant, and therefore lacks credibility. Nothing in the DEIS or FERC filings appears to support the assertion that engine cooling water will be only 3 degrees C higher than the average ambient Coos Bay water temperatures.

On the other hand, the assertion is belied by FERC's FEIS for the Bradwood LNG Project, which states that "cooling water discharged from a 150,000 m^3 steam powered LNG carrier could initially be 19.4°F higher than ambient water temperatures" as compared to seasonally ranging ambient temperatures in the Columbia River of 42 to 68°F. Bradwood LNG Project FEIS at 4-85 (2008). Oregon LNG, also proposed for the Columbia River, estimated that "according to industry sources, the water taken for cooling the vessel's machinery is warmed by 6 to 9 degrees Celsius at the point of discharge" and that the average for diesel-powered LNG vessels would be 8.9°C above ambient water temperatures. Oregon LNG, CH2MHill Technical Memorandum, Appendix F Cooling Water Discharge Analysis, at 2 (Sept. 10, 2008). And according to EPA, cooling water can reach high temperatures with the "thermal difference between seawater intake and discharge typically ranging from 5°C to 25°C, with maximum temperatures reaching 140°C." EPA, *Final 2013 Vessel General Permit Fact Sheet* at 133.

CO28-129
cont.

Therefore, it appears that the information provided in the DEIS is not accurate, and in fact discharges could be as much as 19°F higher than ambient temperatures, presenting a significant temperature stress risk to salmonids. Since the ambient temperature in Coos Bay ranges from 51-58°F with a mean temp of 55° (not "nominally 50°" as the DEIS claims at 4-92),[200] a temperature increase of 10 degrees—which appears possible and even likely based on FERC's EIS for Bradwood LNG—would put the temperature above the optimum temperature for growth of spring Chinook salmon, which is 60.1°F (15.6°C). The DEIS in fact notes that temperatures above 60 during summer could reduce growth and lead to increased mortality rates, and that water temperatures ranging from 71.6 to 75.2°F (22 to 24°C) would limit distribution of many salmonid species. DEIS at 4-291. A 19° increase over ambient temperatures, as FERC acknowledged for the Bradwood LNG project, would therefore pose a significant risk to these species, yet the DEIS fails to assess or account for these impacts. The analysis in the DEIS is therefore premised on inaccurate information, and does not provide the hard look that NEPA requires.

The DEIS appears to state that the temperature increase will be dispersed—apparently discussing a 5.4° F increase 40-80 feet from the discharge point and the average increase in the slip area as a whole—but the DEIS does not specifically discuss potential impacts from higher temperatures prior to dispersion closer to the discharge point. DEIS 4-91. Thus, the DEIS does not offer an adequate analysis of impacts to ESA-listed species from cooling water discharge. Consultation for the project is clearly warranted, and until official consultation is initiated, it is impossible for the public to know what mitigation measures will be proposed and whether they will be effective. Regardless, it is readily apparent that the DEIS is misleading and inadequate, and the actual levels of thermal discharge must be revisited.

[200] See https://www.currentresults.com/Oceans/Temperature/oregon-average-water-temperature.php

6. Other harms associated with LNG Tankers

In addition to the foregoing, FERC must also consider that ocean-going ships emit substantial amounts of air pollutants, including sulphur dioxide (SOx), nitrogen dioxide (NOx), and particulate matter that can cause serious human health impacts like respiratory inflammation, worsening of existing respiratory diseases, and even premature death.[201] Environmental impacts of these pollutants are also serious and include nitrogen nutrient loading, acidification, smog caused by NOx and other precursor gases, and changes in visibility.[202]

Further, ships also emit substantial amounts of greenhouse gases. For example, in 2007 alone, shipping resulted in carbon dioxide emissions of 1,046 million metric tons, almost three percent of global greenhouse gas emissions.[203] A single container ship can emit more pollution than 2,000 diesel trucks. Ships also contribute as much as 30 percent of the world's nitrogen oxide emissions, an estimated 27.8 million tons per year.[204] Ships also emit black carbon, or soot, as they burn fossil fuels. Marine shipping was responsible for 3.6 percent of the United States' black carbon emissions in 2002,[205] and shipping is responsible for all black carbon released over the oceans.[206] All of these pollutants contribute to the ongoing and increasing impacts of global climate change. Further, the absorption of carbon dioxide into the ocean causes ocean acidification, altering seawater chemistry and impacting species.

CO28-130

The DEIS, however, fails to calculate and consider all air emissions of the shipping associated with this project and evaluate the impacts this air pollution will have on human health and the environment, in addition to all other direct and indirect air emissions associated with this project. The DEIS therefore fails to take the "hard look" that NEPA requires.

[201] *See* Proposal to Designate an Emission Control Area of Nitrogen Oxides, Sulphur Oxides and Particulate Matter, International Maritime Organization, Marine Environment Protection Committee, Submitted by the United States and Canada (Apr. 2009).

[202] *Id.*

[203] Marine Environment Protection Committee, International Maritime Organization (IMO), Prevention of Air Pollution from Ships: Second IMO GHG Study 2009 (Apr. 9, 2009). Prepared by Øyvind Buhaug et al. Available at: http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/SecondIMOGHGStudy2009.pdf

[204] Friends of the Earth International (FOEI). 2007. Prevention of Air Pollution from Ships: Recent Findings on Global Warming Justifying the Need for Speedy Reductions of Greenhouse Gas Emissions from Shipping. Submitted to the Marine Environment Protection Committee, IMO (May 4, 2007).

[205] Battye, W. and K. Boyer. 2002. Methods for Improving Global Inventories of Black Carbon and Organic Carbon Particulates, Report No. 68-D-98-046. Prepared for U.S. EPA by EC/R Inc. Available at http://www.epa.gov/ttn/chief/conference/ei11/ghg/battye.pdf.

[206] Reddy, M. Shekar and O. Boucher. 2006. Climate impact of black carbon emitted from energy consumption in the world's regions. *Geophysical Research Letters* 34: L11802. Available at https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/2006GL028904

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CO28-130 We have revised the final EIS to include all LNG carrier emissions within state waters. Potential emissions from LNG carrier are included for the entire time they are within state waters. LNG carrier emissions outside of this area not quantified because LNG carriers are free to set their own courses, schedules, and destinations while en route to and after departing from the proposed Jordan Cove LNG terminal.

J. Loss of High-Quality Benthic Communities

The project would result in significant harm to the benthic communities within Coos Bay. The proposed activities would mobilize fine sediments harmful to many stages of aquatic life, clear streamside habitats, and alter the basic structure of the bottoms of our streams, rivers and bays, negatively impacting essential benthic habitat.[207] These impacts were discussed in the DEIS; however, as set forth below, FERC failed to provide the "hard look" that NEPA requires.

The applicant proposes to dredge nearly 6 million cubic yards of material from Coos Bay and dig trenches through roughly 400 waterways, laying a 36" pipeline across hundreds of acres of sensitive estuary and wetland habitats, which will cause increased sediment loading in Coos Bay. The construction of the Project would result in the permanent loss of 14.5-acres of shallow subtidal and intertidal habitat, 0.6-acres of estuarine saltmarsh habitat, and 1.9 acres of submerged aquatic vegetation habitat. Approximately 9,519 cubic yards of material would be excavated and discharged into waterways. The proposed dredging would impair water quality by decreasing dissolved oxygen, changing salinity levels, increasing temperature, and increasing sedimentation.

CO28-131

Dredging will undoubtedly destroy habitat in Coos Bay, with damaging impacts on fish habitat and benthic communities that species rely on, including species protected under the ESA such as Coho salmon. Suspended particulates released from dredging harm various life stages of aquatic organisms by smothering eggs, altering substrates, and interfering with reproduction, among other things. The project would result in a loss of the substrate that local fish depend upon for feeding and breeding. It would introduce contaminants into the water column, such as heavy metals, that would cause direct harm and adversely impact the habitats and resources they depend on.

Many studies have found that sediment loading can adversely impact fish, such as salmon. In fact, studies have found that sediment loading "can be considered one of the greatest causes of impaired water quality."[208] The 2014 Southern Oregon/Northern California Coast (SONCC) Coho Recovery Plan identifies impaired water quality as one of the key limiting stressors for the Upper Rogue River population.[209] Studies have further found that the effects of turbidity on water quality may result in biological effects on aquatic organisms such as disruptions in

[207] *See i.e.* Kjelland et. al. (2015) A review of the potential effects of suspended sediment on fishes: potential dredging-related physiological, behavioral, and transgenerational implications, Environ Syst Decis 35:334–350 (available at https://link.springer.com/article/10.1007/s10669-015-9557-2) (citing U.S. EPA (2003) National water quality report to congress (305(b) report); Dara H. Wilber & Douglas G. Clarke (2001) Biological Effects of Suspended Sediments: A Review of Suspended Sediment Impacts on Fish and Shellfish with Relation to Dredging Activities in Estuaries, North American Journal of Fisheries Management, 21:4, 855-875; Berg, L., and T.G. Northcote (1985) Changes in territorial, gill-flaring, and feeding behavior in juvenile coho salmon (*Oncorhynchus kisutch*) following short-term pulses of suspended sediment. Can. J. Fish. Aquat. Sci. 42: 1410-1417.

