UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OR 97232-1274

Refer to NMFS Consultation No.:
WCRO-2019-01956

January 10, 2020

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Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Jordan Cove LNG Export Terminal and Pacific Connector Pipeline Project, Southwest Oregon (FERC Docket Nos. CP17-494-000 and CP07-495-000)

Dear Cooperating Federal Partners:

Thank you for your July 29, 2019 letter requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act

of 1973 (ESA) (16 U.S.C. 1531 et seq.) for Jordan Cove LNG Export Terminal and Pacific Connector Pipeline Project. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action. The Federal Energy Regulatory Commission (FERC) is designated the lead Federal agency on behalf of cooperating agencies (Table 1).

Table 1. Federal Agencies, Authorities, and their permit or authorization.

Federal Action Agency	Authority	Permit or authorization
Federal Energy Regulatory Commission	Sections 3 and 7 Natural Gas Act, Section 311 Energy Policy Act	Order granting authorization, Certificate of public convenience and necessity
Bureau of Land Management	Section 28 Mineral Leasing Act, Federal Land Policy and Management Act	Right-of-way grant for crossing federal lands, Resource Management Plan Amendments
U.S. Forest Service	Mineral Leasing Act, National Forest Management Act	Concurrence with right of way grant, Land and Resource Management Plan Amendments
Bureau of Reclamation	Mineral Leasing Act	Concurrence with right of way grant
Department of the Army Corps of Engineers	Section 10 and 14 (408) Rivers and Harbors Act, Section 404 Clean Water Act	Permit structure installation and removal in navigable waters, approve alterations to civil works projects, permit discharge of dredged and fill material within waters of the U.S.
U.S. Department of Homeland Security Coast Guard	Navigation and Vessel Inspection Circular, Maritime Transportation Security Act	Develop LNG Vessel Transit Management Plan, approve Facility Security Plan
U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration	Natural Gas Pipeline Safety Act, 49 CFR 193	Approve terminal siting, Enforce safety regulations and standards for design, construction and operation of natural gas pipelines
U.S. Department of Energy	Section 3 Natural Gas Act	Authorization to export LNG to Free Trade Agreement Nations and Non-Free Trade Agreement Nations

In this opinion, we concluded the proposed actions are not likely to jeopardize the continued existence of the following species, or result in the destruction or adverse modification of the following proposed/designated critical habitats:

1. Blue whale (*Balaenoptera musculus*)
2. Fin whale (*Balaenoptera physalus*)
3. Mexican distinct population segment (DPS) humpback whale (*Megaptera novaeangliae*)
4. Central American DPS humpback whale
5. Sperm whale (*Physeter microcephalus*)

6. Oregon Coast (OC) coho salmon (*Oncorhynchus kisutch*)
7. OC coho salmon critical habitat
8. Southern Oregon/Northern California Coast (SONCC) coho salmon
9. SONCC coho salmon critical habitat
10. Southern DPS Pacific eulachon (*Thaleichthys pacificus*)
11. Southern DPS green sturgeon (*Acipenser medirostris*)
12. Southern DPS green sturgeon critical habitat

We also concluded that the proposed action is not likely to adversely affect the following species or proposed/designated critical habitats:

1. Southern resident killer whale (*Orcinus orca*)
2. Southern resident killer whale critical habitat
3. Sei whale (*Balaenoptera borealis*)
4. North Pacific right whale (*Eubalaena japonica*)
5. Western North Pacific gray whale (*Eschrichtius robustus*)
6. Mexican DPS humpback whale critical habitat
7. Central DPS humpback whale critical habitat
8. Green sea turtle (*Chelonia mydas*)
9. Leatherback sea turtle (*Dermochelys coriacea*)
10. Leatherback sea turtle critical habitat
11. Olive Ridley sea turtle (*Lepidochelys olivacea*)
12. Loggerhead sea turtle (*Caretta caretta*)

As required by section 7 of the ESA, we are providing an incidental take statement (ITS) with the opinion. The ITS describes reasonable and prudent measures we consider necessary or appropriate to minimize the impact of incidental take associated with this program. The ITS also sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal action agencies must comply with to carry out the reasonable and prudent measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of the listed species considered in this opinion.

We also reviewed the likely effects of the proposed action on EFH and concluded the action would adversely affect EFH of Pacific Coast salmon, Pacific groundfish, and coastal pelagic species. We have included the results of that review in Section 3 of this document, including ten conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH.

Section 305(b)(4)(B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations. If the response is inconsistent with the EFH conservation recommendations, the action agency must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the program and the recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, we established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by

the action agency. Therefore, we request that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

Please direct questions regarding this opinion to Chuck Wheeler at 541.957.3379 of my staff in the Oregon Coast Branch of the Oregon/Washington Coastal Office.

Sincerely,

Kim W. Kratz, Ph.D.
Assistant Regional Administrator
Oregon Washington Coastal Office

cc: John Peconom, FERC
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Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the

Jordan Cove LNG Export Terminal and Pacific Connector Pipeline Project

NMFS Consultation Number: WCRO-2019-01956

Action Agencies: Federal Energy Regulation Commission
Bureau of Land Management
Forest Service
Bureau of Reclamation
Department of Energy
U.S. Army Corps of Engineers
Coast Guard
Department of Transportation; Pipeline and Hazardous Materials Safety Administration

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to			
		Adversely Affect Species?	Jeopardize the Species?	Adversely Affect Critical Habitat?	Destroy or Adversely Modify Critical Habitat?
Blue whale (*Balaenoptera musculus*)	Endangered	Yes	No	N/A	N/A
Fin whale (*Balaenoptera physalus*)	Endangered	Yes	No	N/A	N/A
Mexican DPS humpback whale (*Megaptera novaeangliae*)	Threatened	Yes	No	No	No
Central American DPS humpback whale	Endangered	Yes	No	No	No
Southern resident killer whale (*Orcinus orca*)	Endangered	No	No	No	No
Sei whale (*Balaenoptera borealis*)	Endangered	No	No	N/A	N/A
Sperm whale (*Physeter microcephalus*)	Endangered	Yes	No	N/A	N/A
North Pacific right whale (*Eubalaena japonica*)	Endangered	No	No	No	No
Western North Pacific stock gray whale (*Eschrichtius robustus*)	Endangered	No	No	N/A	N/A
Oregon Coast coho salmon (*Oncorhynchus kisutch*)	Threatened	Yes	No	Yes	No
Southern Oregon/Northern California Coast coho salmon	Threatened	Yes	No	Yes	No
Southern DPS Pacific eulachon (*Thaleichthys pacificus*)	Threatened	Yes	No	Yes	N/A
Southern DPS green sturgeon (*Acipenser medirostris*)	Threatened	Yes	No	Yes	No
East Pacific DPS green sea turtle (*Chelonia mydas*)	Endangered	No	No	No	No
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	No	No	No	No

ESA-Listed Species	Status	Is Action Likely to			
Olive ridley sea turtle (*Lepidochelys olivacea*)	Endangered	No	No	N/A	N/A
North Pacific DPS loggerhead turtle (*Caretta caretta*)	Threatened	No	No	N/A	N/A

Fishery Management Plan That Describes EFH in the Project Area	Would the action adversely affect EFH?	Are EFH conservation recommendations provided?
Pacific Coast Salmon	Yes	Yes
Coastal Pelagic Species	Yes	Yes
Pacific Coast Groundfish	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:

Kim W. Kratz, Ph.D.
Assistant Regional Administrator
Oregon Washington Coastal Office

Date: January 10, 2020

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LIST OF ACRONYMS

APCO	Al Pierce Company site (two islands used for sediment disposal)
BA	Biological Assessment
BLM	Bureau of Land Management
BMPs	Best Management Practices
CFR	Code of Federal Regulations
cfs	cubic feet per second
CHART	Critical Habitat Analytical Review Teams (salmon and steelhead)
CHRT	Critical Habitat Review Team (green sturgeon)
CMP	Compensatory Mitigation Plan
CORPS	United States Army Corps of Engineers
cy	cubic yards
dB	Decibel
DOE	Department of Energy
DOI	United States Department of the Interior
DOT	Department of Transportation (Federal)
DP	Direct Pipe
DPS	Distinct Population Segment
DQA	Data Quality Act
EAR	Existing Access Road
ECRP	FERC's Upland Erosion Control, Revegetation, and Maintenance Plan
ESCP	Erosion and Sediment Control Plan
EEZ	U.S. Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
Fast 41	Fixing America's Surface Transportation Act
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FWCA	Fish and Wildlife Coordination Act
FR	Federal Register
HDD	Horizontal Directional Drills
HUC	Hydrologic Unit Code
IMST	Independent Multi-disciplinary Science Team
IPCC	Intergovernmental Panel on Climate Change
ISAB	Independent Scientific Advisory Board
ITS	Incidental Take Statement
IWC	International Whaling Commission
JCEP	Jordan Cove Energy Project, L.P.
kHz	Kilohertz
LAA	Likely to adversely affect
LCREP	Lower Columbia River Estuary Partnership
LFA	Low Frequency Active sonar

LNG	Liquefied Natural Gas
LW	Large wood
mg/l	milligrams per liter
MLV	Mainline Valve
MMPA	Marine Mammal Protection Act
MOF	Material Offloading Facility
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NE	No effect
NEPA	National Environmental Policy Act
NLAA	Not likely to adversely affect
Nmi	Nautical Miles
NMFS	NOAA's National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRC	National Research Council
NRCS	Natural Resource Conservation Service
NRCS	Natural Resources Conservation Service
NWFSC	Northwest Fisheries Science Center
NWR	NMFS Northwest Region
OC coho	Oregon Coast Coho
OCS	Outer Continental Shelf
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
OGV	Ocean Going Vessels
OIPCB	Oregon International Port of Coos Bay
Pacific Connector	Pacific Connector Gas Pipeline Project, L.P.
PARS	Permanent Access Roads
PBFs	Physical and Biological Features
PBR	Potential Biological Removal
PCE	Primary constituent element
PFMC	Pacific Fisheries Management Council
Project	Collectively Jordan Cove and Pacific Connector
PSET	Portland Sediment Evaluation Team
RM	River Mile
ROW	Right-of-Way
SEFSC	Southeast Fisheries Science Center
SEL	Sound exposure level
SER	NMFS Southeast Region
SONCC	Southern Oregon/Northern California Coast coho
spp	Species
SWR	NMFS Southwest Region
TARs	Temporary Access Roads
TEWAs	Temporary Extra Work Areas
TMMB	Temporary Materials Barge Berth

TRT	Technical Review Team
UCSA	Uncleared Storage Areas
μPa	Micro Pascal
U.S.C.	United States Code
USDA	United States Department of Agriculture
USDC	United States Department of Commerce
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WCR	West Coast Region
WDFW	Washington Department of Fish and Wildlife

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3 below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402. We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the Oregon Coast Branch in Roseburg, Oregon.

1.2 Consultation History

On October 12, 2017, the Federal Energy Regulatory Commission (FERC) determined the Jordan Cove LNG Terminal and Pacific Connector Gas Pipeline (Project) qualifies as a "covered project" under the Fixing America's Surface Transportation Act (FAST-41). On October 18, 2017, FERC invited us to participate as a cooperating agency in the development of the Environmental Impact Statement (EIS) pursuant to the National Environmental Policy Act (NEPA). On December 19, 2017, we accepted that offer. Since October 2017, we have participated in numerous meetings, as well as, bi-weekly coordination calls with FERC and multiple other action agencies.

Starting in August 2018, we reviewed and commented on numerous sections of the draft EIS. On July 29, 2019, we received a letter from the FERC which included a biological assessment (BA) and request to initiate formal consultation under section 7(a)(2) of the ESA and section 305(b)(2) of the MSA on the species listed in Table 1. On August 8, 2019, we agreed to initiate consultation, but requested that our agencies continue to share information as we develop the opinion. On December 5, 2019, we received FERC's request to conference on the proposed expansion of critical habitat for southern resident killer whale and the proposed designation of critical habitat for the Central American distinct population segment (DPS) humpback whale and the Mexican DPS humpback whale (hereafter, when discussed together, these two DPSs are referred to as humpback whale).

On August 30, 2019, the Jordan Cove and Pacific Connector (the Applicants) uploaded a comprehensive mitigation plan (CMP) to FERC's docket. The CMP compiled minimization and mitigation measures the Applicants will implement as part of the proposed action. Most of these

measures were already included in the BA. One addition, with significant effects to NMFS' trust resources, is the list of restoration actions on Bureau of Land Management (BLM) managed lands (Attachment 2). We have included the CMP in its entirety into the proposed action and our analysis.

Table 1. FERC's determinations for species and critical habitats.

ESA-Listed Species	Effect to Species[1]	Effect to Critical Habitat
Blue whale (*Balaenoptera musculus*)	LAA	N/A
Fin whale (*Balaenoptera physalus*)	LAA	N/A
Central American DPS humpback whale (*Megaptera novaeangliae*)	LAA	NLAA
Mexican DPS humpback whale	LAA	NLAA
Southern resident killer whale (*Orcinus orca*)	NLAA	NLAA
Sei whale (*Balaenoptera borealis*)	NLAA	N/A
Sperm whale (*Physeter microcephalus*)	LAA	N/A
North Pacific right whale (*Eubalaena japonica*)	NLAA	NE
Western North Pacific gray whale (*Eschrichtius robustus*)	NLAA	N/A
Oregon Coast coho salmon (*Oncorhynchus kisutch*)	LAA	LAA
Southern Oregon/Northern California Coast coho salmon	LAA	LAA
Southern DPS Pacific eulachon (*Thaleichthys pacificus*)	LAA	NE
Southern DPS green sturgeon (*Acipenser medirostris*)	LAA	LAA
Green turtle (*Chelonia mydas*)	NLAA	NE
Leatherback turtle (*Dermochelys coriacea*)	NLAA	NLAA
Olive Ridley turtle (*Lepidochelys olivacea*)	NLAA	N/A
Loggerhead turtle (*Caretta caretta*)	NLAA	N/A

[1]LAA = Likely to adversely affect, NLAA = not likely to adversely affect, NE = no affect

On September 27, 2019, FERC revised the schedule for completion of the Environmental Impact Statement. The issuance of final order was deferred 34 days, from January 10, 2020, to February 13, 2020. In an October 18, 2019 letter, we requested a commensurate 30-day extension to the ESA/MSA consultation timeline. The expected completion date for ESA/MSA consultation changed from December 11, 2019, to January 10, 2020. FERC agreed the extension is warranted in a letter dated October 31, 2019.