[208] Kjelland et. al. (2015) A review of the potential effects of suspended sediment on fishes: potential dredging-related physiological, behavioral, and transgenerational implications, Environ Syst Decis 35:334–350 (available at https://link.springer.com/article/10.1007/s10669-015-9557-2) (citing U.S. EPA (2003) National water quality report to congress (305(b) report) at 335.

[209] Available at https://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/southern_oregon_northern_california_coast/SONCC_recovery_plan.html

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CO28-131 The analysis presented in section 4.3.2 and 4.5.2 is inclusive of the types and levels of effects, considers the proportionality of these effects, and BMPs and mitigative actions that would be implemented.

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migrations and spawning, movement patterns, sublethal effects (e.g., disease susceptibility, growth, and development), reduced hatching success, and direct mortality.[210]

Dredging will also result in a loss of benthic habitat and important food sources for fish. The DEIS notes that submerged aquatic vegetation (including eelgrass, macrophytic algae) as well as other food web components such as phytoplankton, zooplankton, detritus, and epiphyton, are all important in supplying habitat and food base for EFH species within Coos Bay:

Submerged grasses are one of the important major habitat components in Coos Bay. Recreationally and commercially harvested species such as clams and shrimps, Dungeness crab, English sole, and salmonids use the eelgrass beds extensively. Previous studies (Akins and Jefferson 1973) have reported that Coos Bay has 1,400 acres of lower intertidal and shallow subtidal flats covered by eelgrass meadows. ODFW (1979) conducted habitat mapping in Coos Bay and documented intertidal and subtidal aquatic beds. Submerged grass meadows provide cover and food for many organisms including burrowing, bottom-dwelling invertebrates; diatoms and algae; herring that deposit eggs clusters on leaves; tiny crustaceans and fish that hide and feed among the blades; and, larger fish, crabs and wading birds that forage in the meadows at various tides. Eelgrass provides shelter for a variety of fish and may lower predation, allowing more opportunity for foraging. The protective structure attribute of eelgrass is primarily for smaller organisms and juvenile life history stages of fishes.

CO28-131 cont.

DEIS at 4-241. The DEIS fails, however, to put the loss of these important benthic resources into context, and never explains how the loss of this benthic habitat will ultimately affect the species that rely on it.

A large and diverse population of benthic and epibenthic invertebrates is present in and around Coos Bay. Clams, crabs, oysters, and shrimp make up important components of these invertebrates in the bay. Some of the most abundant and commercially important of these species include bentnose clams (*Macoma nasuta*), Pacific oyster (*Crassostrea gigas*), Dungeness crab (*Metacarcinus magister*), and ghost shrimp (*Neotrypaea californiensis*). DEIS at 4-232. These species are susceptible to direct and cumulative harm from dredging and the loss of benthic communities, particularly due to sedimentation.

The creation of the access channel and marine slip would modify approximately 37 acres of present-day subtidal and intertidal habitat to deep water habitat within Coos Bay. DEIS at 4-243. This would adversely affect marine species, including juvenile salmonid listed under the ESA:

> The creation of the access channel would result in the modification of about 37 acres of present-day subtidal and intertidal habitat to deeper water habitat in the bay. The dredging operation to create the access channel would change physical conditions of the bay bottom in this area, locally altering the bathymetry and potentially altering the morphology and water currents. About 19 acres of intertidal to shallow subtidal

[210] Coen L.D. 1995. A review of the potential impacts of mechanical harvesting on subtidal and intertidal shellfish resources. South Carolina Division of Natural Resources, Marine Resources Research Institute, James Island, South Carolina, pp 46. Available at file:///C:/Users/JMargolis/Desktop/ORLNG/Attachments%20for%20DSL/harvester.pdf

habitat, including approximately 2 acres of eelgrass habitat and less than 1 acre of salt marsh, would be modified to primarily deep subtidal habitat during the dredging process of the deepened channel. Increasing depth and removal of vegetation would reduce the quality of habitat for juvenile salmonids and other juvenile marine species.

DEIS at 4-243.

The DEIS further acknowledges direct impacts to benthic organisms from dredging activities:

> To improve navigation reliability for LNG carriers, Jordan Cove proposes to excavate four submerged areas in Coos Bay along the vessel access route. This would include the dredging of some 27 acres of deep subtidal habitat at bend areas along the route and the dredge lines for this activity would include another 13 acres of mostly deep subtidal habitat modification. These dredging activities and follow-up maintenance dredging would disturb this habitat and, in the short term, reduce function of these areas primarily from disturbance to benthic and epibenthic organisms living in these areas and organism that feed in these areas.
>
> The installation of the pile dike rock apron would change habitat from soft bottom to rock habitat over an area of about 2 acres. The construction would include short-term increase of local turbidity from bottom disturbance and initial loss of benthic organisms by burial.
>
> ***
>
> A large quantity of suspended sediment can reduce light penetration, which in turn reduces primary production of both pelagic and benthic algae and grasses. Increased suspended sediment can affect feeding of benthic and pelagic filter feeding organisms (Brehmer 1965; Parr et al. 1998), and the settling of the suspended particles can cause local burial, affect egg attachment, and modify benthic substrate. High enough levels can have direct adverse effects on fish ranging from avoidance to direct mortality.
>
> ***
>
> Jordan Cove's dredging would also directly remove benthic organisms (e.g., worms, clams, benthic shrimp, starfish, and vegetation) from the bay bottom within the access channel and navigation channel modifications.

DEIS at 4-244, 245, 247.

While the DEIS has therefore acknowledged that the project will result in substantial harm to benthic communities, it does not fully analyze the harm this would have on the marine environment, particularly on imperiled species, such as Coho salmon. Rather, it discounts the harm, averring that the disturbed areas would recover in several months to one year. *Id.* at 4-248. This, however, does not provide a full analysis of the potential harm, including the short-term harm associated with the loss of habitat and food resources, as well as long-term harm associated with a project of this scale. The DEIS in fact notes that this project would result in larger quantities being dredged and in different substrates than the reference sites it uses for its analysis (i.e. Lowe Columbia and Yaquina Bay), and therefore there is scant support for the assertions in the DEIS. The lack of project- and species-specific analysis of the harm from loss

CO28-131 cont.

and damage to benthic communities in the DEIS renders it inadequate under the law. *See Balt. Gas & Elec. Co. v. Nat. Res. Def. Council, Inc.*, 462 U.S. 87, 97 (1983) (NEPA obligates federal agencies to take a "hard look" at the environmental consequences of its actions).[211] CO28-131 cont.

Moreover, there is no discussion of the potential for release of heavy metals or other contaminants through the dredging of Coos Bay, which requires a site-specific analysis that has not been provided. Dredging is likely to lead to the introduction of contaminants, such as heavy metals and pesticides, into the water column. These contaminants are released when settled soils are disturbed, leading to exposure and uptake by fish. There is, in fact, known contamination at the terminal site that, if disturbed as a result of project activities, could impact species – both the Ingram Yard property and the location of the proposed South Dunes site on the former Weyerhaeuser North Bend Containerboard Mill are listed in the DEQ's Environmental Cleanup Site Information ("ECSI") database. The release of heavy metals or other contaminants from these areas could devastate the local fisheries and adversely affect the habitat for much longer than one year, yet the DEIS fails to even mention this potential for harm. CO28-132

Dredging the bay will degrade the habitat for several species of shrimp, including the native mud shrimp. The DEIS failed to address this species, other than acknowledging that they are harvested in the region. DEIS at 4-232. The shrimp are especially sensitive to the kind of disturbance caused by installing the pipeline through the bay. Mud shrimps are also dealing with the cumulative impacts of an introduced parasite infestation, a parasitic isopod called *Orthione griffenis*.[212] The invasive parasite arrived in the ballast water, probably on container ships sailing from Japan.[213] If the dredging and the pipeline installation in the bay cause the shrimp to decline even further, it can trigger lower water quality in the bay since the shrimp are filter feeders. Scientists have determined that "In Oregon estuaries, mud shrimp filter as much as 80 percent of the bay water per day."[214] They are also an important food source for birds, fish, and other animals. The DEIS failed to consider the impacts to the bay ecosystems if the Jordan Cove Project reduces Mud Shrimp populations even further. The DEIS fails to address any of these concerns, and is therefore inadequate. CO28-133