1.3 Proposed Federal Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). The proposed action includes all the permits and authorizations required to construct and operate the Project (Table 2). The proposed action also includes all permits and authorizations required to implement other work by the applicants related to the Project, such as their offsite mitigation activities.

FERC has provided us with a BA including appendices, the EIS, and the Applicants' CMP describing in detail the actions being proposed. Our analysis adopts the descriptions in those documents, wholly incorporating them by reference. The following is a summary of activities, as described in those documents, of particular importance to our analysis of the effects on our trust resources.

The three main components of the Project include:

- The Jordan Cove LNG terminal and associated facilities in Coos Bay, Oregon
- The Pacific Connector pipeline and associated facilities within Klamath, Jackson, Douglas, and Coos County, Oregon
- Offsite mitigation activities

Table 2. Federal Agencies and their proposed permit or authorization.

Federal Action Agency	Authority	Permit or authorization
Federal Energy Regulatory Commission	Sections 3 and 7 Natural Gas Act, Section 311 Energy Policy Act	Order granting authorization, Certificate of public convenience and necessity
Bureau of Land Management	Section 28 Mineral Leasing Act, Federal Land Policy and Management Act	Right-of-way grant for crossing federal lands, Resource Management Plan Amendments
US Forest Service	Mineral Leasing Act, National Forest Management Act	Concurrence with right of way grant, Land and Resource Management Plan Amendments
Bureau of Reclamation	Mineral Leasing Act	Concurrence with right of way grant
Department of the Army Corps of Engineers	Section 10 and 14 (408) Rivers and Harbors Act, Section 404 Clean Water Act	Permit structure installation and removal in navigable waters, approve alterations to civil works projects, permit discharge of dredged and fill material within waters of the U.S.
US Department of Homeland Security Coast Guard	Navigation and Vessel Inspection Circular, Maritime Transportation Security Act	Develop LNG Vessel Transit Management Plan, approve Facility Security Plan
US Department of Transportation, Pipeline and Hazardous Materials Safety Administration	Natural Gas Pipeline Safety Act, 49 CFR 193	Approve terminal siting, Enforce safety regulations and standards for design, construction and operation of natural gas pipelines
U.S. Department of Energy	Section 3 Natural Gas Act	Authorization to export LNG to Free Trade Agreement Nations and Non-Free Trade Agreement Nations

1.3.1 Jordan Cove LNG Terminal

Jordan Cove proposes to construct and operate a LNG terminal located on the bay side of the North Spit of Coos Bay. Construction and operation of the terminal includes building new

facilities and using existing ones, including (for a full description, see FERC's BA and EIS, which we adopt for our analysis):

- New Marine Slip – Excavate existing upland area adjacent to Coos Bay to accommodate the LNG carriers, tug and escort boat docks, and an emergency lay berth.
- New LNG Terminal – Adjacent to the new marine slip in existing upland areas, the Applicants will construct facilities associated with processing LNG and loading onto carriers.
- New Access Channel – The Applicants will dredge the portion of Coos Bay extending from the existing Federal Navigation Channel to the Marine Slip to allow LNG carriers access to the terminal area.
- LNG Carrier Transit Route – The route through existing nearshore ocean areas, existing Coos Bay Federal Navigation Channel, and the new access channel and marine slip where LNG carriers will traverse to and from the LNG terminal. To improve transit of LNG carriers, the Applicants will dredge four areas adjacent to the existing Federal Navigation Channel between river mile (RM) 2 and RM 7 of Coos Bay.
- New Pile Dike Apron – As requested by the U.S. Army Corps of Engineers (Corps), the Applicants will place a rock apron at the base of an existing pile dike (part of the Federal Navigation Channel system, located immediately west of the access channel). The apron will serve to prevent potential erosion of the pile dike from vessel induced wave action.
- New Material Offloading Facility (MOF) – A sheetpile bulkhead offloading facility installed on the southeast side of the marine slip to receive components for the terminal too large to transport by rail or truck. The MOF will be retained indefinitely to support maintenance and replacement of components.
- New Temporary Materials Barge Berth (TMBB) – Initial marine deliveries will come to a temporary berth. The Applicants will build this berth by dredging existing shoreline within the footprint of the eventual marine slip.
- Trans Pacific Parkway and U.S. Highway 101 (US-101) Intersection – The Applicants will add a new turning lane at the existing intersection of these two roads. The road fill will encroach on Coos Bay.
- Dredge Disposal Islands – Two small islands currently exist on the south side of Coos Bay across from the terminal site, once owned by the Al Pierce Company (APCO). The Applicants will dispose of dredge spoils in the uplands of the islands. They will also construct a permanent bridge between the two.
- New Workforce Housing – The Applicants will construct a temporary workforce housing facility in the South Dunes portion of the site. The site will also include parking. The Applicants will remove the facility after construction is completed.
- Existing Off-Site Parking – A park-and-ride facility will be established at the vacated Myrtlewood RV Park. The off-site parking lot will be restored to pre-construction condition once terminal construction is completed.

Activities to construct and maintain the facilities include:

- Dredging material with a clamshell or hydraulic dredge
- Excavating material out of uplands
- Building docks

- Pile installation with a vibratory hammer until refusal then proofing with an impact hammer
- Upland construction
- Installing stormwater treatment systems
- Placing rock riprap
- Future maintenance dredging
- Placing fill in Coos Bay
- Placing meteorological buoys in the ocean and within Coos Bay to aid in vessel transit

Jordan Cove will implement conservation measures to minimize impacts to ESA-listed species, including the following most pertinent to our analysis:

- All in-water work will be conducted during the Oregon Department of Fish and Wildlife (ODFW)-approved in-water work window for Coos Bay (October 1 to February 15) unless otherwise approved by NMFS.
- If hydraulic dredging (cutter suction) is used for dredging in Coos Bay, the cutter head will be held at the substrate to the extent practicable to minimize potential for entrainment of listed fish species and suspended sediment generation. If a mechanical dredge (clamshell or excavator) is used, the clamshell bucket will be lowered and raised slowly through the water column to reduce the potential for entrainment of fish species and to minimize suspended sediment.
- The hydraulic dredge transport pipelines for excavated materials from the Navigation Improvement areas and Eelgrass Mitigation Site and to the Kentuck Aquatic Restoration Site will be submerged or float along the Federal Navigation Channel in Coos Bay. Where the dredge transport pipelines cross eelgrass near the APCO disposal sites and the Kentuck Aquatic Restoration Site, the pipeline will be placed on pile-supported cradles or by other means to minimize impacts.
- All dredged material disposal will occur at upland sites or the Kentuck Aquatic Restoration Site prior to restoring water to it.
- If dredge material is transported via barge, the barge will be loaded so that enough of the freeboard remains to allow for safe movement of the barge and its material on its planned route to the approved disposal facility. Appropriate measures will be used to minimize the release of turbid water.
- Upon completion of dredging operations, any temporary in-water and upland facilities will be removed. Slurry and decant water pipelines will be removed, and any areas disturbed by these pipelines will be restored to pre-construction conditions.
- At the terminal and APCO disposal sites, placement of hydraulically dredged material will be contained by berms and will be sufficiently large to dewater the dredge slurry and contain rainfall.
- Excavation and dredging activities in the slip will be isolated from Coos Bay by an earthen berm. The berm will be removed during the approved in-water work period (October 1 to February 15) to minimize effects of suspended sediment on the bay.
- Untreated slurry water will not enter Coos Bay from dredge disposal placement sites. Passively treated decant water will be transported via pipeline back to the slip, a purpose-built decant basin, or Coos Bay.

- To minimize potential introduction of exotic species, LNG carriers will comply with applicable ballast water management protocols including the 2012 U.S. Coast Guard Final Rule on Ballast Water Discharges, the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, the 1996 National Invasive Species Act, and any applicable regulations programs.
- To minimize potential introduction or spreading of invasive species, the applicable recommendations, outlined in the Oregon Aquatic Species Management Plan, the Oregon Noxious Weed Strategic Plan, the Bureau of Land Management's multi-state Environmental Impact Statement Northwest Area Noxious Weed Control Program and its supplements, and the Bureau of Land Management's Final Vegetation Treatments on Bureau of Land Management Lands in 17 Western States Programmatic Environmental Report will be followed.
- Construction lighting will be designed, installed, and operated at a level that allows construction work to be completed safely and effectively while minimizing glare to surrounding areas.
- Operation lighting levels will be based on American Petroleum Institute standards and provide sufficient light for safety. Directional lighting facing onshore will be used to the extent possible. Screens or lighting hoods will be installed to the extent practical based on considerations in the final lighting plan.
- At the terminal site, stormwater facilities will capture and infiltrate 100% of the 2-year, 24-hour storm.
- Stormwater collected in areas that are potentially contaminated with oil or grease will be collected and conveyed to the oily water collection sumps. Collected stormwater from these sumps will flow to the oily water separator packages before discharging to the industrial wastewater pipeline and the Pacific Ocean.
- Along Trans-Pacific Highway, 100% of the 2-year, 24-hour event stormwater runoff will be treated using stormwater filter cartridge systems. Best management practices (BMPs) in the operations and maintenance plan will include regular inspection and replacement of cartridge filters.
- Water quality monitoring performed during active in-water work to ensure compliance with State water quality standards.
- Implementing measures to reduce suspended sediment from dredging activities. These measures will include: 1) Testing procedures to ensure procedures are consistent and accurate, 2) water quality monitoring to be performed during in-water activity to ensure compliance with state standards, and 3) corrective measures will be undertaken if testing results indicate out-of-compliance situations, work will cease until corrective actions are taken.
- Ensuring the hydrostatic test water meets all applicable regulations prior to discharge.
- Finalizing the draft erosion and sediment control plan (ESCP) and implementing it during construction. The contractor will delineate all construction clearing limits with high-visibility markings and maintain the markings during construction of the LNG Terminal and facilities. The area outside the clearing limits will not be disturbed.

- In accordance with NMFS and U.S. Fish and Wildlife Service (USFWS) Impact Pile Driving Sound Attenuation Guidance,[1] using sound attenuation devices for all impact driving within fish-bearing waters.

1.3.2 Pipeline Component

Pacific Connector proposes to construct and operate an underground, high-pressure 36" pipeline to transport natural gas to the LNG terminal from the Klamath Compressor Station near Malin, Oregon. Construction and operation of the pipeline includes building new facilities and using existing ones, including (for a full description, see FERC's BA and EIS, which we adopt for our analysis):

- Constructing one compressor station, 3 meter stations, 5 pig launcher[2]/receiver assemblies, 17 mainline valves (MLV), and 15 communication towers
- Using existing rock source/disposal sites to acquire gravel or dispose of spoils
- Clearing a standard construction right-of-way and permanent easement
- Clearing and using temporary construction rights-of-way, temporary extra work areas (TEWAs), uncleared storage areas (UCSAs)
- Constructing and using new permanent access roads (PARs) and new temporary access roads (TARs)
- Using existing access roads (EARs)
- Using new and existing pipe storage and contractor yards

Activities to construct the pipeline facilities include:

- Ground clearing and site preparation
- Road construction
- Pipeline installation, including waterbody crossings
- Hydrostatic testing the pipeline
- Building construction
- Rock removal and spoil disposal
- Site restoration and planting

Pacific Connector will implement conservation measures to minimize impacts to ESA-listed species, including the following most pertinent to our analysis:

- Following construction practices as outlined in the Applicant's *Plan of Development. FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (ECRP), FERC's Wetland and Waterbody Construction and Mitigation Procedures,* the Applicant's *Erosion Control and Revegetation Plan* and the Applicant's *Stream Crossing* R*isk Analysis and Addendum*

[1] Published by FWS Western Washington Fish and Wildlife Office, Revised October 13, 2006.
[2] A pig launcher is the facility where a remotely operated pipe inspection and cleaning tool (called a pig) is deployed into the pipeline.

- Isolating the in-water work area when direct pipe (DP) technology or horizontal directional drilling (HDD) are not used
- Salvaging fish from isolated stream crossing areas
- Using site-specific BMPs/restoration plans at the following mileposts of the pipeline on the following perennial streams because of the risk for slope failure. These plans were developed based on field measurements and observations, widely accepted techniques for bank restoration, bed restoration, and aquatic habitat restoration techniques:
    - Milepost 24.07 Middle Creek
    - Milepost 37.35 Tributary to Big Creek
    - Milepost 48.27 Deep Creek
    - Milepost 109.17 Tributary to East Fork Cow Creek
    - Milepost 109.47 East Fork Cow Creek
    - Milepost 109.69 Tributary to East Fork Cow Creek
    - Milepost 109.78 Tributary to East Fork Cow Creek
    - Milepost 162.45 South Fork Little Butte Creek
- After installation of the pipeline, restore TARs to their previous condition and land use
- Implementing the *Integrated Pest Management Plan* to minimize the potential spread and infestation of weeds along the construction right-of-way. The Plan was developed with the assistance of Oregon Department of Agriculture (ODA), BLM and U.S. Forest Service (USFS). The Plan calls for reconnaissance surveys, pre-construction mechanical equipment removal of noxious weeds, spot treatment of infested areas (not within 100 feet of wetlands or waterbodies without approval by an appropriate agency), buffers and timing restrictions and the use of only those chemicals that are approved by the appropriate Federal land management agency on Federal lands and by ODA on private lands.
- Burying the pipeline at stream crossings below the estimated 100-year scour depth or into competent bedrock, whichever is shallower
- At shallow bedrock areas, use specialized excavation methods to reach the required pipeline design burial depth before blasting
- All areas disturbed by construction, including the construction right-of-way, TEWAs, UCSAs, and contractor yards, will be restored and revegetated post-construction
- Implement BMPs, as described in the Stream Crossing Risk Assessment, at all waterbody crossings
- All waterbodies (other than areas of HDD or DP methods or temporary bridge construction) will be crossed during the ODFW recommended in-water work windows
- Monitoring revegetation for up to five years with replanting/interplanting when stocking levels do not meet targets.

Implementing monitoring and contingency plans during all HDD and DP activities to minimize inadvertent release of drilling fluid (BA Appendix D)

1.3.3 Offsite Mitigation Activities

The overarching goal of proposed offsite mitigation activities is to benefit listed species and their habitats. The Applicants will implement restoration activities throughout the action area; these

include the following (for a full description, see the Applicants' CMP and FERC's BA and EIS, which we adopt for our analysis). All in-water work will be conducted during the approved ODFW in-water work window, unless otherwise approved by NMFS.