Dredging may also set back efforts to restore habitat for oysters. As the DEIS acknowledges:

Coos Bay contains one of only three known native Oregon coastal populations of the Olympia oyster (*Ostrea lurida*). Within its native range, this species has significantly diminished from historical levels (National Fish and Wildlife Federation et al. 2010). Efforts have been taken in the bay to restore this species and improvements in bay water quality and sediment have resulted in self-sustaining populations over the last two decades (Groth and Rumrill 2009; Rumrill 2007). CO28-134

[211] As part of this review, the agency must examine the indirect effects of a proposed project, 40 C.F.R. § 1508.8, and include those "effects related to induced changes in … water and other natural systems, including ecosystems." 40 C.F.R. § 1508.8(b).
[212] Jolene Guzman, *Invader kills off mud shrimp* (February, 2009), available at http://theworldlink.com/news/local/invader-kills-off-mud-shrimp/article_fa08c2d9-47c9-5cb6-83d3-6bad07ec3bdf.html. (Guzman, 2009)
[213] *Id.*
[214] Eric Wagner, *Mud Shrimp Meets Invasive Parasite, High Drama for Northwest Estuaries* (2006), *available at* http://depts.washington.edu/nwst/issues/index.php?issueID=winter_2006&storyID=782. (Wagner, 2006)

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CO28-132 Potentially contaminated bay sediments are addressed in Section 4.2.1.3 of the EIS.

CO28-133 The EIS acknowledges that benthic shrimp would be lost as a result of Project actions. However, dredging has been occurring regularly in Coos Bay for decades so this type of impact is not new in this area. The pipeline would occupy a very small area of the total bay bottom and is a temporary disturbance so magnitude of effect is slight. Overall areas affected are a limited portion of the total bay habitat. Also, the Applicant has proposed habitat mitigation to replace some lost habitat resulting from habitat changes. The level and magnitude of effects is adequately presented in section 4.5.2.

CO28-134 Additional discussion has been added to the EIS addressing Olympia oysters distribution.

DEIS at 4-232. The DEIS fails to address how the dredging would affect these oysters, and the loss of resources that have been put into the recovery efforts.
In sum, the DEIS has failed to provide the "hard look" that NEPA requires on the permanent loss of several acres of highly productive intertidal and benthic habitat that would be converted to low productive deep-water habitat, and the impacts this would have on the species of Coos Bay.

CO28-134 cont.

K. Permanent Loss of Coastal Riparian Vegetation

Removal of vegetation near the shorelines will adversely affect aquatic species by removing a source of food. Numerous studies have established that riparian vegetation provides a valuable food source for fish, especially juveniles. Wipfli, 1997. The food is the result of invertebrates in the detritus, understory, and canopy of riparian vegetation. Many of these invertebrates find their way into the water and are subsequently eaten by fish.

Clearing vegetation along the edge of Henderson Marsh and Coos Bay will destroy this habitat for invertebrates, thus destroying a valuable food source for fish along the stretches of these waterbodies. The analysis of food source impacts due to removal of vegetation conducted in the DEIS is limited to possible increases in food in the form of microorganisms and aquatic invertebrates in the water due to increased temperatures. Any increases in food by increased production of microorganisms and aquatic invertebrates will further be offset by losses of invertebrates along the shoreline due to the removal of vegetation. The impacts to fish and other aquatic organisms resulting from the removal of a valuable food source, in the form of invertebrates, through the destruction of terrestrial vegetation along the shores of Coos Bay and Henderson Marsh, would be detrimental to resident biological communities.

CO28-135

The DEIS fails to address salinity changes and resulting impacts to fish resources in Coos Bay. The DEIS likewise does not address the impacts of fertilization in riparian areas and nutrient loading impacts on water quality.

CO28-136

Jordan Cove will introduce or allow the proliferation of invasive species to Coos Bay, the terminal site, and along the pipeline route. First, ships from foreign ports will transport exotic species on multiple surfaces and in water releases from ballast or engine cooling water. These species may harm the aquatic ecosystem. Second, the removal of vegetation, and long-term disturbances at the site will allow the introduction and proliferation of exotic species, which will harm native ecosystems and may require herbicides and pesticides to manage.

L. Individual Species

1. Coho Salmon – Southern Oregon/Northern California Coast ESU

The project area includes two major river systems known to support SONCC Coho: the Rogue River and the Klamath River. The DEIS acknowledges that the project is likely to adversely affect SONCC Coho due to numerous impacts to feeding, juvenile exposure to elevated turbidity levels, potential swim bladder rupture due to blasting activities, injury and mortality during fish salvage, and long term habitat deterioration due to reductions in large woody debris. Stream

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CO28-135 The extent of vegetation that would be removal along the Coos Bay shoreline is slight, consisting primarily of grasses along the shore of the access channel (see section 4.4.1). Additionally, Henderson Marsh would not be directly removed but may be slightly reduced in function from slight water input reduction. Loss of these would not have any substantial effects to input of invertebrates to marine resources due to the small size of the area, the mostly low-growing vegetation, and mostly distant proximity to the water.

CO28-136 Additional information on salinity changes was added (see response SA2-180). Section 4.3 addresses the plans that are required to control potential fertilizer input to water bodies, including not allowing application within 100 feet of water bodies.

crossing construction and removal of riparian vegetation are the two primary contributors to these impacts.

In addition, the DEIS admits that the project is likely to adversely impact critical habitat for SONCC Coho. The acknowledged impacts include loss of hatching and rearing habitat from substrate removal and turbidity at stream crossings, degraded water quality as a result of turbidity caused by stream crossing construction, reduction in food sources, barriers to migration during stream crossing construction, and long term loss of native riparian vegetation.

The pipeline construction will disrupt fish passage by damming the streams during the trenching and pipeline placement. It is unclear how long fish passage would be interrupted. The mitigation of capturing and removing fish behind the dams is historically ineffective, and will result in the take of threatened salmonids. This is particularly troubling and unacceptable for large crossings proposed on the Coquille, Umpqua, and potential crossings of the Rogue and Coos if proposed HDDs fail. *See* discussion of HDD failure, *supra*. The DEIS fails to acknowledge the potentially severe impacts to SONCC Coho and its designated critical habitat as a result of HDD failure, and the FERC should not rely on this faulty analysis. CO28-137

2. Coho Salmon – Oregon Coast ESU

The project area includes designated critical habitat for the Federally Threatened Oregon Coast Coho: the South Umpqua Subbasin, Coquille Subbasin, and the Coos Subbasin (which includes the Coos Bay estuary). The DEIS acknowledges that the project is likely to adversely affect Oregon Coast Coho and its critical habitat.

Activities related to the marine terminal and north spit facilities, including discharge of maintenance dredging spoils causing turbidity plumes, LNG vessel wake strandings, engine cooling water intake entrainment, dredging of the access channel and construction of the pipeline across Hayes Inlet could all jeopardize the survival of this species. Moreover, cooling water intake is likely to entrain and impinge many food sources for Coho, such as juvenile stages of crab and shrimp, other zooplankton and eggs and larvae fish. Pipeline-related activities including stream crossing construction or failures of those operations, blasting, mortality during fish salvage operations, and loss of large woody debris for habitat also have the potential to cause jeopardy to the Oregon Coast Coho and adversely affect its designated critical habitat.

The DEIS does not address direct mortality impacts to listed fish from dredging in Coos Bay. As discussed *supra*, the proposed hydraulic cutterhead dredge method will entrain juvenile fish, including threatened salmonids, as well as benthic organisms critical to salmon diets. Mechanical dredging would not have the same fish entrainment impacts, but is not seriously considered as an alternative dredge method. CO28-138

The FERC must analyze the impacts of fish entrainment due to dredging. The FERC must also consider the fact that the fish killed will include salmonids listed as threatened under the federal ESA and the Oregon ESA. The FERC must also look to the effect cooling water entrainment would have on food sources for the threatened Coho salmon. The FERC must consider cumulative impacts on aquatic life, including the impacts from dredging, terminal construction

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CO28-137 Most dry crossing would occur in two days or less, some possibly up to four. So movement delays would be minor if no passage were supplied, which is partly at flumed crossings. Details of effects to listed species are presented in the BA and section 4.6. Only three river HDD crossings are proposed (Rogue River, Coos, and Klamath Rivers) and two on Coos Bay; no fish removal would be needed on these crossings. Detailed contingency plans are in place should there be any problems, which includes a requirement for agency engagement should issues arise (see the *Drilling Fluid Contingency Plan for Horizontal Directional Drilling Operations*). We acknowledged in the EIS the potential impacts with details supplied in the BA for the listed species and critical habitat.