Restoration activities in watersheds along the pipeline route include (for further descriptions, including amounts and locations, refer to Appendix O of the BA and Attachment 2 of the CMP):

- In-stream large wood (LW) installation (these are stand-alone LW projects, not LW installed at waterbody crossings)
- Riparian vegetation planting
- Fish passage improvement
- Road decommissioning
- Road surfacing and storm-proofing
- Repairing/replacing road-stream crossings
- Riparian fencing

Activities at the Kentuck Aquatic Restoration Site include (for a full description, refer to Attachment 14 of the CMP):

- Constructing a new bridge on East Bay Drive to allow tidal exchange between Kentuck Inlet and the tidal portion of the Kentuck Aquatic Restoration Site
- Restoring tidal connectivity to approximately 72 acres of historic tidelands
- Constructing a new tide gate with muted tidal regulator to redirect Kentuck Creek into the tidal portion of the Kentuck Aquatic Restoration Site
- Creating new channels and floodplains in the tidal restoration area with heavy equipment and dredge spoils from terminal construction
- Restoring floodplain connectivity and fish habitat to approximately 2.7 acres of Kentuck Creek above the new tide gate
- Raising the profile of East Bay Drive and Golf Course Lane to be above the zone of tidal influence
- Installing stormwater treatment facilities for new impervious surfaces along East Bay Drive and Golf Course Lane
- Installing a culvert under Golf Course Lane meeting fish passage criteria
- Constructing a temporary unloading facility, including a hydraulic unloader on a deck barge, mooring/fleeting barges, booster pump(s), and a dredge material transport pipeline
- Post-construction monitoring for 5 years with performance standards for habitat features and vegetation

Activities at the eelgrass creation site include (for a full description, refer to Appendix O of the BA):

- Excavating a 9.3-acre elevated mound of unvegetated sand/mudflat bordered by eelgrass
- All spoils will be disposed at upland sites
- Resting the area over a winter season
- Transplanting eelgrass shoots to establish at least 2.7 acres of eelgrass

- Annual post-construction monitoring for up to 8 years to ensure establishment, with performance standards for coverage and density of eelgrass
- Consulting the appropriate agencies to determine corrective actions if performance standards are not met

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA establishes a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

FERC determined the proposed action is not likely to adversely affect southern resident killer whale, southern resident killer whale critical habitat, Central American humpback whale critical habitat (proposed), Mexican humpback whale critical habitat (proposed), sei whale, sperm whale, North Pacific right whale, western North Pacific gray whale, green sea turtle, olive ridley sea turtle, loggerhead sea turtle, leatherback sea turtle, or leatherback sea turtle critical habitat. We did not concur with the determination for sperm whales and included them in this biological opinion. We concur with FERC's other NLAA determination and document our concurrence in the "Not Likely to Adversely Affect" determinations section (2.12). On September 19, 2019, we proposed to designate new areas as critical habitat for killer whale (84 FR 49214). We found the project will not likely adversely affect areas under this new designation. That analysis can also be found in section 2.12.

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species" (50 CFR 402.02).

The designation(s) of critical habitat for (species) use(s) the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a ‘‘destruction or adverse modification’’ analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this opinion we use the terms "effects" and "consequences" interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by: (1) Reviewing the status of the species and critical habitat; and (2) adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that is adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species faces, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value

of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. The largest hydrologic responses are expected to occur in basins with significant snow accumulation, where warming decreases snow pack, increases winter flows, and advances the timing of spring melt (Mote *et al*. 2014, Mote *et al.* 2016). Rain-dominated watersheds and those with significant contributions from groundwater may be less sensitive to predicted changes in climate (Tague *et al*. 2013, Mote *et al*. 2014).

During the last century, average regional air temperatures in the Pacific Northwest increased by 1-1.4°F as an annual average, and up to 2°F in some seasons (based on average linear increase per decade; Abatzoglou *et al*. 2014, Kunkel *et al*. 2013). Warming is likely to continue during the next century as average temperatures are projected to increase another 3 to 10°F, with the largest increases predicted to occur in the summer (Mote *et al*. 2014). Decreases in summer precipitation of as much as 30% by the end of the century are consistently predicted across climate models (Mote *et al.* 2014). Precipitation is more likely to occur during October through March, less during summer months, and more winter precipitation will be rain than snow (ISAB 2007, Mote *et al*. 2013, Mote *et al*. 2014). Earlier snowmelt will cause lower stream flows in late spring, summer, and fall, and water temperatures will be warmer (ISAB 2007, Mote *et al.* 2014). Models consistently predict increases in the frequency of severe winter precipitation events (i.e., 20-year and 50-year events), in the western United States (Dominguez *et al*. 2012). The largest increases in winter flood frequency and magnitude are predicted in mixed rain-snow watersheds (Mote *et al*. 2014).

Overall, about one-third of the current cold-water salmonid habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (Mantua *et al.* 2009). Higher temperatures will reduce the quality of available salmonid habitat for most freshwater life stages (ISAB 2007). Reduced flows will make it more difficult for migrating fish to pass physical and thermal obstructions, limiting their access to available habitat (Mantua *et al*. 2010, Isaak *et al*. 2012). Temperature increases shift timing of key life cycle events for salmonids and species forming the base of their aquatic foodwebs (Crozier *et al*. 2011, Tillmann and Siemann 2011, Winder and Schindler 2004). Higher stream temperatures will also cause decreases in dissolved oxygen and may also cause earlier onset of stratification and reduced mixing between layers in lakes and reservoirs, which can also result in reduced oxygen (Meyer *et al*. 1999, Winder and Schindler 2004, Raymondi *et al*. 2013). Higher temperatures are likely to cause several species to become more susceptible to parasites, disease, and higher predation rates (Crozier *et al*. 2008, Wainwright and Weitkamp 2013, Raymondi *et al*. 2013).

As more basins become rain-dominated and prone to more severe winter storms, higher winter stream flows may increase the risk that winter or spring floods in sensitive watersheds will damage spawning redds and wash away incubating eggs (Goode *et al*. 2013). Earlier peak stream flows will also alter migration timing for salmon smolts, and may flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and reducing smolt survival (McMahon and Hartman 1989, Lawson *et al*. 2004).

In addition to changes in freshwater conditions, predicted changes for coastal waters in the Pacific Northwest as a result of climate change include increasing surface water temperature, increasing but highly variable acidity, and increasing storm frequency and magnitude (Mote *et*

al. 2014). Elevated ocean temperatures already documented for the Pacific Northwest are highly likely to continue during the next century, with sea surface temperature projected to increase by 1.0-3.7ºC by the end of the century (IPCC 2014). Habitat loss, shifts in species' ranges and abundances, and altered marine food webs could have substantial consequences to anadromous, coastal, and marine species in the Pacific Northwest (Tillmann and Siemann 2011, Reeder *et al*. 2013).

Moreover, as atmospheric carbon emissions increase, increasing levels of carbon are absorbed by the oceans, changing the pH of the water. Acidification also impacts sensitive estuary habitats, where organic matter and nutrient inputs further reduce pH and produce conditions more corrosive than those in offshore waters (Feely *et al*. 2012, Sunda and Cai 2012).

Global sea levels are expected to continue rising throughout this century, reaching likely predicted increases of 10-32 inches by 2081-2100 (IPCC 2014). These changes will likely result in increased erosion and more frequent and severe coastal flooding, and shifts in the composition of nearshore habitats (Tillmann and Siemann 2011, Reeder *et al*. 2013). Estuarine-dependent salmonids such as chum and Chinook salmon are predicted to be impacted by significant reductions in rearing habitat in some Pacific Northwest coastal areas (Glick *et al*. 2007).

Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances, and therefore these species are predicted to fare poorly in warming ocean conditions (Scheuerell and Williams 2005, Zabel *et al*. 2006). This is supported by the recent observation that anomalously warm sea surface temperatures off the coast of Washington from 2013 to 2016 resulted in poor coho and Chinook salmon body condition for juveniles caught in those waters (NWFSC 2015). Changes to estuarine and coastal conditions, as well as the timing of seasonal shifts in these habitats, have the potential to impact a wide range of listed aquatic species (Tillmann and Siemann 2011, Reeder *et al*. 2013).

The adaptive ability of these threatened and endangered species is depressed due to reductions in population size, habitat quantity and diversity, and loss of behavioral and genetic variation. Without these natural sources of resilience, systematic changes in local and regional climatic conditions due to anthropogenic global climate change will likely reduce long-term viability and sustainability of populations in many of these salmon ESUs and steelhead DPSs (NWFSC 2015). New stressors generated by climate change, or existing stressors with effects that have been amplified by climate change, may also have synergistic impacts on species and ecosystems (Doney *et al*. 2012). These conditions will possibly intensify the climate change stressors inhibiting recovery of ESA-listed species in the future.

2.2.1 Status of the Species

Table 3 provides a summary of listing and recovery plan information, status, and limiting factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. These documents are available on the NMFS West Coast Region website (http://www.westcoast.fisheries.noaa.gov/) and cited in the References Section of this

Opinion. The BA included detailed analysis of the status of these species. We incorporate that discussion by reference here, also.

Table 3. Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered in this opinion.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Oregon Coast (OC) coho salmon	Threatened 6/20/11; reaffirmed 4/14/14	NMFS 2016a	NWFSC 2015	This ESU comprises 56 populations including 21 independent and 35 dependent populations. The last status review indicated a moderate risk of extinction. Significant improvements in hatchery and harvest practices have been made for this ESU. Most recently, spatial structure conditions have improved in terms of spawner and juvenile distribution in watersheds; none of the geographic area or strata within the ESU appear to have considerably lower abundance or productivity. The ability of the ESU to survive another prolonged period of poor marine survival remains in question.	• Reduced amount and complexity of habitat including connected floodplain habitat • Degraded water quality • Blocked/impaired fish passage • Inadequate long-term habitat protection • Changes in ocean conditions
Southern Oregon/ Northern California Coast (SONCC) coho salmon	Threatened 6/28/05	NMFS 2014	NMFS 2016b	This ESU comprises 31 independent, 9 independent, and 5 ephemeral populations all grouped into 7 diversity strata. Of the 31 independent populations, 24 are at high risk of extinction and 6 are at moderate risk of extinction. The extinction risk of an ESU depends upon the extinction risk of its constituent independent populations; because the population abundance of most independent populations are below their depensation threshold, the SONCC coho salmon ESU is at high risk of extinction and is not viable	• Lack of floodplain and channel structure • Impaired water quality • Altered hydrologic function • Impaired estuary/mainstem function • Degraded riparian forest conditions • Altered sediment supply • Increased disease/predation/competition • Barriers to migration • Fishery-related effects • Hatchery-related effects

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Southern DPS green sturgeon (green sturgeon)	Threatened 4/7/06	NMFS 2018a	NMFS 2015a	The Sacramento River contains the only known green sturgeon spawning population in this DPS. The current estimate of spawning adult abundance is between 824-1,872 individuals. Telemetry data and genetic analyses suggest green sturgeon generally occur from Graves Harbor, Alaska to Monterey Bay, California and, within this range, most frequently occur in coastal waters of Washington, Oregon, and Vancouver Island and near San Francisco and Monterey bays. Within the nearshore marine environment, tagging and fisheries data indicate that green sturgeon prefer marine waters of less than a depth of 110 meters.	• Reduction of its spawning area to a single known population • Lack of water quantity • Poor water quality • Poaching
Southern DPS Pacific eulachon (eulachon)	Threatened 3/18/10	NMFS 2017a	Gustafson *et al*. 2016	The Southern DPS of eulachon includes all naturally-spawned populations that occur in rivers south of the Nass River in British Columbia to the Mad River in California. Sub populations for this species include the Fraser River, Columbia River, British Columbia and the Klamath River. In the early 1990s, there was an abrupt decline in the abundance of eulachon returning to the Columbia River. Despite a brief period of improved returns in 2001-2003, the returns and associated commercial landings eventually declined to the low levels observed in the mid-1990s. Although eulachon abundance in monitored rivers has generally improved, especially in the 2013-2015 return years, recent poor ocean conditions and the likelihood that these conditions will persist into the near future suggest that population declines may be widespread in the upcoming return years	• Changes in ocean conditions due to climate change, particularly in the southern portion of the species' range where ocean warming trends may be the most pronounced and may alter prey, spawning, and rearing success. • Climate-induced change to freshwater habitats • Bycatch of eulachon in commercial fisheries • Adverse effects related to dams and water diversions • Water quality, • Shoreline construction • Over harvest • Predation

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Blue Whale	Endangered 10/2/70	NMFS 1998	Carretta *et al.* 2019	North Pacific blue whales produce two distinct acoustic calls, "northwestern" and "northeastern" types. The northeastern call predominates in the Gulf of Alaska, along the U.S. West Coast, and in the eastern tropical Pacific. The Eastern North Pacific Stock includes animals found in the eastern North Pacific from the northern Gulf of Alaska to the eastern tropical Pacific. An analysis of line-transect survey data from 1996-2014 provides a range of blue whale estimates from a high of approximately 2,900 whales in 1996 to a low of 900 whales in 2008 (Barlow 2016a). The mean abundance estimate from the two most-recent line-transect surveys conducted in 2008 and 2014 is 1,146 (coefficient of variation=0.33) whales. The minimum population estimate for blue whales is approximately 1,551. Based on mark-recapture estimates there is no evidence of a population size increase in this blue whale population since the early 1990s. The observed rate of population increase from mark-recapture estimates likely represents an underestimate of the maximum net productivity rate for this stock. For this reason and because an estimate of maximum net productivity is lacking for any blue whale population, the default rate of 4% is used for all blue whale stocks, based on NMFS guidelines for preparing stock assessments (NMFS 2016c). Although the species is often found in coastal waters, blue whales are thought to occur generally more offshore (NMFS 1998).	• Collisions with vessels, entanglement in fishing gear, habitat degradation (loss of prey resources), and disturbance from low-frequency noise are potential indirect threats (NMFS 1998). • The potential biological removal (PBR)[3] level for this stock is 9.3 whales per year. Because whales in this stock spends approximately three quarters of their time outside the U.S. EEZ, the PBR allocation for U.S. waters is one-quarter of this total, or 2.3 whales per year (Carretta *et al.* 2018). • Commercial fishing gear, ship strikes and anthropogenic sound pose the biggest risk to blue whales. • Annual entanglement rates of blue whales in commercial fishing gear is approximately 0.96 blue whales annually. • Most observed blue whale ship strikes have been in the southern California Bight, where large container ship ports overlap with seasonal blue whale distribution (Berman-Kowalewski *et al*. 2010). • The estimated mortality of 18 blue whales annually in the California Current due to ship strikes represents approximately 1% (18 deaths / 1,647 whales) of the estimated population size of the stock (Rockwood *et al*. 2017). PBR is exceeded based on this estimate. • Anthropogenic noise results in a variety of behavioral responses. • One concern expressed is that "repeated exposures could negatively impact individual feeding performance, body condition and ultimately fitness and potentially population health." (Goldbogen *et al*. 2013). • Currently, no evidence indicates that such reduced population health exists, but such evidence would be difficult to differentiate from natural sources of reduced fitness or mortality in the population (Carretta *et al.* 2018).

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Fin Whale	Endangered 6/2/70	NMFS 2010	Carretta *et al.* 2019	The best estimate of fin whale abundance in California, Oregon, and Washington waters out to 300 nmi is 9,029 (coefficient of variationV=0.12) whales (Nadeem *et al*. 2016). The minimum population estimate for fin whales is approximately 8,127 whales (Carretta *et al.* 2019). Population wise there has been a roughly 5-fold increase between 1991 and 2014. Since 2005, the abundance increase has been off northern California, Oregon and Washington, numbers off Central and Southern California have been stable (Nadeem *et al*. 2016). It is unknown how much of this growth is due to immigration rather than birth and death processes.	• Among the current potential threats are collisions with vessels, reduced prey abundance due to overfishing and/or climate change, and, possibly, the effects of increasing anthropogenic ocean noise (NMFS 2010). • The potential biological removal (PBR) level for this stock is 81 whales per year. • The total documented incidental mortality and serious injury (2.1/yr.) due to fisheries (0.5/yr.) and ship strikes (1.6/yr.) is less than the calculated PBR (81) (Carretta *et al.* 2018). • Estimated vessel strike mortality in the population ranges between 43 and 95 whales annually, or 0.5 to 1% of the total estimated population size. These estimates of ship strike deaths are corrected for undocumented and undetected cases, as they are model-derived (Carretta *et al.* 2018). • Increasing levels of anthropogenic sound in the world's oceans has been suggested to be a habitat concern for whales. Behavioral changes associated with exposure to simulated mid-frequency sonar has been documented in tagged blue whales (Goldbogen *et al*. 2013), but it is unknown if fin whales respond in the same manner to such sounds (Carretta *et al.* 2018).

[3] We use the potential biological removal (PBR) concept in assessing effects of incidental mortality under the MMPA. PBR represents the maximum level of anthropogenic mortality consistent with achievement of the stock's optimum sustainable population level. While PBR serves as a useful metric for gauging the relative level of impact on marine mammal stocks as defined in the MMPA, PBR by itself does not equate to a species or population level assessment under the ESA where analyses are conducted at the level of the species listed as threatened or endangered, under the ESA's "jeopardy" standard. PBR is calculated as Nmin* 0.5 Rmax * F, where Nmin is the minimum current population size, Rmax is the maximum annual rate of increase for the species or stock, and F is a recovery factor that ranges from 0.1 to 1 depending on the conservation status of the stock.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Central American and Mexican DPS Humpback Whale (hereafter humpback whale)	Endangered 12/2/70	NMFS 1991	Carretta *et al.* 2019	Humpback whales off the coast of California, Oregon and Washington are primarily from the non-listed Hawaii distinct population segment (DPS) and the threatened Mexico DPS, with a very small proportion from the endangered Central America DPS (Wade *et al*. 2016). This "California/Oregon/Washington Stock" is defined to include humpback whales that feed off the west coast of the United States. Two feeding groups are identified, California/Oregon and Washington/southern British Columbia. Population estimates for the California/Oregon group estimates range from approximately 1,400 to 2,400 animals (Carretta *et al.* 2019). Combining abundance estimates from both the California/Oregon and Washington/southern British Columbia feeding groups (2,374 + 526) yields an estimate of 2,900 animals for the California/Oregon/Washington stock (Carretta *et al.* 2019) The minimum population estimate for humpback whales in the California /Oregon /Washington stock is 2,784 animals. Ship surveys indicate that humpback whales increased in abundance in California coastal waters between 1979/80 and 1991 (Barlow 1994) and between 1991 and 2014 (Barlow 2016b) with slight dips in 2001 and 2008. Mark-recapture population estimates show a long-term increase of approximately 8% per year (Calambokidis *et al*. 2009). Recent estimates show a possible leveling-off of the population size depending on the choice of model and time frame used (Calambokidis and Barlow 2013, Calambokidis *et al*. 2017).	• Human induced factors that could impede recovery include subsistence hunting, incidental entrapment or entanglement in fishing gear, collision with ships, and disturbance or displacement caused by noise and other factors associated with shipping, recreational boating, high-speed thrill craft, whale watching or air traffic. Introduction and or persistence of pollutants and pathogens from waste disposal; disturbance and/or pollution from oil, gas or other mineral exploration and production; habitat degradation or loss associated with coastal development; and competition with fisheries for prey species (NMFS 1991). • The potential biological removal (PBR) level for this stock is resulting in a PBR of 33.4. Because this stock spends approximately half its time outside the U.S. EEZ, the PBR allocation for U.S. waters is 16.7 whales per year. • 123 human-related interactions (commercial fisheries, vessel strikes and entanglements with moorings) involving humpback whales occurred for the 5-year period 2012-2016 (Carretta *et al.* 2018). The number for each humpback whale feeding group are unknown, but based on 82% of the stock being in the California/Oregon group, a majority of cases likely involve whales from that group (Calambokidis *et al*. 2017). • Estimated ship strike mortality for the California Current is 22 whales per year (Rockwood *et al*. 2017). • The total observed and estimated annual human-caused mortality of humpback whales is 38.6 humpback whales annually. This exceeds the range-wide PBR estimate of 33.4 humpback whales. • Increasing levels of anthropogenic sound in the world's oceans such as those produced by shipping traffic, or LFA (Low Frequency Active) sonar has been suggested to be a habitat concern for whales as it can reduce acoustic space used for communication.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Sperm Whale	Endangered 12/2/70	NMFS 2010	Carretta *et al.* 2019	Sperm whale abundance estimates based on the trend-model ranged between 2,000 and 3,000 animals for the 1991-2014 time series (Moore and Barlow 2014). The best estimate of sperm whale abundance in the California Current is 1,997 animals. The minimum population estimate for sperm whales is based on the 2014 abundance estimate, or 1,270 whales (Moore and Barlow 2017). Moore and Barlow (2014) reported that sperm whale abundance appeared stable from 1991 to 2008 and additional data from a 2014 survey does not change that conclusion (Moore and Barlow 2017).	• Among the current potential threats are collisions with vessels, reduced prey abundance due to climate change, contaminants and pollutants, and, possibly, the effects of increasing anthropogenic ocean noise (NMFS 2010). • The potential biological removal (PBR) level for this stock is 2.5 animals per year. • Mortality from commercial fishing ventures is ≥ 0.7 animals per year • For the most recent 5-year period of 2011-2015, one ship strike death of a sperm whale was documented in 2012 (Carretta *et al.* 2017a) and the mean annual average mortality and serious injury is ≥ 0.2 whales. • The annual rate of documented mortality and serious injury (≥ 0.9 per year) is less than the calculated PBR (2.5) for this stock. Since the total human-caused mortality is greater than 10% of the calculated PBR, it cannot be considered to be insignificant and approaching zero mortality and serious injury rate. • Increasing levels of anthropogenic sound in the world's oceans has been suggested to be a habitat concern for whales, particularly for deep-diving whales like sperm whales that feed in the ocean's "sound channel".

2.2.2 Status of the Critical Habitat

This section describes the status of designated critical habitats affected by the proposed action by examining the condition and trends of the essential PBFs of that habitat throughout the designated areas. These features are essential to the conservation of the ESA-listed species because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration and foraging). For several of the species covered in this opinion, we have not designated critical habitat or it is designated, but outside of the action area. The BA included detailed analysis of the status of critical habitat. We incorporate that discussion by reference here, also.

A summary of the status of critical habitats considered in this opinion is provided in Table 4, below.

Table 4. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered in this opinion.

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Oregon Coast (OC) coho salmon	2/11/08 73 FR 7816	Critical habitat encompasses 13 subbasins in Oregon. The long-term decline in OC coho salmon productivity reflects deteriorating conditions in freshwater habitat as well as extensive loss of access to habitats in estuaries and tidal freshwater. Many of the habitat changes resulting from land use practices over the last 150 years that contributed to the ESA-listing of OC coho salmon continue to hinder recovery of the populations; changes in the watersheds due to land use practices have weakened natural watershed processes and functions, including loss of connectivity to historical floodplains, wetlands and side channels; reduced riparian area functions (stream temperature regulation, wood recruitment, sediment and nutrient retention); and altered flow and sediment regimes (NMFS 2016a). Several historical and ongoing land uses have reduced stream capacity and complexity in Oregon coastal streams and lakes through disturbance, road building, splash damming, stream cleaning, and other activities. Beaver removal, combined with loss of large wood in streams, has also led to degraded stream habitat conditions for coho salmon (Stout et al. 2012)
Southern Oregon/Northern California Coast (SONCC) coho salmon	5/5/99 64 FR 24049	Critical habitat includes all areas accessible to any life-stage up to long-standing, natural barriers and adjacent riparian zones. SONCC coho salmon critical habitat within this geographic area has been degraded from historical conditions by ongoing land management activities. Habitat impairments recognized as factors leading to decline of the species that were included in the original listing notice for SONCC coho salmon include: 1) Channel morphology changes; 2) substrate changes; 3) loss of in-stream roughness; 4) loss of estuarine habitat; 5) loss of wetlands; 6) loss/degradation of riparian areas; 7) declines in water quality; 8) altered stream flows; 9) fish passage impediments; and 10) elimination of habitat
Southern DPS of green sturgeon (hereafter green sturgeon)	10/09/09 74 FR 52300	Critical habitat has been designated in coastal U.S. marine waters within 60 fathoms depth from Monterey Bay, California (including Monterey Bay), north to Cape Flattery, Washington, including the Strait of Juan de Fuca, Washington, to its United States boundary; the Sacramento River, lower Feather River, and lower Yuba River in California; the Sacramento-San Joaquin Delta and Suisun, San Pablo, and San Francisco bays in California; tidally influenced areas of the Columbia River estuary from the mouth upstream to river mile 46; and certain coastal bays and estuaries in California (Humboldt Bay), Oregon (Coos Bay, Winchester Bay, Yaquina Bay, and Nehalem Bay), and Washington (Willapa Bay and Grays Harbor), including, but not limited to, areas upstream to the head of tide in various streams that drain into the bays, as listed in Table 1 in USDC (2009). The CHRT identified several activities that threaten the PBFs in coastal bays and estuaries and necessitate the need for special management considerations or protection. The application of pesticides is likely to adversely affect prey resources and water quality within the bays and estuaries, as well as the growth and reproductive health of green sturgeon through bioaccumulation. Other activities of concern include those that disturb bottom substrates, adversely affect prey resources, or degrade water quality through re-suspension of contaminated sediments. Of particular concern are activities that affect prey resources. Prey resources are affected by: commercial shipping and activities generating point source pollution and non-point source pollution that discharge contaminants and result in bioaccumulation of contaminants in green sturgeon; disposal of dredged materials that bury prey resources; and bottom trawl fisheries that disturb the bottom (but result in beneficial or adverse effects on prey resources for green sturgeon).

2.3 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). Areas affected directly or indirectly by this action occur within a corridor between the eastern end of the pipeline near Malin, Oregon and the edge of the Outer Continental Shelf (OCS) approximately 12 nautical miles (nm) off the coast of Oregon. There is overlap between the areas impacted by the proposed action and the range of ESA-listed species and designated critical habitats. We describe this overlap below in three contiguous analysis areas:

Riverine Analysis Area – This area encompasses fifth-field watersheds disturbed by construction of the pipeline. It incorporates the pipeline construction corridor, locations of offsite mitigation activities, the downstream extent of suspended sediment plumes from in-water work (see BA for these locations and distances), and the downstream extent of contaminants from the stormwater outfall locations. Oregon Coast (OC) coho salmon occur within watersheds of the Coos, Coquille and Umpqua river basins. Southern Oregon/Northern California Coast (SONCC) coho salmon occur within watersheds of the Rogue River basin.

The riverine analysis area is delimited as the geographic locations where consequences from the proposed action are reasonably certain to result in effects on listed species and/or critical habitat. The pipeline also crosses watersheds in the Klamath River Basin. Current distribution of SONCC coho salmon, the only NMFS ESA-listed species in the upper Klamath River Basin, and designated SONCC coho salmon critical habitat are restricted to the Klamath River below Iron Gate Dam (far from the consequences of the proposed action). Therefore, effects from the portion of the action area in the Klamath River Basin do not overlap with species or critical habitats considered in this opinion and will not be discussed further.

Estuarine Analysis Area – The estuarine analysis area incorporates all areas disturbed by construction and operation of the project from the entrance to Coos Bay extending upstream to the heads of tides. It includes the terminal construction area, pipeline construction corridor, locations of offsite mitigation construction (Kentuck Slough and the eelgrass mitigation site), pile placement areas, the Federal Navigation Channel, the extent of suspended sediment plumes from in-water work, the downstream extent of contaminants from the stormwater outfall locations, and the extent of sound pressure waves from pile driving (approximately 522 feet from each pile). Southern DPS Green sturgeon (green sturgeon), southern DPS eulachon (eulachon), and OC coho salmon occur within the estuarine analysis area.

Marine Analysis Area – For the Marine Analysis Area, we identified the overlap of effects from shipping and ESA-listed species and designated critical habitats as a fan shape, beginning at the entrance to Coos Bay extending approximately 12 nm off the coast of Oregon to the edge of the OCS. The northern border of the fan extends from the North Jetty to the point located at the edge of the OCS near 43°28′39″ -124°33′34″, and the southern border extends from the South Jetty to a point located at the edge of the OCS near 43°24′49″, -

124°35′8″. Although the LNG vessels calling on the terminal are likely to continue on to Asia, we identified the OCS as a boundary. The potential for consequences of the proposed action to result in an effect (e.g. marine mammal ship strike or fish entrained in engine cooling water) to species covered in this opinion beyond the OCS is too remote and uncertain. This is because the density of project related vessels, marine mammals, and fish is substantially lower beyond the OCS, to the point that exposure is not reasonably certain. Also, the vessel destinations and routes are not known at this time.