CO28-138 Direct mortality of listed fish from dredging entrainment was addressed in the BA, and is discussed in section 4.5.2. We concluded based on dredging studies in other areas that direct mortality of listed salmon is unlikely to occur. While slip dredging volume is large, more than half of the area removal would be in the dry and removal is a one-time event in confined area over a short period. The four navigation channel areas are small in magnitude compared to dredging that normally occurs for standard channel maintenance. Also, dredging is an ongoing activity in the bay that has occurred for decades so changes from current channel maintenance dredging actions would be small, with project maintenance dredging a fraction of what currently occurs in Coos Bay. Entrainment loss from cooling water intake was noted to be very small for all organisms and would therefore not have substantial effects on resources in the bay. The direct and indirect effects of these actions are addressed in the section 4.5.2 of this EIS, while cumulative effects are addressed in section 4.14.

and operation, pipeline construction and operation, as well as the impact of the channel deepening dredging and maintenance dredging.

The proposed dredging is the antithesis of salmon recovery and restoring estuarine habitats, as described in every local, state, and federal management plan. Quite simply, we cannot recover threatened salmon while simultaneously permitting this huge dredging project. Jordan Cove is a prime example of an unacceptable project due to its size, scope, and location in critical salmon habitat.

CO28-138 cont.

3. North American Green Sturgeon – Southern Distinct Population Segment

Both Northern and Southern population segments of the North American Green Sturgeon are known to occur within Coos Bay for feeding, growth, and thermal refuge. The DEIS admits that the project is likely to adversely affect Green Sturgeon as a result of bottom disturbance and reduction of benthic food supply from construction and maintenance dredging as well as dredged spoils disposal, and the potential for dredged spoils disposal to bury subadult Green Sturgeon. Likewise, the project is likely to adversely affect critical habitat for the species. The FERC must look at the effect dredging and dredged spoils disposal would have on food sources for the threatened green sturgeon.

CO28-139

4. Pacific Eulachon – Southern Distinct Population Segment

Pacific Eulachon (also known as candlefish) utilize Coos Bay for habitat, and may be present in the estuary during construction and operation of the project. Eulachon typically spend three to five years in saltwater before returning to freshwater to spawn in late winter through mid-spring. Eulachon are a small fish rich in calories and important to marine and freshwater food webs, as well as commercial and recreational fisheries and indigenous people from Northern California to Alaska. The DEIS does not adequately assess potential impacts to this species as a result of the dredge and fill operations proposed in ocean waters, Coos Bay, and coastal tributaries.

CO28-140

5. Lost River Sucker

The Lost River Sucker is a federally listed endangered species that spawns in freshwater streams. The Pacific Connector Pipeline will cross the Lost River upstream of known spawning areas. The pipeline will also cross the Klamath River, another basin where Lost River suckers occur. The DEIS acknowledges that the project is likely to aversely affect Lost River sucker and its designated critical habitat due to injury or death during fish salvage or release of drilling muds from frac-out during HDD of the Klamath River.

CO28-141

6. Shortnose Sucker

The Shortnose sucker is another endangered fish species whose populations have been severely impacted by dam construction, water diversions, overfishing, water quality problems, loss of riparian vegetation, and agricultural practices. Shortnose sucker critical habitat includes the Klamath River within the project area. The DEIS states that the project is likely to adversely

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CO28-139 The detailed analysis for effects to listed species is provided in the BA. Section 4.6 in the EIS provides the conclusions of this BA analysis.

CO28-140 This is an ESA listed species (see section 4.6.1) and is addressed in the BA (See response to CO28-139).

CO28-141 Comment noted.

affect shortnose suckers for the same reasons that the Lost River sucker is likely to be adversely affected. CO28-141 cont.

7. Snowy Plover.

The DEIS failed to consider all threats to the threatened western snowy plover from this project. For instance, dredging soils will attract snowy plovers to nest in inappropriate areas. Plovers often return to the same breeding sites year after year , while the dredged sand will be moved for various purposes.

The closest snowy plover nest is only 1.1 miles from the terminal site, in critical habitat, and in the best Snowy Plover nesting habitat in Oregon, at the tip of the north spit. CO28-142

Additional impacts the DEIS failed to consider would be increased predation to plover nests because increased development brings increased corvids, a predator of plover nests. LNG ships could negatively impact the snowy plover at sea. Skunks and coyote's could be attracted to the dredged material or human presence, increasing the predation threat in plovers. Increased human activity also means more dogs disturbing their nests. The DEIS says that Jordan Cove would "minimize" impacts by humans and pets, but has no specific information on how that would be done.

These impacts to the Snowy Plover should have made the Plover a Likely to Aversely Affect endangered species. The mitigation offered in the DEIS is inadequate, simply a few thousand dollars.

Western snowy plover active nest sites are located within two miles of the proposed LNG terminal site, with critical habitat located approximately 2.6 miles from the site. Snowy plovers are heavily impacted in this area due to human disturbance and scavenger and predator effects. Jordan Cove proposes to implement BMPs to protect plovers from construction and operation impacts, however, those measures have not been clearly articulated or demonstrated that they will offset the potential impacts from increased human activities in the area where plover are known to nest and occupy critical habitat.

8. Native Oysters.

Coos Bay contains one of only three known native Oregon coastal populations of the Olympia oyster. Within its native range, this species is significantly diminished from historical levels. Thousands of Olympia Oysters could be within the pipeline right-of-way. Oysters will be affected by turbidity and sedimentation caused by the installation of the pipeline in the bay, using an open cut method in Haynes Inlet. CO28-143

The DEIS refers us to the Olympia Oyster mitigation plan . That plan claims that "dispersal of fine sediments and elevated turbidity will be confined to a very small area and are thus unlikely to negatively impact Olympia oysters outside the pipeline right of way. Thus the only negative effects to Olympia oysters would be direct disturbance."

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CO28-142 The EIS provides an analysis of effects to snowy plover adequate to meet the requirements of the NEPA. Additional details (which included information not required by the NEPA) are provided in our Biological Assessment.

CO28-143 No dredging is proposed for Haynes Inlet and sediment plumes from all other project dredging activity would not reach this areas where Olympia oysters are most common. Potential effects on this species are addressed in section 4.5.2.

The PCGP failed to consider that fine sediments and turbidity spread downstream with the flow of water, or upstream if the tide is coming in. The PCGP has no basis to conclude the dispersal of fine sediments will not travel.

Dredging the bay, which would not occur as much without this project, will harm more oysters. These oysters, including at the mouth of Coos Bay, should have been considered in the DEIS.

PCGP proposes to relocate the oysters within the right-of-way to an area northwest of the right-of-way, where there are already Olympia oysters. However, the DEIS failed to consider how many oysters can occupy that site, and if it is currently at capacity.

CO28-143 cont.

M. Compliance with the Coastal Zone Management Act.

Pursuant to section 307(c) of the CZMA, the applicants must provide a consistency certification that the project is consistent with the Oregon Coastal Management Program. 16 U.S.C. § 1456(c)(3). The Oregon Department of Land Conservation and Development is responsible for ensuring, pursuant to the federal Coastal Zone Management Act (CZMA) of 1972, that the proposed project is consistent with the state's coastal management program. 15 C.F.R. Part 930, Subpart D, contains the applicable regulations for the federal consistency determination. Specifically, 15 C.F.R. § 930.11(h) defines "enforceable policy," stating,

The term 'enforceable policy' means State policies which are legally binding through constitutional provisions, laws, regulations, land use plans, ordinances, or judicial or administrative decision, by which a State exerts control over private and public land and water uses in the ['coastal zone,' 16 USC 1453(6a), and which are incorporated in a management program as approved by OCRM either as part of a program approval or as a program change under 15 CFR part 923, subpart H.

Oregon's coastal management program includes: 1) the statewide land use planning goals; 2) the applicable acknowledged city or county comprehensive plan and land use regulations; and 3) state statutes and regulations governing removal-fill, water quality, and fish & wildlife protections.

The DEIS does not demonstrate compliance with the Coastal Zone Management Act ("CZMA"). The application is both incomplete and inadequate. The application is premature, lacking complete applications to other key agencies and adequate analyses of impacts to sensitive resources. Additionally, the project has failed to obtain local approvals for the terminal and pipeline necessary for the project to demonstrate compliance with the CZMA.

CO28-144

1. Inadequate Information to Support Certification.

The application to the Corps, DEQ, and DLCD lacks key information. The lack of adequate information for all of these agencies, including DEQ, renders the CZMA application incomplete because the CZMA requires key state authorizations be received as part of the application. For all the reasons detailed above demonstrating incompleteness of the section 401 application to DEQ, the application to DLCD is also incomplete under the CZMA.

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CO28-144 It is not the role or scope of the federal EIS to assess the Project's compliance with State regulations. We assume that the State would determine if the Project is in compliance with the State requirements during their review of the Applicant's State permit applications. As disclosed in section 5 of the EIS, any authorization from the Commission would be conditional on the Applicant acquiring all applicable federal and federally delegated permits.

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The application is also incomplete because it does not show that the project complies with local land use regulations, despite assertions to the contrary in the DEIS. Although some portions of the project have been reviewed and approved by Coos County, key elements of the project, including the South Dunes Power Plant and Utility Corridor, have not yet been subject to review for consistency with Statewide Planning Goals and/or local comprehensive plan and land use ordinance provisions. There are currently no pending applications before Coos County for these determinations. Instead, these components are being reviewed as part of the Oregon Department of Energy (Energy Facility Siting Council) certification process. The DEIS is therefore inaccurate and the public notice is misleading and premature.

CO28-144 cont.

The applicants have failed to provide adequate information related to Statewide Planning Goals and local land use requirements:

- Information demonstrating compliance with Statewide Planning Goals 16, 17, and 18 for impacts to coastal shorelands, estuaries, and dunes.
- Information demonstrating compliance with Statewide Planning Goal 7 related to natural hazards.
- Information demonstrating compliance with Statewide Planning Goals 5 and 6 for natural resources and air and water.
- Information demonstrating compliance with CBEMP Policies #17 and #18. The location of project components within the Coos County Shorelands Values Inventory Map has not been provided and/or explained with sufficient detail to allow a determination of compliance with those policies.

The applicants have failed to provide adequate information related to state removal-fill laws:

- Information regarding impacts to waters of the state including wetlands at the South Dunes site. The information provided as to impacts to Wetland M is inconsistent. In addition, the applicants have not provided any information explaining the nature of fill material to be deposited in the waters of the state.
- Descriptions of the nature and duration of each activity associated with the construction of the barge berth, including dredging, filling or pile driving, and impacts due to sedimentation and noise.

The applicants have failed to provide adequate information related to state water quality laws:

- Information related to wastewater discharge from the South Dunes site.
- Information related to the source of water for the South Dunes facility, maximum water use, and annual average and worst-case conditions for water loss.
- Information explaining measures to be included in the NPDES permit for stormwater discharges that will minimize impacts of erosion and sedimentation on surface water.

The applicants have failed to provide adequate information related to state wildlife protection laws:

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- Information related to sensitive species on ODFW Wildlife Division Sensitive Species List.
- Information related to the nature, extent and duration of impacts on the habitat that could result from construction, operation and retirement of the South Dunes facility.
- Information related to the potential for indirect impacts on eelgrass habitat from sedimentation and the quantity of habitat that could be impacted.
- Information sufficient to demonstrate how the Upland Erosion Control, Revegetation, and Maintenance Plan will offset fragmentation impacts to wetlands and estuarine habitat for the South Dunes site.
- Information related to mitigation of indirect impacts to amphibians at the South Dunes site.
- Information related to impacts to raptors, other birds, and nesting habitat at the South Dunes site.
- Information to substantiate claims of no direct impact to stellar sea lions from the South Dunes project component.
- Information related to mitigation measures for wildlife habitat disturbed as a result of activities related to the South Dunes site.
- Information related to impacts to marine mammals and birds resulting from the South Dunes project component.
- Inconsistent information related to impacts to green sturgeon.

This lack of information puts DLCD in the impossible position of reviewing a consistency certification without fundamental information about how the project would impact the coastal zone. Without this information, DLCD and the public are crippled in their ability to comment on the project's consistency with the enforceable policies of the OCMP. At a minimum, the Coalition requests that DLCD object to the Applicants' CZMA certification on the basis that they have failed to submit adequate information demonstrating that the project complies with the enforceable policies of the Oregon Coastal Management Program.

2. The Project is Inconsistent with Statewide Planning Goals.

DLCD should object to the CZMA certification because the project is inconsistent with several of Oregon's Statewide Planning Goals. The Statewide Planning Goals are implemented through local comprehensive plans. For this project, Coos County and Douglas County, as well as the City of Coos Bay are the local governments with regulatory authority for land use approval of the project. However, as discussed above, many components of the project have not been reviewed or approved for local land use approvals. DLCD must independently consider whether the project will comply with the Statewide Planning Goals applicable to this project within the Coastal Zone.

CO28-145

a. Goal 6: Air, Water, and Land Resource Quality

Jordan Cove LNG fails to demonstrates its project is consistent with Statewide Planning Goal 6, "[t]o maintain and improve the quality of the air, water and land resources of the state." The Coalition's scoping comments to FERC, as well as prior comments from the State of Oregon,

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CO28-145 It is not the role or scope of the federal EIS to assess the Project's compliance with State regulations. We assume that the State would determine if the Project is in compliance with the State requirements during their review of the Applicant's State permit applications. As disclosed in section 5 of the EIS, any authorization from the Commission would be conditional on the Applicant acquiring all applicable federal and federally delegated permits.

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National Marine Fisheries Service, and others, describe a multitude of environmental impacts from Jordan Cove LNG's terminal. DLCD should object to the CZMA certification because the project is not consistent with Statewide Planning Goal 6.

b. Goal 7: Natural Hazards

Statewide Planning Goal 7 requires land use planning to reduce risk to people and property from natural hazards. Regulated natural hazards include floods, landslides, earthquakes and related hazards, tsunamis, coastal erosion and wildfire. The proposed LNG terminal would be located in an area subject to extreme risk from earthquake and tsunami inundation. In addition, the pipeline would cross several areas of steep terrain and heavily forested areas within the Coastal Zone, subject to landslide and wildfire risk.

CO28-145 cont.

Scientists predict that there is a 40 percent chance of a major earthquake (magnitude 8.7 to 9.2) and tsunami on the Cascadia Subduction Zone off Coos Bay in the next 50 years. The severity of the earthquake would be similar to that experienced in Japan in March of 2011. If by 2060 there has not yet been a major earthquake, 85 percent of known intervals of earthquake recurrence in 10,000 years will have been exceeded. This type of event would cause violent ground motion, soil liquefaction, lateral spreading and subsidence. In turn, these land changes could cause pipe breaks and damage the LNG storage tanks proposed for the facility. In order to protect the site from tsunami inundation, Jordan Cove proposes to use sand to fill and elevate the property site above the projected inundation level, 40 feet or more about current land elevations.

The project site on the North Spit is located at a bend in Coos Bay, where tidal energy is deflected. The elevation of the land at this location could significantly alter the direction and velocity of an incoming tsunami. For example, instead of running up onto the North Spit and inundating the land there, the proposed sand wall, if it survives the liquefaction and lateral spreading effect of the earthquake, would deflect and re-direct the force of a tsunami. DOGAMI has prepared inundation zone maps to help the communities of Coos Bay and North Bend prepare for evacuation and planning in case of tsunami. The proposed significant alteration of the shoreline at this location could have important effects on the inundation of other areas within the Bay Area communities. In other words, the risks of these types of hazards extend beyond just the inundation, liquefaction, and ground shaking at the project site. The project's proposed alterations of the shoreline at the project location could have significant impacts to the communities of the Coos Bay area. These types of risks to people and property must be accounted for in order to comply with Goal 7.

c. Goal 9: Economic Development

Statewide Planning Goal 9, OAR 660-015-0000(9) provides for "adequate opportunities throughout the state for a variety of economic activities vital to the healthy welfare, and prosperity of Oregon's citizens." Jordan Cove LNG's proposed terminal and its adverse effects on shipping, fishing, and tourism would undermine the fundamental mandate of Goal 9. The Jordan Cove LNG site falls along the necessary ingress and egress of practically any vessel bound for or leaving from Coos Bay. These unavoidable interferences with these industries

indicate the failure of Jordan Cove LNG's proposal to comply with Goal 9's intent for Comprehensive Plans to account for the economies of all regions of the state.

Additionally, construction of the terminal would disregard at least two Planning Guidelines enumerated in Goal 9. Planning Guideline 2 of Goal 9 offers among the most relevant considerations to the proposals at issue when it states in part that "[t]he [comprehensive] plan should also take into account the social, environmental, energy, and economic impacts upon the resident population." While guidelines are "suggested approaches . . . designed to aid . . . in compliance with goals," ORS § 197.015, the failure to follow guidelines suggests the potential for noncompliance with goals. Here, the Applicants' proposals would negatively impact each of the considerations enumerated in the portion of Planning Guideline 2 stated above.

Social: Construction of the Jordan Cove LNG terminal would diminish recreational and commercial fishing due to both the fishing vessels' compliance with the mandatory safety zone accompanying every LNG carrier en route to Jordan Cove LNG as well as the decreased salmon spawning habitat as a result of the vast amount of proposed dredging and filling of critical salmon habitat. Additionally, the danger of an LNG breach will surely instill a degree of apprehension among a number of those within an LNG carrier's mobile blast zone and, in some cases, fear. Particularly given the modern potential for terrorist activity, both apprehension and fear would have a reasonable basis in reality.