The action area includes the offshore industrial wastewater pipeline outfall and associated 500-foot mixing zone where contaminants from the terminal site will be discharged. Present in the marine analysis area are all listed marine mammals, green sturgeon, eulachon, OC coho salmon, and SONCC coho salmon.

Collectively, the three analysis areas form the action area for this consultation.

2.4 Environmental Baseline

Environmental baseline refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

Habitat conditions within all of the entire watersheds crossed by the pipeline corridor are considered in this discussion of the baseline, partly because the potential consequences of pipeline construction may extend beyond the pipeline corridor. Moreover, exact locations of some offsite mitigation activities included in the proposed action have not been determined, but we know they will occur within these watersheds.

As described above in the Status of the Species and Critical Habitat sections, factors that limit the recovery of species considered in this opinion vary with the overall condition of aquatic habitats on private, state, and Federal lands. Within the action area, many stream and riparian areas have been degraded by the effects of land and water use, including road construction, forest management, agriculture, mining, transportation, urbanization, and water development. Each of these activities has contributed to a myriad of factors for the decline of species considered in this opinion. Among the most important of these are changes in stream channel morphology, degradation of spawning substrates, reduced instream roughness and cover, loss and degradation of estuarine rearing habitats, loss of wetlands, loss and degradation of riparian areas, water quality degradation (*e.g.*, temperature, sediment, dissolved oxygen), blocked fish passage, direct take, and loss of habitat refugia. Climate change is likely to play an increasingly important role

in determining the abundance of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest.

2.4.1 Environmental Baseline – Riverine Analysis Area: Upper Rogue River

The Upper Rogue population of SONCC coho salmon is the only NMFS ESA-listed species in the Upper Rogue River subbasin. Until Gold Ray Dam was removed in 2009, ODFW operated a fish counting station in its ladder. This station counted nearly all the Upper Rogue SONCC coho salmon population (with the exception of fish returning to Evans Creek; ODFW 2019). To estimate the recent adult returners to the Upper Rogue population, we multiplied the last 10 years of Huntley Park data (which estimates all four populations within the Rogue River; Sounhein *et al*. 2019) by a correction factor.[4] The average annual adult return of SONCC coho salmon to the Upper Rogue population over the last 10 years (2009-2018) is approximately 6,581 fish.

The basin covers 2,422 mi² of which approximately 52% is Federal land, managed by the USFS or the BLM. The USFS primarily manages lands in the Upper Rogue River headwaters along the crest of the Cascade Range. The BLM manages a substantial amount of land in the upper Rogue River, but it alternates with private land in a checker board pattern. The BLM and USFS have consulted on Federal land management activities, including restoration actions, forest management, livestock grazing, and special use permits. The Corps, NOAA Restoration Center, state agencies and private entities have also completed significant restoration actions, including dam removal and other passage projects. Restoration actions may have short-term adverse effects, but generally result in long-term improvements to habitat condition and salmonid population abundance, productivity, and spatial structure.

The recovery plan found the juvenile life stage of SONCC coho salmon is most limited due to degraded summer and winter rearing habitat. Juvenile summer rearing habitat is impaired due to poor habitat complexity, high water temperatures due to degraded riparian conditions, and loss of summer flow due to water withdrawals. Winter rearing habitat has been degraded by poor habitat complexity and loss of floodplain connection. Logging and other uses of riparian forests has reduced the amount of large wood in channels, as well as the potential for future large wood input. Barriers throughout the basin limit access to rearing habitat. The two key limiting stresses identified in the Recovery Plan for the upper Rogue River population are impaired water quality and altered hydrologic function.

The plan also discusses 13 threats affecting the life stages of SONCC coho salmon. The two key limiting threats identified in the plan are agricultural practices and urban/residential/industrial development. Agricultural practices in the Upper Rogue River remove a significant percentage of water from streams during summer and reduce riparian vegetation form streambanks. Urban/residential/industrial development cause increased peak flows, decreased base flows, simplified channel conditions, increased non-point source stormwater pollution, and result in loss of aquatic system function.

[4] Calculated as counts at Gold Ray Dam divided by counts at Huntley Park from the last 10 years of data from both Huntly Park and Gold Ray Dam 2000-2009

2.4.2 Environmental Baseline – Riverine Analysis Area: Coos, Coquille and Umpqua Rivers

The Coos, Coquille, and South Umpqua populations of OC coho salmon are the only ESA-listed salmonid species in these basins. ODFW estimates the adult returners to these populations each year. Over the last 10 years (2009-2018), the average annual adult return of OC coho salmon is 13,845 to the Coos population, 19,591 to the Coquille population, and 13,696 to the South Umpqua population (Sounhein *et al*. 2019).

The current primary limiting factors to the recovery of OC coho salmon as identified in the OC Coho Final Recovery Plan (NMFS 2016a) are:

- Reduced amount and complexity of habitat
- Degraded water quality
- Blocked/impaired fish passage
- Uncertainty that there is an adequate combination of voluntary and regulatory mechanisms to ensure success (defined in the plan as sustainability)

The primary habitat threats to OC coho salmon as described in the recovery plan (NMFS 2016a) are:

- Historical, current and future land use activities that affect watershed functions that support coho habitat
- Disease and increase in parasites
- Predation from birds, marine mammals and warm water fishes
- Ineffective regulatory mechanisms
- Changes in ocean conditions
- Climate change

The primary limiting factor for the Coos and Coquille populations is stream complexity with water quality a secondary limiting factor (NMFS 2016a). Water quantity is the primary limiting factor for the South Umpqua population with stream complexity and water quality listed as secondary limiting factors (NMFS 2016a).

Rising temperatures anticipated with global climate change will have an overall negative effect on the status of the ESU. Likely changes in temperature, precipitation, wind patterns, ocean acidification, and sea-level height due to climate change could affect survival and productivity of OC coho salmon in their freshwater, estuarine, and marine habitats (NMFS 2016a).

The long-term decline in OC coho salmon productivity reflects deteriorating conditions in freshwater habitat, as well as, extensive loss of access to habitats. Many of the habitat changes resulting from land use practices over the last 150 years that contributed to the ESA-listing of OC coho salmon have stabilized, but continue to hinder recovery of the populations. Changes in the watersheds due to land use practices have weakened natural watershed processes and functions, including loss of connectivity to historical floodplains, wetlands and side channels; reduced riparian area functions (stream temperature regulation, wood recruitment, sediment and nutrient retention); and altered flow and sediment regimes (NMFS 2016a). Several historical and

ongoing land uses have reduced stream capacity and complexity in Oregon coastal streams and lakes through disturbance, road building, splash damming, stream cleaning, and other activities.

The BLM manages a substantial amount of land in these basins, but it alternates with private land in a checkerboard pattern. The USFS primarily manages lands in the upper South Umpqua River watersheds. The BLM has consulted on Federal land management activities, including restoration actions, forest management, and special use permits. The USFS and BLM have completed significant restoration activities, including large wood placements and passage projects. Restoration actions may have short-term adverse effects, but generally result in long-term improvements to habitat condition and salmonid population abundance, productivity, and spatial structure.

2.4.3 Environmental Baseline – Estuarine Analysis Area

The Coos Bay estuary, where the LNG terminal will be located, and across which a 2.4-mile-long portion of the pipeline will cross, contains habitats for the Coos population of OC coho salmon, eulachon, and green sturgeon. Over the last 10 years (2009-2018), the average annual adult return of OC coho salmon is 13,845 to the Coos population (Sounhein *et al*. 2019). Eulachon returning to Coos Bay tributaries are likely part of the Columbia River subpopulation, which has a 10-year (2009-2018) average annual adult return of approximately 57 million (Langness *et al*. 2018). The total population of green sturgeon is estimated at 17,548 individuals (Mora *et al*. 2018).

The estuary is classified as a drowned river mouth type estuary, where winter flows discharge high volumes of sediment through the estuary. In summer, when discharge is lower, seawater inflow dominates the estuary. ODFW researchers have divided the estuary into subsytems: marine (mouth to RM 2.5), lower bay (RM 2.5 to RM 9), upper bay (RM 9 to RM 17), riverine and slough. These categories were based on sediments, habitat types and geographic locations.

The terminal site at Jordan Cove is within the lower bay subsystem. Berg *et al.* (2013) described the lower bay subsystem as:

> "The lower bay subsystem experiences substantial oceanic influence, but is not strongly affected by wave action. Habitat has considerable bearing on the type of fish present, and generally this area is relatively protected from turbulence. Marsh and eelgrass habitat are more common in this subsystem and these vegetated areas appear to exhibit greater species diversity and are preferred by aquatic species. Many species are also found in great numbers over sandy substrates. Most fish species of Coos Bay use the flats of the lower bay at some time during the year. Sediments of the lower bay are predominately sand. Subtidal habitats include unconsolidated bottom substrates of the dredged ship channel and adjacent areas and aquatic beds in shallower areas."

The Coos Watershed Association has reported summaries of watershed health indicators for tideland habitats in Coos Bay (Table 5). They summarize and report for three habitat types: tidal wetlands, tidal flats and the sub-tidal zone.

Wetland functions within the estuary have been affected by dikes, tide gates, roads and railroads, ditches, and dams that restrict tidal flows and/or have changed tidal flow patterns. Agricultural land uses have contributed to erosion of channels and, along with channel armoring, have affected vegetation diversity in wetlands, channel shading, and salmonid habitat function; tidal wetlands have also been affected by excavations and disposal of dredged materials. Extensive filling and diking of Coos Bay and its sloughs, estuaries, and tributaries have changed the form and function of the estuary. Approximately 90% of the salt marshes of Coos Bay have been diked or filled to accommodate industry, residential areas, and agriculture and for dredged material disposal sites (Hoffnagle and Olson 1974).

Dredging of the navigation channel has deepened channels and thereby changed circulation, physical processes, and bathymetry in the systems. In 2017, NMFS consulted with the Corps and found their proposed maintenance dredging of the Federal Navigation Channel would not jeopardize any species or result in adverse modification of any critical habitats (NMFS No. WCR-2016-5055). The Corps removes up to 2,350,000 cubic yards of sediment from Coos Bay annually. The Corps may place some of this material within the bay, particularly when the entrance channel bar is impassable, but the vast majority of the material is taken offshore. Intense development in and around the estuary has impacted the shoreline and intertidal zone by removing vegetation and habitats.

Table 5. Watershed Health Indicators for Three Tidal Habitat Zones in the Coos Bay Estuary.

Tideland Habitat Zone	Hydro-Modification	Sediment Regime	Water Quality	Vegetation Modification	Invasive Species	Habitat Loss
Tidal Wetlands	Limiting	Limiting	Moderate	Limiting	Moderate	Limiting
Tidal Flat Zone	Limiting	Moderate	Moderate	N/A	Limited	Moderate
Sub-Tidal Zone	Moderate	Moderate	Moderate	N/A	Moderate	Moderate
Source: Oregon Watershed Enhancement Board, from Table 3.5.4-4 in FERC 2015a						

Restoration activities have gained popularity in recent decades. Tidal restorations have significantly improved aquatic habitats, particularly in the Winchester Creek arm and Isthmus Slough. Other channel restorations have also occurred, such as Anderson Creek and Matson Creek. These restorations are locally significant, though just bringing back a small fraction of the amount of wetlands lost in Coos Bay. Cessation of log storage within Coos Bay and Isthmus Slough has also improved aquatic habitat there.

2.4.4 Environmental Baseline – Marine Analysis Area

The ocean portion of the action area supports SONCC coho salmon, OC coho salmon, green sturgeon, eulachon, and several species of whales. Warming ocean waters associated with climate change will likely have profound effects on the marine ecosystem in the action area. Warm ocean waters are generally associated with low fish productivity and abundance.

The Corps removes up to 2,350,000 cubic yards of sediment from Coos Bay annually. The Corps disposes of the vast majority of this material within the marine analysis area at designated ocean dredged material disposal sites. In 2017, NMFS consulted with the Corps on this disposal and found it would not jeopardize any species or result in adverse modification of any critical habitats (NMFS No. WCR-2016-5055).

We have no reports of ship strikes within the action area. However, ship strikes have been identified as a significant source of mortality to whales. According to the BA, approximately 50 large cargo vessels per year travel in and out of Coos Bay (100 trips). Blue whales, fin whales and humpback whales are most susceptible to ship strikes due to their propensity to be closer to the shore.

Increasing levels of anthropogenic sound in the world's oceans, such as those produced by shipping traffic, Acoustic Thermometry of Ocean Climate or Low Frequency Active sonar, have been suggested to be a concern for whales, particularly for baleen whales (fin, humpback, and blue) that may communicate using low frequency sound. Based on vocalizations, reactions to sound sources, and anatomical studies, humpback whales also appear to be sensitive to mid-frequency sounds, including those used in active sonar military exercises. We do not have specific information about what types of acoustic disturbance is in the action area; however, we expect noise from shipping, boating associated with commercial and recreational fishing, and Coast Guard operations.

Whales (particularly gray whales) can become entangled in commercial fishing gear. We completed a section 7 consultation on the Federal groundfish fishery, finding the proposed action would not jeopardize green sturgeon, eulachon, or humpback whales, or adversely modify critical habitat for green sturgeon (NMFS# 2011/6358). This biological opinion covers activities up and down the coast. Use of commercial fishing gear (most likely to entangle whales) within the action area has likely been limited as it is an active shipping lane.

2.5 Effects of the Action

Under the ESA, "effects of the action" are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b). For example, LNG vessels calling on the terminal in the future are a consequence of the proposed action. They will not be traversing the action area but for the proposed action.

For this consultation, we do not consider impacts from greenhouse gases generated at the ultimate point of using LNG from the proposed action as a consequence of the proposed action. The causal connection between project-related LNG and effects to our trust species requires several steps to analyze, including; the point of use (which we do not know), how it will be used (which we do not know), the efficiency of that use, how much CO_2 may be released into the

atmosphere, where atmospheric current will take the CO_2, how much the CO_2 will affect air temperatures where it ends up, and what effect those air temperature changes have on water temperatures. Further compounding any analysis would be that natural gas use releases less CO_2 than other fuel uses. Which means that if project-related LNG replaces the use of other fuels, the total release of CO_2 may be reduced. As we now understand them, the best scientific data currently available do not draw a causal connection between greenhouse gas emissions resulting from a specific Federal action and effects on listed species or critical habitat by climate change. Therefore, any effect to our trust species would involve a lengthy and uncertain causal chain that involves so many steps and unknowns as to make the consequence not reasonably certain to occur.