Environmental: The proposed terminal site is home diverse flora and fauna, both marine and land, including salmon rearing habitat. In supplanting this ecosystem with industry, Jordan Cove LNG will harm these and other environmental treasures. As discussed throughout these comments, the environmental effects of the proposed project are significant and far-reaching.

Economic: The terminal and accompanying carriers will cause economic harm inhibiting the flow of boat traffic, diminishing the tourism appeal of the area, and negatively impacting the housing market. Coos County is home to many commercial and recreational fishermen. The LNG-related delays caused to commercial fishing vessels would thus be felt heavily in Coos County. Delayed shipping and tourist vessels bound for Coos County would experience similar costly delays. In addition to these delays faced by tourist vessels, LNG would diminish tourism in the area in general. Additionally, property values of areas near Jordan Cove or anywhere along the LNG tanker pathway would experience a considerable decrease, due to factors such as the diminished aesthetic appeal of the area as well as the ongoing subjection to the blast zone of the LNG carriers. Also associated with the risks inherent in LNG are increased insurance costs. Id.

CO28-145
cont.

Energy: The costs of LNG export likewise will harm the community. LNG export activities, rather than providing public benefits, will significantly increase gas costs to U.S. consumers and businesses as they are forced to compete with high-priced overseas markets. These impacts are discussed in detail in Section 1.1 of these comments, *infra*.

Jordan Cove LNG's project also disregards Goal 9's Planning Guideline 4, which states "[p]lans should strongly emphasize the expansion of increased productivity from existing industries and firms as a means to strengthen local and regional economic development." This guideline

indicates the Goal 9's preference toward improvements or modifications of existing entities, with an emphasis on "local and regional economic development."

d. Goal 11: Public Facilities and Services

Statewide Planning Goal 11 is to "plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development." OAR 660-015-0000(11). The project, with its influx of 2,100 workers (at peak), is likely to place stress on existing public services including police and fire protection, as well as water and sewer treatment providers. Several components of the project, including the addition of the Southwest Oregon Regional Safety Center and the North Bend worker's camp, threaten to violate the policies of Goal 11. For example, the Applicants have not demonstrated that the proposed North Bend workers' camp can be adequately served by existing water and sewer systems. If existing water and/or wastewater treatment facilities are not adequate to serve the additional 2,000 users at the workers' camp, the expansion of these public services must comply with Goal 11 policies.

DLCD has an independent obligation under the CZMA to review Douglas and Coos County's actions related to land use approvals for the project and ensure that the counties' actions comply with the Statewide Planning Goals. In addition, several components of the project have not yet been reviewed for land use compliance. DLCD must ensure that all aspects of the project comply with the Statewide Planning Goals as part of the enforceable policies of the Coastal Management Program. The Coalition urges DLCD to protect Oregon's interests by objecting to the Applicants' consistency determination on the basis that the project is inconsistent with the Statewide Planning Goals.

CO28-145 cont

3. The Project's Proposed Water Use is Inconsistent with Coastal Management Plan Policies.

The Applicants will be required to seek approval for water rights to construct and operate the LNG terminal and pipeline. The Oregon Water Resources Department's (OWRD) mission is to "restore and protect streamflows and watersheds in order to ensure the long-term sustainability of Oregon's ecosystems, economy, and quality of life."[215] Further, water resources are held by the state in trust for its citizens. "The state, as trustee for the people, bears the responsibility of preserving and protecting the right of the public to the use of the waters [for navigation, fishing and recreation]." *Oregon Shores Conservation Coalition v. Oregon Fish and Wildlife Comm'n*, 62 Or App 481, 493, 662 P2d 356 (1983).

CO28-146

As part of its mission and public trust duty, OWRD must act to protect water resources for future generations of Oregonians. In light of the threats to water resources posed by population growth, increased usage and demand, upstream pollution, urbanization, drought and climate effects, and over-utilization of groundwater and surface waters, OWRD should be vigilant in acting to protect continued access to potable water. OWRD has acknowledged that management of water resources in Oregon is facing a number of significant challenges. *See* WRD, *Integrated Water Resources Strategy Discussion Draft* 8 (Dec 2011). Surface water is nearly fully allocated during

[215] Oregon Water Resources Department, *About Us*, http://www.oregon.gov/OWRD/about_us.shtml (May, 2007) (last visited Jan. 11, 2015).

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CO28-146 It is not the role or scope of the federal EIS to assess the Project's compliance with State regulations. We assume that the State would determine if the Project is in compliance with the State requirements during their review of the Applicant's State permit applications. As disclosed in section 5 of the EIS, any authorization from the Commission would be conditional on the Applicant acquiring all applicable federal and federally delegated permits.

summer months and groundwater is showing decline in many areas. *Id.* at 19. Almost 15,000 stream miles in Oregon do not meet the state's water quality standards for one or more pollutants. *Id.* at 22. These include several streams and waterways that will be impacted by the project, including Coos Bay and the Coos River.

Using Oregon's public water resources to construct and operate LNG export facilities is not in the best interest of the public of this state. The proposed LNG terminal and pipeline would consume millions of gallons of water each year, cause water pollution, and harm Oregon's recovering salmon runs. Pipeline construction would damage forestlands and watersheds, and disrupt property rights. Forcing Oregonians to live and work near massive LNG export facilities will subject citizens to unacceptable and unnecessary risks. Because using Oregon's water for LNG export would be detrimental to Oregon's interests, OWRD has the authority, and the obligation, to deny applications for water rights for this project.

CO28-146 cont.

N. Air Impacts

FERC must revise the DEIS to explain how operational air emissions were estimated, and to ensure a hard look at these emissions. Because the DEIS provides no explanation as to how the values presented in table 4.12.1.3-2 were calculated, commenters cannot meaningfully comment on the appropriateness of these estimates. However, several discrepancies between these estimates and those presented in the prior EIS call the current estimates into question.
For example, the current DEIS estimates combined vessel and tug emissions that, on a per-vessel-call basis, are significantly lower than the estimate provided in table 4.12.1.1-5 in the prior FEIS. This discrepancy is entirely unexplained. It is also contrary to what would be expected, given that the current DEIS appears to assume both larger tankers and a longer transit time, factors that we assume would *increase* per-vessel-call emissions.
As another example, the current DEIS estimates vastly lower operational volatile organic chemical emissions, principally because of a reduction in fugitive emissions (131.05 tons reduced to 7.98). The DEIS offers no explanation for this reduction; we question whether this reduction is even plausible.

CO28-147

III. PACIFIC CONNECTOR NATURAL GAS PIPELINE.

The applicants also propose to construct a 229-mile, 36-inch high-pressured gas pipeline, which will be placed through Coos Bay and cross and permanently impair streams, wetlands, and sloughs, along with causing associated deleterious impacts to upland habitat, forest, farm, recreational, and residential uses. The pipeline would cross approximately 400 waterbodies, require clear cutting of thousands of acres of the remaining old growth forests in Oregon, cross steep and remote terrain prone to landslides where emergency response is limited to local volunteers, and impact and permanently impair approximately 5,938 acres of state, federal and privately owned lands. The DEIS states that the Pacific Connector Gas Pipeline (PCGP) would cross approximately 11.6 miles of wetlands. The Joint Permit Application ("JPA") associated with Clean Water Act compliance for this project states that the PCGP would cross approximately 11.64 miles of wetlands, impacting approximately 239 acres of wetlands. The JPA also states that 87,454.19 cubic yards of material will be excavated from wetlands, and 39,117.61 cubic yards of material from waters, for a total of 126,571.80 cubic yards to be

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CO28-147 The EIS format does not allow for a detailed discussion of the emission calculation methodology to be included in the text. Detailed emission calculation sheets that detail the assumptions and emission factors used for determining operational air emissions are included in the public application and resource reports that Jordan Cove filed with FERC in September 2017.

Regarding the changed operating emission estimates between the current application and the prior EIS, the proposed Jordan Cove facilities have been significantly redesigned since the prior EIS. For example, the previous design included a separate electric power plant powered by combustion turbines to provide power to electric refrigeration compressors, while the current design uses refrigeration compressors that are directly driven by combustion turbines. The current design eliminates the separate power plant, and uses fewer combustion turbines with lower heat input ratings as compared to the prior EIS. The sizes and heat input ratings of other equipment, such as the thermal oxidizer, have also changed as compared to the prior EIS.