2.5.1 Effects on Species

Riverine Analysis Area

As described in the BA, effects on SONCC coho salmon and OC coho salmon in the riverine analysis area will occur from in-water construction and associated activities, in-stream/riparian habitat modification, and maintenance of the pipeline corridor. We reviewed the effects analysis provided in the BA and compared it to the best available scientific literature on the potential effects that may occur.[5] Based on our independent review, we fully agree with the assessment of most effect pathways and adopt the BA analysis for those pathways. We do not agree with the severity of some pathways as described by FERC, and have discussed those in detail below.

Our independent review found FERC's BA accurately described the following effects pathways; therefore, we adopt their analyses without further detail, also considering them in the summaries at the end of this section:

- Acoustic shock from blasting pipe trench through bedrock streambeds;
- Underwater noise produced during use of a track hoe or impact hammer if fish are proximate to the construction site;
- Inadvertent release of drilling mud during HDD construction;
- Migration blockage during in-stream construction;
- Suspended sediment generated during construction activities;
- Capturing juveniles during salvage operations from in-water work isolation areas;
- Stream bank and unstable hillslope erosion;
- Reduction of food resources due to reduction of freshwater stream invertebrates;
- Reduction of shade from removal of riparian vegetation (increase water temperature);
- Hydrostatic testing and risk of test water entering streams;
- Introduction and/or re-distribution of aquatic nuisance species through hydrostatic testing;
- Accidental release of fuels and entry of other petroleum products into surface waters;
- Channel migration, avulsion, widening, and/or streambed scour;
- Effects to hyporheic exchange and hyporheic zones;

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[5] A list of the scientific documents reviewed by NMFS may be found in the References section of this document within the riverine and General portions.

- Run-off from new permanent access roads, new temporary access roads, existing access roads and temporary extra work areas;
- Application of herbicides to control noxious weeds near waterbodies;
- Improved channel complexity from LW placement;
- Reduced suspended sediment from road decommissioning and improvement;
- Improved shade and stream cover from riparian vegetation planting and fencing projects; and
- Improved migration from fish passage projects.

Our independent review found FERC's BA did not fully describe the effects from:

- Removal of riparian vegetation affecting recruitment of LW; and
- Run-off from contractor yards, rock source and disposal sites, and aboveground facilities.

Removal of riparian vegetation affecting recruitment of LW

The proposed action includes constructing 75[6] waterbody crossings on all stream types in river basins containing SONCC coho salmon (Upper Rogue population) and 117 on all stream types in river basins containing OC coho salmon (Coos, Coquille, and South Umpqua populations). The construction corridor at each waterbody crossing will clear 75 linear feet of riparian vegetation from both sides of the stream. Pacific Connector will maintain a corridor 30-feet wide for the life of the project. Trees in the maintenance corridor will never grow large enough to contribute LW to the stream. Trees in the rest of the construction corridor will not provide LW until they grow, likely 60-80 years or more. The Applicants propose to place LW at crossing locations at the completion of construction to reduce effects from loss of LW due to construction and maintenance of the pipeline. The following schedule will be followed:

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

[6] This updated number of waterbody crossings in river basins containing SONCC coho salmon comes from Table 4.5.2.3-2in the FEIS.

The Applicants also propose to scale the diameter of LW by the wetted width of the stream according to this table:

Table 6. Minimum Diameter Large Wood for Placement in Waterbody Based on Bank full Width.

Bankfull Width (feet)	Minimum Diameter Large Wood (inches)
0 to 10	10
10 to 20	16
20 to 30	18
Over 30	22

FERC determined this will result in only minor intermediate-term adverse effects as this amount of wood loading results in the streams meeting ODFW's "desirable" range for key pieces of LW (Foster *et al*. 2001). However, Foster *et al*. (2001) defines a key piece as a minimum diameter of 24-inches with length greater than 32 feet. Under the definition used by Foster *et al*. (2001), the proposed action does not ensure any of the LW will be key pieces. Furthermore, the proposed action puts many of the LW pieces on the bank where they may never recruit to the stream. Lastly, the BA analysis only accounts for effects at time of construction, not into the future when LW is still not recruiting from the cleared areas. For these reasons, we find clearing and maintaining the pipeline corridor will result in long-term reductions of LW.

The positive effects of LW on coho salmon have been studied at length (see review in Roni *et al.* 2015). Most of the benefit of LW comes from its positive effect on stream channel complexity, which is a limiting factor in most of the watersheds affected by the pipeline. Exacerbating a limiting factor decreases juvenile carrying capacity, thus decreasing the number of juveniles that can survive in that habitat (Hays *et al.* 1996). Fish in excess of carrying capacity are likely to be displaced, and expend more energy searching for food or cover, resulting in slower growth and lower fitness, potentially resulting in injury or death. Therefore, we find the proposed action will reduce LW at the crossing locations, resulting in reduced carrying capacity and harm to SONCC coho salmon and OC coho salmon.

However, these effects are small on a population level because they affect small spatial scales (75 feet per crossing), affect a very small percentage of available habitat (less than 0.1%, calculated using 75 linear feet of clearing at each of the 192 stream crossings divided by a conservative estimate of 4,000 miles of streams total), and are distributed throughout the action area. Furthermore, the LW placed by the applicants at crossings at the completion of construction, while not fully offsetting the loss of LW, will offset some of that loss. Therefore, we expect a small number of individuals to be harmed, but not enough to have an impact on the abundance or productivity of the Upper Rogue population (average annual adult return of 6,581), Coos population (average annual adult return of 13,845), Coquille population (average annual adult return of 19,591), or the South Umpqua population (average annual adult return of 13,696).

Run-off from contractor yards, rock source and disposal sites, and aboveground facilities

The BA only discussed effects from impervious surfaces by stating there is some unknown level of risk that stored materials and surface runoff could enter streams with SONCC coho salmon or OC coho salmon. We agree with this determination, but we do not agree with the analysis. The BA does not clearly explain the effects of stormwater discharges on species in the riverine analysis area.

Some of the contractor yards, rock source and disposal sites, and aboveground facilities the Applicants propose to use are currently owned and used by other entities. These existing facilities are surfaced with gravel. The applicant will also need to construct new facilities, and will surface them with gravel, as well. While these sites may infiltrate rainfall initially, it is our experience that gravel surfaces compact with use (particularly the heavy equipment needed for the proposed action) and become impervious. We assume gravel surfaced facilities within 100 feet of streams will deliver stormwater contaminants during storms greater than the 2-year, 24-hour storm. Within SONCC coho salmon range (Upper Rogue population), only one construction yard will be located within 100 feet of a waterbody (the Rogue River, BA page 3-460). In the riverine portion of OC coho salmon range, two contractor yards are within 100 feet of an inhabited stream (one in the Coquille population, the other in the South Umpqua population), as is one aboveground facility (BA page 3-618). The only facility of these used long-term by the proposed action is the aboveground facility, a mainline block valve. After construction, we assume traffic at this facility will be less than one vehicle per day. Because of the few vehicles visiting the facility, the amount of contaminants deposited on the impervious surfaces will be very low and unlikely to be delivered to the adjacent waterbody (Boone Creek).

We expect delivery of untreated stormwater from three temporary construction facilities and contractor yards to adjacent waterbodies. Stormwater runoff from impervious surfaces (even when treated) delivers a wide variety of pollutants to aquatic ecosystems, such as metals (*e.g.,* copper and zinc), petroleum-related compounds (e.g., polynuclear aromatic hydrocarbons), and sediment washed off the surface (Driscoll *et al.* 1990, Buckler and Granato 1999, Colman *et al.* 2001, Kayhanian *et al.* 2003). These pollutants can accumulate in the prey and tissues of fish where, depending on the level of exposure, they cause a variety of lethal and sublethal effects including disrupted behavior, reduced olfactory function, immune suppression, reduced growth, disrupted smoltification, hormone disruption, disrupted reproduction, cellular damage, and physical and developmental abnormalities (Fresh *et al*. 2005, Hecht *et al.* 2007, LCREP 2007, Sommers *et al*. 2016).

The area where fish are affected by increased contaminants extends from the outfalls of stormwater downstream until concentrations are below all thresholds of effect. Since contaminant discharges occur during storm events, streamflow in the receiving body will be high, as will mixing, both of which shorten the area affected by concentrations exceeding thresholds for effect.

The Applicants will only use these three facilities likely to contribute contaminants to adjacent streams inhabited by SONCC coho salmon and OC coho salmon during the construction period. These three facilities do not include stormwater treatment measures meeting currently accepted construction standards for stormwater systems. Effects from these facilities will affect reaches of

the three receiving waterbodies, but only short-term during the construction period. Although use of these facilities for construction activities will cause a short-term degradation of water quality in two streams with OC coho salmon and one with and SONCC coho salmon, that degradation will cease shortly after construction is complete. Because the effects from stormwater contaminants will be small scale and short term, we do not expect the number of individuals harmed will be large enough to have an impact on the abundance or productivity of the Upper Rogue population (average annual adult return of 6,581), Coos population (average annual adult return of 13,845), Coquille population (average annual adult return of 19,591), or the South Umpqua population (average annual adult return of 13,696).

Estuarine Analysis Area

As described in the BA, effects on OC coho salmon, green sturgeon, and eulachon in the estuarine analysis area will occur from in-water construction and associated activities, habitat modification, and operation and maintenance of the terminal and pipeline. We reviewed the effects analysis provided in the BA and compared it to the best available scientific literature on the potential effects that may occur.[7] Based on our independent review, we fully agree with the assessment of most effect pathways and adopt the BA analysis for those pathways. We do not agree with the severity of some pathways as described by FERC, and have discussed those in detail below.

Our independent review found FERC's BA accurately describes the following effects pathways; therefore, we adopt their analyses without further detail, also considering them in the summaries at the end of this section:

- Suspended sediment from in-water construction;
- Suspended sediment from initial and maintenance dredging;
- Re-suspending contaminated sediments during dredging;
- Suspended sediment from LNG carrier prop wash and ship wake;
- Erosion runoff from Coos Bay upland facility;
- Introduction of exotic, invasive species from ballast water;
- Inadvertent release of drilling mud during HDD construction;
- Entrainment and impingement in LNG carrier intake ports;
- Entrainment of food organism in LNG carriers intake ports;
- Temperature effects from LNG carriers' cooling water discharge;
- Facility lighting during construction and operation;
- Habitat and food source effects related to construction and maintenance of the slip, access channel, marine waterway modifications, and pile dike rock apron development;
- Shading effects from over-water structures;
- Suspended sediment potentially released from construction activities during HDD across Coos Bay and Coos River;
- Restoring tidal connectivity at the Kentuck Aquatic Restoration Site;
- Restoring floodplain connectivity and channel structure in Kentuck Creek;

[7] A list of the scientific documents reviewed by NMFS may be found in the References section of this document within the estuarine and General portions. [7]

- Improving fish passage under Golf Course lane; and
- Planting eelgrass at the eelgrass creation site.

Our independent review found FERC's BA did not fully describe the effects from:

- Stormwater discharge from impervious surfaces;
- Acoustic effects from impact driving in-water piles;
- Stranding by LNG carrier ship wake; and
- Entrainment from dredging.

<u>Stormwater discharge from impervious surfaces</u>
The BA found adverse effects to the estuarine analysis area resulting from stormwater discharges. We agree with this determination, but we do not agree with the analysis. The BA discusses (page 3-334) stormwater being discharged in accordance with a National Pollutant Discharge Elimination System (NPDES) permit, which should protect aquatic resources even though stormwater often exceeds water quality criteria. The BA does not clearly explain the effects of stormwater discharges on species in the estuarine analysis area.

The applicant proposes to treat 100% of the 2-year, 24-hour storm generated at the terminal site, the Trans-Pacific Parkway/US 101 intersection, and roads affected by construction at the Kentuck Aquatic Restoration Site. This treatment exceeds the current standard of 50% of the 2-year, 24-hour storm. Under the proposed action, stormwater at the APCO disposal site will be treated to the current standard of 50% of the 2-year, 24-hour storm with vegetated swales, filter strips, and replanting with native vegetation.

Six contractor yards are adjacent to the estuary (BA, page 3-618). The applicant proposes to surface temporary construction facilities, and contractor yards with large, open-graded aggregate to allow infiltration. While these sites may infiltrate rainfall initially, it is our experience that gravel surfaces compact with use (particularly the heavy equipment needed for the proposed action) and become impervious. We assume gravel surfaced facilities within 100 feet of streams will deliver stormwater contaminants during storms greater than the 2-year, 24-hour storm. The applicant does not propose installing stormwater treatment measures at the Myrtlewood off-site park and ride facility. There is no indication that this parking lot currently has any treatment facilities. Therefore, we assume the Myrtlewood site will deliver stormwater contaminants during every rainstorm.

We expect delivery of untreated stormwater from aboveground facilities, contractor yards, and the Myrtlewood site to Coos Bay. Stormwater runoff from impervious surfaces (even when treated) delivers a wide variety of pollutants to aquatic ecosystems, such as metals (*e.g.,* copper and zinc), petroleum-related compounds (e.g., polynuclear aromatic hydrocarbons), and sediment washed off the surface (Driscoll *et al.* 1990, Buckler and Granato 1999, Colman *et al.* 2001, Kayhanian *et al.* 2003). These pollutants can accumulate in the prey and tissues of fish where, depending on the level of exposure, they cause a variety of lethal and sublethal effects including disrupted behavior, reduced olfactory function, immune suppression, reduced growth, disrupted smoltification, hormone disruption, disrupted reproduction, cellular damage, and physical and developmental abnormalities (Fresh *et al*. 2005, Hecht *et al.* 2007, LCREP 2007, Sommers *et al*. 2016).

The area where fish are affected by increased contaminants extends from the outfalls of stormwater downstream until concentrations are below all thresholds of effect. The extent of area above the threshold is determined by the amount of contaminants and the volumes over water in the receiving body. Because these outfalls are within the estuary, and contaminant discharge occurs during rainstorm events, the volume of water in the receiving body will be high, as will mixing.

Impervious surfaces constructed by the proposed action and used after the construction period will include stormwater treatment meeting or exceeding current standard of 50% of the 2-year, 24-hour storm. Effects from these facilities will last long-term, but due to reduced amounts of contaminants from treatment, are likely to only affect small areas around the outfall (which we assume will be an average of approximately 50 feet in all directions from each outfall). We assume approximately 20 outfalls will be necessary for all these permanent locations. The total area of effect from these outfalls is approximately 2 acres, which is approximately 0.015% of Coos Bay (13,348 acres).

Existing facilities, and those only used during the construction period, either do not include stormwater treatment or include measures that do not meet current treatment standards. Effects form these facilities will only be short-term as they will only be used by proposed action during the construction period. However, their contaminants will affect larger areas than the treated locations because the amounts of contaminants are greater (which we assume will be an average of approximately 200 feet in all directions from each outfall). We assume approximately 10 outfalls will be necessary for these temporary locations. The total area of effect from these outfalls is approximately 14 acres, which is approximately 0.1% of Coos Bay (13,348 acres).

Because the effects from stormwater contaminates are either small scale or short term, we do not expect the number of individuals harmed will be large enough to have an impact on the abundance or productivity of the Coos population of OC coho salmon (average annual adult return of 13,845 adults), the population of green sturgeon (17,548 individuals), or the Columbia River subpopulation of eulachon (average annual adult return of approximately 57 million).

<u>Acoustic Effects from Impact Driving In-Water Pile</u>

For proofing in-water pile, the BA assumes the applicants will use an impact driver without any sound attenuation. Under that assumption, the BA determined peak sound pressures will physically injure fish within 40 feet of the pile and cumulative sound exposure levels will injure fish up to 2,415 feet from the pile (for fish less than two grams). However, the applicants will implement sound attenuation measures (bubble curtains) for all impact hammer driving (BA page 3-362). Also, the BA estimated 3,000 impact hammer strikes per day to proof steel piles, but did not consider that would require the use of four pile driving rigs, such that not all of the strikes occur at one location. Therefore, the BA overestimates acoustic effects.

We re-calculated the acoustic effects using the largest pile size (24-inch steel) with sound attenuation (data from Rodkin and Pommerenck 2014, Tables 2.3.1). We also assumed each pile driving rig will deliver up to 800 strikes per day[8] with two pile driving rigs operating within

[8] Email from Natalie Eades, Jordan Cove LNG, to Chuck Wheeler, NMFS, November 13, 2019 (with table explaining pile driving statistics).

close vicinity (about 500 feet) of each other. However, we assumed operating three or four rigs within vicinity of each other will be unlikely. Our calculations found injury from peak sound pressures within 10 feet of the pile and injury from cumulative sound exposure within 282 feet (fish greater than 2 grams) or 522 feet (fish less than 2 grams).

We found injury and harassment to OC coho salmon, green sturgeon, and eulachon will occur from pile driving, but at a much smaller spatial scale than that described in the BA. Pile driving will occur during the in-water work period (October 1 through February 15), when few individuals will be present. Green sturgeon are only likely to be present in the estuarine analysis area from June until October (Moser and Lindley 2007). The most vulnerable life stages to sound pressures are juvenile coho salmon and larval eulachon. A low level of coho salmon juvenile rearing occurs in Coos Bay, but nearly all only pass by the pile driving areas as smolts, which occurs after the close of the in-water work period. Larval eulachon are also unlikely to be present until after the close of the in-water work window (February 15; Hay and McCarter 2000, WDFW and ODFW 2001). Therefore, few individuals of these species are reasonably certain to be injured. We do not expect the number of individuals killed by pile driving will be large enough to have any impact on population abundance or productivity of the Coos population of OC coho salmon (average annual adult return of 13,845 adults), the population of green sturgeon (17,548 individuals), or the Columbia River subpopulation of eulachon (average annual adult return of approximately 57 million).

<u>Stranding by LNG Carrier Ship Wake</u>
The BA found stranding from ship wakes is not reasonably certain for larval eulachon because they are; "not expected to occur in the bay due to the lack of documented spawning populations in Coos Bay tributaries." We have no records to document spawning, but we know of no one surveying to document it. Adult eulachon have been observed in the Coos River (Gustafson *et al.* 2010), but occur on an infrequent basis and in small numbers (Monaco *et al*. 1990, Emmett *et al*. 1991, Hutchinson 1979 as cited in Gustafson *et al.* 2010). On March 3, 2015, ODFW collected a pre-spawn female from a screw trap being operated in Winchester Creek, a tributary of South Slough within Coos Bay.[9] Because eulachon are anadromous and semelparous (spawn once and die), the only reasonable purpose for adults in Coos Bay is to spawn and produce offspring. While the amount of spawning in Coos Bay is likely only a few fish every year (Monaco *et al*. 1990, Emmett *et al*. 1991, Hutchinson 1979 as cited in Gustafson *et al.* 2010), presence of larval eulachon is reasonably certain.

The BA found stranding from ship wakes is not reasonably certain for green sturgeon, OC coho salmon, and adult eulachon because of their sizes. We agree with this conclusion for green sturgeon, because only adults and sub-adults are present and they prefer deeper water habitats. We do not agree that OC coho salmon and eulachon will be too large to become stranded. In support of the conclusion, the BA cites a study (Pearson *et al*. 2006) that found no Chinook salmon over 3.5 inches were stranded from ship wakes. However, Pearson *et al*. (2006) found no Chinook salmon over 3.5 inches were present in the study area. Thus, it was not possible for any to become stranded. We find no literature to support a conclusion that OC coho salmon (3 to 8 inches) and eulachon (8 to 12 inches) are not susceptible to wake stranding.

[9] Email from Gary Vonderohe, ODFW, to Ken Phippen, NMFS, March 5, 2015 (notifying NMFS of the collection of a eulachon in Coos Bay).

The BA relies on a report (Moffatt and Nichol 2017) which assumes the LNG vessels will travel at 5 knots between the jetty and the terminal. However, we find no proposed BMP in the BA or CMP to support this assumption. The Coast Guard is required to review and approve an LNG Vessel Transit Management Plan, which could contain requirements for vessel speed. That approval is required at least 60 days prior to the first vessel arrival, and to our knowledge the Applicants have not developed the plan or submitted it for approval. After reviewing available literature, we agree with the BA's finding that stranding of OC coho salmon and eulachon is not reasonably certain to occur with vessels transiting the bay at speeds less than 9 knots (Pearson *et al*. 2006). But, because the proposed action does not include ship speed restrictions, we cannot assume they will travel less than 9 knots and therefore assume that some stranding will occur.

Pearson *et al*. (2008) found multiple factors were involved in the probability of a ship wake stranding fish. Predicting exactly when, and under what circumstances, these factors all come together to produce a stranding event in Coos Bay is not possible. We know that wake stranding can occur with vessels of the size used for the proposed action, and we know that OC coho salmon spend time near the shoreline, so we are reasonably certain strandings will occur at some time. However, we do not have adequate data from Coos Bay at this time to estimate a precise number of fish stranded.

One of the most important was beach slope, with low slope (less than 4%) related to higher stranding rates. The LNG vessels will be traversing Coos Bay at high tides when shallow sloping beaches will be inundated, thus minimizing probability of stranding any fish. OC coho salmon and adult eulachon will have even lower susceptibility due to their size. Therefore, while we are reasonably certain some OC coho salmon and eulachon will be stranded at some point, and we cannot precisely predict how many will be stranded, we are reasonably certain the number of individuals in any stranding event will be low. We do not expect the number of individuals killed by wake stranding will be large enough to have any impact on abundance or productivity of the Coos population of OC coho salmon (average annual adult return of 13,845 adults) or the Columbia River subpopulation of eulachon (average annual adult return of approximately 57 million).

Entrainment from Dredging

The BA determined dredging is not reasonably certain to entrain green sturgeon. We reviewed the literature, as well as several recent biological opinions (NMFS Nos. SER-2010-05579, SER-2017-18749, WCR-2016-6057), and agree the probability of entraining green sturgeon sub-adults and adults is highly unlikely to occur.[10] The BA determined "some juvenile coho may be subject to localized entrainment by construction and ongoing maintenance dredging" (page 3-644). We reviewed the literature and found many sources documenting no or low numbers of entrained salmonids (e.g. Larson and Moehl 1990, R2 Resource Consultants 1999, McGraw and Armstrong 1990, Stickney 1973). Some studies (Dutta 1976, Dutta and Sookachoff 1975, Boyd 1975) documented significant entrainment of salmonids, but they studied the much more vulnerable fry life stage (coho salmon fry are not present in Coos Bay).

In our 2017 biological opinion for dredging the Corps navigational channel (NMFS No. WCR-2016-5055), we estimated 42 juveniles would be entrained annually. However, that opinion

[10] See December 4, 2019 memo to the administrative file for the full analysis.

analyzed removal of 2,350,000 cubic yards per year, some of which occurs during the juvenile coho salmon outmigration. The Applicants propose to remove 2,736,500 cubic yards of material from waters open to the bay to construct the slip, access channel, marine waterway improvements, and eelgrass mitigation site over 4 years only working during the in-water work period (October 1 through February 15). Post-construction maintenance dredging of the access channel, slip and marine waterways will occur roughly every three to five years with projected dredge volumes of 115,000 cubic yards. Volumes dredged under the proposed action are substantially less than those we evaluated in the 2017 biological opinion and they will not occur during juvenile coho salmon outmigration. Therefore, we agree with the BA that this proposed action is not likely to entrain more than a small number of OC coho salmon. We do not expect that the number of individuals killed by dredging will be large enough to have any impact on the abundance or productivity of the Coos population of OC coho salmon (average annual adult return of 13,845 adults).

The BA determined that entrainment of eulachon from dredging will be rare. It based this on the large size and swimming ability of the adult life stage, their low abundance, and their mostly pelagic distribution. The literature documents entrainment of adult eulachon (Larson and Moehl 1990). We reviewed this literature and found that when adult eulachon were entrained, the numbers were low. Therefore, while entrainment of adult eulachon is not rare, the proposed action is unlikely to entrain more than a few individual adult eulachon. The BA did not discuss entrainment of larval eulachon, likely because it discounts their presence in Coos Bay. We disagree with that conclusion (see stranding above). However, larval eulachon are not likely to be present until after the close of the in-water work window (February 15; Hay and McCarter 2000, WDFW and ODFW 2001).

Marine Analysis Area

As described in the BA, effects on SONCC coho salmon, OC coho salmon, green sturgeon, eulachon, blue whale, fin whale, and humpback whale in the marine analysis area will occur from operation of the terminal. We reviewed the effects analysis provided in the BA and compared it to the best available scientific literature on the potential effects that may occur.[11] Based on our independent review, we fully agree with the assessment of most effect pathways and adopt the BA analysis for those. We do not agree with the severity of some pathways as described by FERC, and have discussed those in detail below.

Our independent review found FERC's BA accurately described the following effects pathways; therefore, we adopt their analyses without further detail, also considering them in the summaries at the end of this section:

- Increased risk of ship strikes;
- Increased acoustic noise from transiting vessels; and
- Fuel or oil spills at sea.

[11] A list of the scientific documents reviewed by NMFS may be found in the References section of this document within the marine and General portions.

Our independent review found FERC's BA did not fully describe the effects from:

- Contaminant discharge from the industrial wastewater pipeline.

Contaminant discharge from the industrial wastewater pipeline

The BA states the terminal will discharge treated stormwater and treated sanitary waste into the industrial wastewater pipeline. Prior to entering the industrial wastewater pipeline, the terminal will treat stormwater with treatment swales and/or proprietary systems and will treat sanitary waste in an on-site treatment plant. The BA also states that all effluent from this pipeline will meet the NPDES permit. However, the BA does not fully describe the constituents of the effluent or the effects of discharging it from the ocean outfall.

Wastewater effluent contains trace amounts of many chemicals found in a variety of products that are disposed of via municipal sewer systems and through industrial discharges. Municipal effluents have been identified as sources of endocrine disrupting chemicals, pharmaceuticals and personal care products, persistent, bioaccumulative and toxic chemicals, and other compounds of anthropogenic origin in surface waters of the United States, and Europe (Lee *et al*. 2000, Molnar *et al*. 2000, Huang *et al*. 2001, Kolpin *et al*. 2002, Lazorchak and Smith 2004). Stormwater runoff from impervious surfaces delivers a wide variety of pollutants to aquatic ecosystems, such as metals (*e.g.,* copper and zinc), petroleum-related compounds (e.g., polynuclear aromatic hydrocarbons), and sediment washed off the surface (Driscoll *et al.* 1990, Buckler and Granato 1999, Colman *et al.* 2001, Kayhanian *et al.* 2003).

These pollutants can accumulate in the prey and tissues of fish where, depending on the level of exposure, they cause a variety of lethal and sublethal effects including disrupted behavior, reduced olfactory function, immune suppression, reduced growth, disrupted smoltification, hormone disruption, disrupted reproduction, cellular damage, and physical and developmental abnormalities (Fresh *et al*. 2005, Hecht *et al.* 2007, LCREP 2007, Sommers *et al*. 2016).

However, we expect exposure of the species considered in this opinion to be very limited. The outfall is located 4,760 feet off-shore at a depth of 61.4 feet below mean lower low water (OIPCB 2013). At this location, the ocean environment will rapidly dilute contaminant concentrations. The area of adverse effects (500 feet) is extremely small relative to the size of the ocean. Because none of the species considered in this opinion lead a sedentary life, and they are all of sufficient size and mobility to move around, they are not reasonably certain to be near the affected area for longer than a few hours. With the exception of green sturgeon, these species are not likely to be at these depths, this far off-shore, for any significant amount of time. Thus, we do not expect that any individuals will stay in the affected area for sufficient duration or ingest enough prey to elicit adverse effects. Therefore, a small number of individuals may experience sub-lethal effects, but contaminant discharge from the industrial pipeline is not likely to result in any death.

Summary of Effects to SONCC Coho Salmon

Based on our independent review, we find the proposed action is reasonably certain to injure and/or harass SONCC coho salmon juveniles from the Upper Rogue population as a result of construction, operation, and maintenance of the proposed action. The activities resulting in the

most injury or harassment are salvaging from in-water work isolation and suspended sediment plumes.

Capture and handling with a potential of injury or death will occur to approximately 270 SONCC coho salmon juveniles from work area isolation. Suspended sediment plumes will be created by construction activities, harming small numbers of rearing juveniles at each of the 11 waterbody crossings where they are present. The beneficial effects from offsite mitigation activities (LW placement, road decommissioning and improvement, riparian planting, and fish passage projects) will be substantial. The effects from other pathways are too small or not likely to affect more than a few individuals.

The number of individuals adversely affected by the proposed action is a very small percentage of the Upper Rogue population (average annual adult return of 6,581). The effects will occur on small spatial scales distributed over a wide geography. When combined with the beneficial effects from offsite mitigation activities, negative changes to population-level characteristics such as spatial structure, diversity, abundance, and productivity are unlikely.