Regarding estimated emissions from LNG carriers and tugboats, the current application uses the same pollutant emission factors for LNG carriers (on a g/kWh basis) as those used for the prior EIS. However, a number of assumptions regarding LNG carrier operations have changed in the current application. The current transit emissions for LNG carriers assume a much lower propulsion engine load during transit than the prior EIS, resulting in much lower total transit emissions and somewhat lower overall LNG carrier emissions, while actually estimating higher total emissions during the actual cargo loading periods than the prior EIS. Tugboat emissions in the current application are actually higher than in the prior EIS, due to a higher assumed engine load for tugboats, and a higher number of tugboat operating hours per LNG carrier visit.

Regarding fugitive emissions, the prior EIS may have overestimated the fugitive emissions of volatile organic compounds (VOC). Of the 131.05 tons per year estimated for operational fugitive VOC emissions in the prior EIS, virtually all of this amount (130.9 tons per year) was estimated to come from process component leaks in the liquefaction plant (such as valves, flanges, and pump seals). This is a high estimate of VOC emissions, since the prior EIS also estimated that fugitive emissions of methane from process component leaks would be 134 tons per year, and that fugitive emissions of CO2 from process component leaks would be 13.7 tons per year. The fugitive leaks from these process components consist of natural gas and/or LNG, each of which is typically approximately 90% methane by mass, with smaller amounts of other compounds such as CO2 and various heavier compounds, including VOCs. However, the estimated fugitive VOC emissions in the prior EIS would be equivalent to a natural gas composition of only 48% methane, and almost 47% VOC, which is certainly a clerical error. In the current EIS, most of the fugitive VOC emissions are again due to process component leaks (accounting for 7.87 tons per year out of the facility's total 7.98 tons per year of VOC fugitive emissions). However, the current EIS bases these fugitive emissions on a natural gas composition that is 88% methane, 0.29% CO_2, and 1.38% VOC, which is a much more realistic composition for natural gas.

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excavated along the pipeline route. According to the JPA, 660 features of potentially jurisdictional wetlands and other waters were identified within the project corridor. The DEIS states that approximately 239 acres of wetlands will be disturbed during construction of the project. DEIS Appendix N, Table N-1b at N-67.

As a largely undeveloped upstream region, the portion of the Project area sited for the proposed upstream pipeline and related infrastructure will be dramatically affected. The Pacific Connector pipeline would traverse approximately 40 miles of BLM lands and 31 miles of NFS lands on its 232-mile route from Malin to Coos Bay, Oregon. The pipeline project would cross portions of 19 fifth-field watersheds, 16 of which include BLM or NFS lands where the ACS applies. In 12 of the 16 watersheds traversed by the pipeline on federal lands, the pipeline project would cross perennial or intermittent streams or clip areas designated as Riparian Reserves; in 4 of the watersheds crossed, the pipeline project would not intersect with Riparian Reserves or stream crossings.

A. Pipeline and the Pipeline Right-of-Way

Construction of the pipeline, including clearing the pipeline right of way, will have tremendous impacts. In this section, we discuss the impacts related to terrestrial pipeline activities. Impacts related to pipeline stream crossings are discussed in the following subsection.

B. Municipal Watersheds Effects.

The Pacific Connector Gas Pipeline would require blasting and clearcutting a 75 to 95-foot right-of-way across steep terrain and through soils with high potential for erosion and landslides. It would remove trees and streamside vegetation along more than 485 Oregon streams and rivers. It would warm waters and introduce nutrients, increasing the risk of Harmful Algae Blooms (HAB). It would also increase the risks of human-caused fire and wildfire.

As noted by the Oregon Department of Environmental Quality, "Many studies have shown that it is more cost-effective to prevent pollution in the environment than to remove it through treatment or to implement restoration.[216] Reducing or eliminating pollutants through protection and prevention can:

- lower treatment and maintenance costs for public water providers
- improve long-term viability of groundwater drinking water sources
- reduce the need for equipment replacement or upgrades
- reduce risks associated with many contaminants (including ones known to be toxic, persistent, and/or bio-accumulative)
- promote long-term assurances of a safe and adequate drinking water supply
- help protect property values and preserve the local and regional economic growth potential
- enhance public confidence in their drinking water
- reduce the need for expensive treatment in both surface water and groundwater

[216] Oregon Department of Environmental Quality Environmental Solutions: Watershed Management Section, 2018) https://www.oregon.gov/deq/FilterDocs/SurfaceWaterResourceGuide.pdf

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Alternatively, pollution of drinking water associated with fracked gas infrastructure may saddle water providers and ratepayers with costly new monitoring and treatment systems.

The proposed Pacific Connector Pipeline (PCP) has vast potential to degrade water quality and quantity on public, private, and tribal land for drinking water and other beneficial uses. The project would directly harm approximately 480 Oregon rivers and streams by clearcutting through riparian areas, building new roads to access these rivers, damming and diverting water, cutting trenches and laying a 36-inch pipeline directly through riverbanks and riverbeds. Horizontal drilling beneath the wild and scenic Rogue, Umpqua, Coquille, Coos, and Klamath Rivers could result in pollution of waters with toxic drilling fluids. At least twelve public drinking water sources are located in watersheds to be transected by the proposed pipeline.

The pipeline would slash a 95-foot wide swath through forest, ranch, and farm land and would also cross the popular recreational hiking trail, the Pacific Crest Trail. Clear cuts along the trail and elsewhere would be permanently maintained by cutting and spraying fertilizers, herbicides and pesticides.

During construction, testing of the pipeline to determine if it will hold gas would utilize enormous quantities of fresh water in areas that are designated as drought affected. For example, the Klamath Basin and those who rely on Klamath water (irrigators, tribal communities, endangered species, wildlife refuges, and associated wildlife) already experience extreme strain on water resources. Testing could require over 60 million gallons of fresh water. If the project re-uses water to test multiple segments of pipe, it would still consume at least 16 million gallons of water.[217] Discharged test water would be contaminated with materials used to construct the pipeline.

According to the Oregon DEQ and the Oregon Health Authority, water contamination "depends on three major factors: 1) the occurrence of a land use/activity that releases contamination, 2) the location of the release, and 3) the hydrologic, ecological, and/or soil characteristics in the source area that allow the transport of the contaminants to the waterbody and thereby the intake."[218] Human factors affecting water quality include:

- All activities and facilities within riparian areas
- Road locations and conditions, especially stream crossings, and roads near streams, on steep slopes, and with drainage systems connected to the stream network
- Stormwater runoff from contaminated lands, for example, with high phosphorus or nitrogen content
- Recently managed forestland which has been harvested, replanted, and treated with herbicides.
- Quarries, construction, and other industrial sites
- Hazardous material sites
- Solid waste landfill sites

[217] Draft Environmental Impact Statement for the Jordan Cove Energy Project, 2019
[218] Oregon Department of Environmental Quality Environmental Solutions: Watershed Management Section, 2018

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Each of these factors is associated with the proposed pipeline.

Some landscapes are more sensitive to disturbances and contamination has greater potential to impact the water supply.[219] Sensitive areas include:

- Riparian areas
- Springs, seeps, and wetlands
- Steep slopes (>70-85%)
- Floodplains
- Areas with high soil erosion or runoff potential, for example, disturbed or bare soil
- High water table areas
- Areas of high soil permeability
- Areas within 1000 feet of rivers and streams.

The proposed pipeline would pollute streams, wetlands and riverbeds; blast rock and hillsides; clear-cut and destroy vegetation in each of these sensitive areas within municipal watersheds. Potential adverse impacts include:

- increased water temperature from loss of forest cover and riparian area buffers
- increased erosion from loss of forest cover and riparian areas leading to increased sediment and turbidity
- increased use of chlorine due to higher turbidity levels, leading to increased chemical by-products that carry their own health risks
- contamination of water and soil by oil, lubricants, and chemicals
- movement of non-native species into watersheds on tires of vehicles, on boats, and equipment
- fires due to construction and blasting accidents and rupture or failure of the pipeline
- wildfire leading to pipeline explosion leading to larger wildfire
- water contamination through accidental application of fire suppressants/retardants
- post-fire slope failures, debris flows, landslides, increased turbidity, loss of drinking water, increased cost for replacement of drinking water, increased costs for water treatment
- disruption of surface water connection with groundwater (from blasting and water diversions)
- disruption of groundwater connection with wells and surface water (from blasting and water diversions)
- contamination of water by herbicides like picloram (to maintain right-of-way free of vegetation on and near the pipeline route) which could persist in the groundwater for years
- contamination of water by intensive use of fertilizers to re-plant cleared area around pipeline
- increased incidence of harmful algal blooms

[219] Oregon Department of Environmental Quality Environmental Solutions: Watershed Management Section, 2018

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Construction and operation of the pipeline would also degrade habitat for aquatic life, especially the endangered Coho salmon, with negative impacts on fishing and traditional activities of tribal communities. Habitat degradation would occur through loss of forest canopy, removal of riparian vegetation, decreased summer flows, warming of water, and addition of fertilizers/nutrients to encourage re-growth of vegetation on certain properties following installation of the pipeline.

These same effects would increase risk of harmful algal blooms (HAB). According to the Centers for Disease Control and Prevention, HAB can produce toxins that cause illness in people, companion animals, livestock and wildlife.[220] Exposures to the toxins can occur when people or animals have direct contact with contaminated water by:

- Swimming
- Breathing in aerosols (tiny airborne droplets or mist that contain toxins) from recreational activities or wind-blown sea spray
- Swallowing toxins by drinking contaminated water or eating contaminated fish or shellfish

Human and animal illnesses and symptoms vary depending on the nature and length of exposure and the particular HAB toxin involved. Common toxins include cyanotoxins which can be toxic to the nervous system, liver, skin, or the gastrointestinal tract. No human deaths in the United States have been caused by cyanotoxins; however, companion animal, livestock, and wildlife deaths caused by cyanotoxins have been reported throughout the United States and the world.[221]

During the summer of 2018, a state of emergency was declared by Governor Brown when the drinking water supply for the City of Salem was tainted by HABs. Eight drinking watersheds in SW Oregon that would be transected by the PCGP are today at risk for HAB.[222] The construction and maintenance of the proposed Pacific Gas Connector Pipeline would greatly exacerbate that risk.

According to the Jordan Cove DEIS, "If a groundwater supply is affected by the Project, Pacific Connector would work with the landowner to provide a temporary supply of water; if determined necessary, Pacific Connector would provide a permanent water supply to replace affected groundwater supplies."[223]The same claim is made for mitigation for a temporary or permanent loss of surface water supplies. Replacement of a permanently contaminated aquifer or surface water drinking source would, however, require trucking in bottled water or piping it in from an alternative source. This would be costly, difficult, and in some cases impossible. It would represent a permanent erosion of quality of life as well as significant reduction in land value. Lack of an affordable and reliable source of clean water renders a landscape uninhabitable over the long term.

Watersheds that could be degraded by this project include, but are not limited, to those that provide water to the City of Coquille, Myrtle Point, Myrtle Creek, Medford, Eagle Point, Central

[220] Centers for Disease Control and Prevention, n.d.
[221] Centers for Disease Control and Prevention, n.d.
[222] Oregon Health Authority, 2018
[223] Draft Environmental Impact Statement for the Jordan Cove Energy Project. 2019

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Point, Jacksonville, Phoenix, Talent, Shady Cove, Anglers Cove, Tri-City JW and SA, Clarks Branch Water Association, Country View MH Estates, Lawson Acres Water Association, Glendale, Roseburg Forest Products – Dillard, Winston Dillard Water District, Tiller Elementary School, Latgawa Methodist Church Camp, Milo Academy, and Lake Creek Learning Center. Over 156,750 Oregonians rely on safe drinking water from these systems.

Many of these systems are already sensitive to contaminants of concern, including risk of erosion, turbidity, microbiological contamination, and harmful algal blooms. Many have already invested in expensive technology to clean and disinfect water.

The map below demonstrates the drinking watershed for Myrtle Point, one of the many areas in SW Oregon that are susceptible to elevated erosion potential from ground disturbance and vegetation removal and would face increased risk with construction and operation of the Pacific Connector Gas Pipeline. Steep slopes are identified for 117 miles of the proposed pipeline. 94 miles of the pipeline would be located in soils with high or severe erosion potential. Maps at this fine scale for specific watersheds are available from Oregon DEQ. Erosion leads to increased turbidity levels which can present costly challenges for human health, water treatment and water delivery.

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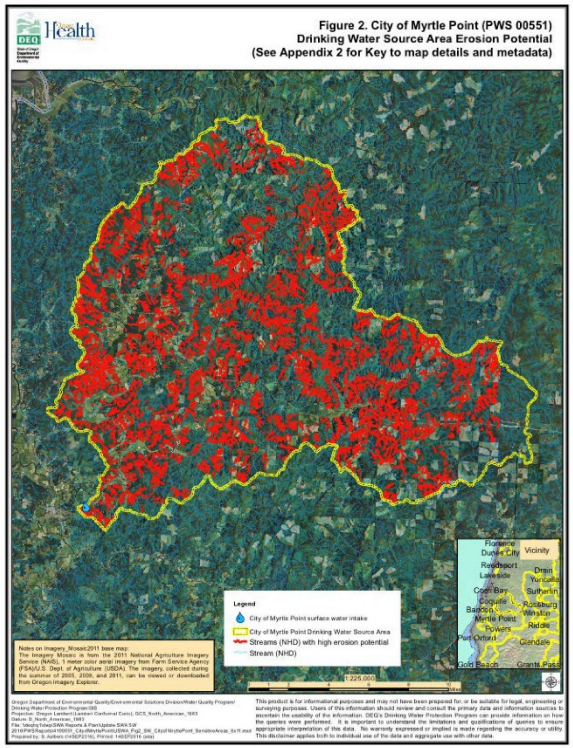
Figure 17
City of Myrtle Point, Oregon
Drinking Water Source Area Erosion Potential



Below are excerpts from Oregon DEQ/Oregon Health Authority Source Water Assessments and/or information published by municipal water providers. Description of watersheds include

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sensitive areas and potential sources of contamination. In many cases they include potential pollutants from erosion and landslides, high soil permeability, stream miles in erodible soils, high soil erosion potential present, shallow landslide potential and landslide deposits. It is staggering to contemplate the damage that could be done by this massive project.

Medford Water Commission (PWS 4100513) provides water to Medford and provides wholesale water to cities of Eagle Point, Central Point, Jacksonville, Phoenix, Talent and the Lake Creek Learning Center

Source: Rogue River and Big Butte Springs
Jackson County
Serves 131,867 (includes those served by wholesale customers)

Oregon DEQ/Oregon Health Authority (OHA) Updated Water Source Assessment demonstrates:

A. Potential Pollutants: 8 hr time of travel in Drinking Water Source Area with 203 stream miles

- Stream miles in erodible soils: *156*
- High Soil Erosion Potential: *77%*
- Shallow Landslide Potential: *See DEQ*
- Landslide Deposits: *limited areas throughout watershed* include earth and debris slides, flows, slumps, falls and complex landslide types. (Does not include rock material landslide deposits.)

B. Potential Pollutants: Full Surface Drinking Water Source Area with 6,909 stream miles

- Stream miles in erodible soils: *5,244*
- High Soil Erosion Potential: *76%*
- Shallow Landslide Potential: *See DEQ*
- Landslide Deposits: *areas throughout watershed* include earth and debris slides, flows, slumps, falls and complex landslide types. (Does not include rock material landslide deposits.)

Potential Harmful Algae Bloom (HAB) **risk criteria/factors identified in Medford's Drinking Water Source Area** by DEQ in June 2018:

Previous HAB Advisory

DEQ Water Quality Limited Listing indicating the waterbody needs TMDL for Algae and aquatic weeds, pH, dissolved oxygen

OHA DWS sampling location for cyanobacteria toxin (2011-2017)

Waters of potential concern for HAB

C. Groundwater wells: Drinking water source area 88.68 acres

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City of Coquille (PWS 4100213)

Source: Coquille River
Serves 3,866 people

D. Potential pollutants from erosion and landslides (See Table 1: Drinking Water Source Area Land Use and Susceptibility Analysis Summary from DEQ 2016 Source Water Assessment):

- Stream miles in erodible soils: *1,488.69* (Coquille River) *4.74* (Rink Creek)
- High Soil Erosion Potential: *41.4%* (Coquille River) *99.6* (Rink Creek) (% stream miles with high erosion located within 300' of stream)
- Shallow Landslide Potential: *See DEQ*
- Landslide Deposits: *Multiple landslide deposits are present* and points are mapped throughout the Coquille watershed; Limited landslide/deposit near Rink Creek intake

Potential Harmful Algae Blooms (HAB) **risk criteria/factors identified in City of Coquille's Drinking Water Source Area** by DEQ in June 2018:

DEQ Water Quality Limited Listing indicating the waterbody needs TMDL for Dissolved Oxygen, Chlorophyll-A

Multiple Water Quality Listings (Source: OR DEQ Water Quality Assessment (DEQ/WQ - 10/31/2014) and DEQ Source Water Assessment 2016)

Myrtle Point (PWS 4100551)
Source: North Fork Coquille River
Serves 2,600 people

DEQ/OHA Source Water Assessment 2016 (excerpts):

Potential Pollutants: 8 hr time of travel in Drinking Water Source Area with 203 stream miles

- Stream miles in erodible soils: *1,011.54*
- High Soil Erosion Potential: *47%* (% stream miles with high erosion located within 300' of stream)
- Shallow Landslide Potential: *See DEQ*
- Landslide Deposits: *Multiple landslide deposits are present* and points are mapped throughout the watershed

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