Summary of Effects to OC Coho Salmon

Based on our independent review, we find the proposed action is reasonably certain to injure and/or harass OC coho salmon juveniles from the Coos, Coquille, and South Umpqua populations as a result of construction, operation, and maintenance of the proposed action. The activities resulting in the most injury or harassment in the riverine analysis area are salvaging from in-water work isolation and suspended sediment plumes.

Capture and handling with a potential of injury or death will occur to approximately 1,055 OC coho salmon juveniles from work area isolation. Suspended sediment plumes will be created by construction activities, harming small numbers of rearing juveniles at each of the 43 waterbody crossings where they are present. The beneficial effects from offsite mitigation activities (LW placement, road decommissioning and improvement, riparian planting, and fish passage projects) will be substantial. The effects from other pathways are too small or not likely to affect more than a few individuals.

The activities resulting in the most injury or harassment in the estuarine analysis area are acoustic effects during in-water pile installation and suspended sediment plumes from dredging. The beneficial effects from offsite mitigation activities (restoring tidal connectivity, floodplain connectivity, channel structure fish passage, and eelgrass) will be substantial. The effects from other pathways are too small or not likely to affect more than a few individuals.

Proofing pile with an impact hammer will result in sound pressure waves that could injure fish greater than 2 grams within 282 feet of the pile being driven and fish less than 2 grams within 522 feet, but few fish should be exposed. Suspended sediment plumes will affect a greater area, but still occur during the in-water work period and are unlikely to expose many fish to injury.

With the exception of capture and handling juveniles during in-water work isolation, we cannot precisely quantify the number of individuals affected by these pathways even though we know

they are likely to be small. The distribution and abundance of fish within the affected areas at the time of effect will vary and be determined by habitat quality, time of year, time of day, and the abundance of OC coho salmon in the four populations when the activities occur.

The number of individuals negatively affected by the proposed action is a very small percentage of the Coos population (average annual adult return of 13,845), Coquille population (average annual adult return of 19,591), and the South Umpqua population (average annual adult return of 13,696). The effects occur on small spatial scales distributed over a wide geography. When combined with the beneficial effects from offsite mitigation activities, negative changes to population-level characteristics such as spatial structure, diversity, abundance, and productivity are unlikely.

Summary of Effects to Green Sturgeon

Based on our independent review, we find the proposed action is reasonably certain to injure and/or harass a small number of green sturgeon individuals as a result of construction, operation, and maintenance of the proposed action. The two activities likely to result in most injury or harassment are dredging and pile driving. Maintenance dredging will result in short-term losses of benthic food sources for green sturgeon subsequent to each operation. However, the dredged area (61 acres) is relatively small (0.5%) compared to the potential feeding areas within Coos Bay (13,348 acres). Thus, we expect that effects to green sturgeon will be relatively minor in scope. Pile driving will occur between October 1 and February 15. Green sturgeon are only likely to be present in the estuarine analysis area from June until October. This limits green sturgeon exposure to one month when their presence in the estuary is tailing off. The effects from other pathways are too small or unlikely to affect more than a few individuals. The beneficial effects from restoring tidal connectivity and eelgrass will be substantial.

The number of individuals affected by the proposed action is a very small percentage of the population of green sturgeon (total population size of 17,548 individuals). The effects occur on small spatial scales distributed around Coos Bay. When combined with the beneficial effects from mitigation activities, negative changes to population-level characteristics such as spatial structure, diversity, abundance, and productivity will not occur.

Summary of Effects to Eulachon

Based on our independent review, we find the proposed action is reasonably certain to injure and/or harass eulachon within Coos Bay resulting from construction, operation, and maintenance of the proposed action. Larval eulachon would be very susceptible to construction related impacts, but they are not likely to be present until after the close of the in-water work window. The effect pathways likely to result in most injury or harassment are entrainment in vessel cooling water and stranding.

We cannot accurately quantify the number of individuals that will be affected by all of these pathways. The distribution and abundance of eulachon within affected areas at the time the effects will occur is highly variable and determined by tidal flows, time of year, time of day, and other factors we may not understand. Furthermore, the abundance of larval eulachon is

dependent on the success of previous adult spawning. However, we know that eulachon in Coos Bay occur on an infrequent basis and in small numbers (Monaco *et al*. 1990, Emmett *et al*. 1991, Hutchinson 1979 as cited in Gustafson *et al.* 2010), which makes them a very small percentage of the Columbia River subpopulation which has a 10 year average annual adult return of approximately 57 million (Langness *et al*. 2018). Larval eulachon are also unlikely to be present until after the close of the in-water work window (February 15) which is when most of the construction occurs. Thus, the number of individuals affected by the proposed action is such a small portion of the subpopulation, that changes to subpopulation-level characteristics such as spatial structure, diversity, abundance, and productivity will not occur.

Summary of Effects to Blue Whales, Fin Whales, Humpback Whales, and Sperm Whales

Based on our independent review, we find the proposed action is reasonably certain to harass, injure and/or kill individual blue whales, fin whales, humpback whales, and sperm whales. Operation of the terminal requires LNG vessels coming to port. These vessels will not be traversing the action area but for the proposed action. With them, the vessels bring acoustic noise and an increased risk of ship strike. Given the distribution and occurrence of these species in the action area, they will be exposed to these effects.

There will be an increase in ship strike risk for these whale species. However, as detailed in the BA, the increase is small and the overall risk of strike is low. LNG carrier noise will contribute to overall noise within the action area. Whales will be exposed to sound levels sufficient to cause behavioral disturbance. However, sound levels will be well below the peak and cumulative exposure levels found in NMFS (2018), and the exposure to increased sound levels will be short and infrequent. It therefore is unlikely to result in permanent shifts in the behavior of the whales.

2.5.2 Effects on Critical Habitat

Effects of the action on SONCC coho salmon critical habitat physical and biological features

Within the action area SONCC coho salmon critical habitat only occurs in the Upper Rogue River portion of the riverine analysis area. Effects on SONCC coho salmon critical habitat were discussed in the BA and are related to the discussion above on the effects to species. We have conducted an independent review and, based on that, agree with the assessment in the BA (except for removal of riparian vegetation affecting recruitment of LW, and run-off from contractor yards). Our analysis is summarized below:

1. Cover/shelter – Short-term reduction due to loss of riparian vegetation and channel structure from in-stream construction. Long-term effects from loss of LW recruitment from maintenance of pipeline corridor, albeit on a small spatial scale at each crossing. Significant improvement in cover/shelter at offsite mitigation sites restoring LW, though on small spatial scales also.
2. Food (juvenile) – Short-term reduction due to construction disturbing substrate and benthos at crossing sites.
3. Riparian vegetation – Small scale, short-term reduction at crossing locations as part of construction activities. Smaller scale, long-term change in tree canopy due to

maintenance of pipeline corridor. Small scale improvements at offsite riparian planting mitigation locations.

4. Space – No change.
5. Spawning gravel/substrate – Short-term reduction at crossing locations due to disturbance during construction activities. Reducing sediment delivery from roads under the offsite mitigation plan will benefit this PBF for the long-term.
6. Water quality – Short-term increases in suspended sediment within and downstream of crossing locations due to disturbance during construction activities. Short-term increases in stormwater contaminants from temporary use of contractor yards. Reducing sediment delivery from roads under the offsite mitigation plan will benefit this PBF for the long-term.
7. Water quantity – Hydrostatic testing will remove a small percentage of the Rogue River, but effect will be temporary.
8. Safe passage – Short-term blockage at crossing locations during construction due to in-water work isolation. Fish passage improvement activities under the offsite mitigation plan will benefit this PBF for the long-term.
9. Water temperature – Small and medium streams will experience a slight temperature increase in the area of the pipeline crossing from loss of riparian vegetation. Duration will be short on smaller streams and could last decades on medium ones.
10. Water velocity – No change.

The proposed action will result in short-term adverse impacts to SONCC coho salmon critical habitat as a result of construction and operation of the pipeline. Clearing and maintenance of the pipeline corridor will result in long-term adverse effects to the cover/shelter, water temperature, and riparian vegetation PBFs, but only on a very limited spatial scale (approximately 0.1%, calculated using 75 linear feet of clearing at each of the 75 stream crossings divided by a conservative estimate of 1,000 of miles of streams in the population. The proposed offsite mitigation activities will result in some short-term construction-related adverse effects, but will provide long-term benefits to the cover/shelter, riparian vegetation, spawning gravel/substrate, safe passage, and water quality PBFs.

Overall, the adverse effects will be short-term or only affect a very small portion of the designated critical habitat. The beneficial effects are long-lasting and will affect larger areas.

Effects of the action on OC coho salmon critical habitat physical and biological features

Within the action area, OC coho salmon critical habitat occurs in the Coos, Coquille, and Umpqua river portion of the riverine analysis area and in the estuarine analysis area. Effects on OC coho salmon critical habitat were discussed in the BA and are related to the discussion above on the effects to species. We have conducted an independent review and, based on that, agree with the assessment in the BA (except for removal of riparian vegetation affecting recruitment of LW, run-off from contractor yards, stormwater discharge from impervious surfaces, acoustic effects from impact driving in-water pile, and stranding by LNG carrier ship wake). Our analysis is summarized below:

1. Substrate - Short-term reduction at riverine waterbody crossing locations due to disturbance during construction activities. Reducing sediment delivery from roads under the offsite mitigation plan will benefit this PBF for the long term. Substrate will be removed from the estuary by dredging, but the newly exposed substrate will be similar.
2. Water Quality – Short-term increases in suspended sediment within and downstream of riverine waterbody crossing locations due to disturbance during construction activities. Reducing sediment delivery from roads under the offsite mitigation plan will benefit this PBF for the long-term. Small and medium streams will experience a slight temperature increase in the area of the pipeline crossing from loss of riparian vegetation. Duration will be short on smaller streams and could last decades on medium ones. Short-term increases in suspended sediment in the estuary from dredging and construction activities. Short-term increases in stormwater contaminants from temporary use of contractor yards. Long-term increases in stormwater contaminants from impervious surfaces constructed by the proposed action and used after the construction period, but only on small spatial scales.
3. Water Quantity – Hydrostatic testing will remove a small percentage of the Coos River, East Fork Coquille River, Middle Fork Coquille River, and South Umpqua River, but effect is temporary.
4. Floodplain connectivity – Offsite mitigation in the freshwater portion of the Kentuck Aquatic Restoration Site will permanently improve floodplain connectivity.
5. Forage - Short-term reduction due to construction disturbing substrate and benthos at crossing sites. Short-term reductions due to dredging and construction in the estuary. Long-term decrease from construction of the access channel. Long-term increase in forage opportunities at the Kentuck Aquatic Restoration and eelgrass mitigation sites.
6. Natural Cover - Short-term reduction due to loss of riparian vegetation and channel structure from in-stream construction. Long-term effects from loss of LW recruitment from maintenance of pipeline corridor, albeit on a small spatial scale at each crossing. Significant improvement in cover/shelter at offsite mitigation sites restoring LW, though on small spatial scales also.
7. Free of artificial obstruction - Short-term blockage at riverine waterbody crossing locations during construction due to in-water work isolation. Fish passage improvement activities under the offsite mitigation plan will benefit this PBF for the long-term.
8. Salinity – Discharge of hydrostatic test water in the terminal slip may alter salinity for a short duration.

The proposed action will result in short-term adverse impacts to OC coho salmon critical habitat as a result of construction and operation of the pipeline and terminal. Clearing and maintenance of the pipeline corridor will result in long-term adverse effects to the natural cover PBF, but only on a very limited spatial scale (approximately 0.05%, calculated using 75 linear feet of clearing at each of the 117 stream crossings divided by a conservative estimate of 1,000 of miles of streams in each of the three populations. Construction of the access channel will reduce forage opportunities for the long-term on a small spatial scale. The proposed offsite mitigation activities will result in some short-term construction-related adverse effects, but will provide long-term benefits to the natural cover, substrate, forage, floodplain connectivity, free of artificial obstruction, and water quality PBFs.

Overall, the adverse effects will be short-term or only affect a very small portion of the designated critical habitat. The beneficial effects are long-lasting and will affect larger areas.

Effects of the action on green sturgeon critical habitat physical and biological features

Within the action area, green sturgeon critical habitat occurs in the marine and estuarine analysis areas. Effects on green sturgeon critical habitat were discussed in the BA and are related to the discussion above on the effects to species. We have conducted an independent review and, based on that, agree with the assessment in the BA (except for acoustic effects from impact driving in-water pile, stranding by LNG carrier ship wake, stormwater discharge from impervious surfaces, and contaminant discharge from the industrial wastewater pipeline). Our analysis is summarized below:

1. Food resources – Short-term reductions due to dredging and construction in the estuary. Long-term decrease at the entrance of the slip. Long-term increase in forage opportunities at the Kentuck Aquatic Restoration and eelgrass mitigation sites.
2. Migratory corridor – The proposed action should result in no blockages.
3. Sediment quality – The sediment composition is not likely to measurably change as the sediment exposed after dredging is similar to pre-disturbance.
4. Water flow – Not likely to measurably change.
5. Water depth – Construction of the slip and entrance will increase depth in those areas for the long-term.
6. Water quality – Short-term increase in suspended sediment due to dredging, pile placement and other construction activities. Short-term increases in stormwater contaminants from temporary use of contractor yards. Long-term increases in stormwater contaminants from impervious surfaces constructed by the proposed action and used after the construction period, but only on small spatial scales. Long-term discharge of contaminants at the ocean outfall.

The proposed action will result in short-term adverse impacts to green sturgeon critical habitat as a result of construction and operation of the pipeline and terminal. Construction of the access channel will reduce the food resource PBF for the long-term on a small spatial scale. Discharge of contaminants at the ocean outfall will impair the water quality PBF for the long-term, but at a small spatial scale. The proposed offsite mitigation activities will result in some short-term construction-related adverse effects, but will provide long-term benefits to the food resources PBFs.

Overall, the adverse effects will be short-term or only affect a very small portion of the designated critical habitat. The beneficial effects are long-lasting and will affect larger areas.

2.6 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02 and 402.17(a)). Future Federal actions that are unrelated to the

proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

The contribution of non-Federal activities to the current condition of ESA-listed species and designated critical habitats within the action area was described in the Status of the Species and Critical Habitats and Environmental Baseline sections, above. Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

2.6.1 Cumulative Effects – Riverine Analysis Area

The contribution of non-Federal activities to the current condition of ESA-listed species and designated critical habitats within the action area was described in the status and environmental baseline sections, above. Among the activities described were agriculture, forest management, mining, road construction, urbanization, water development, and river restoration, all of which are reasonably certain to continue to occur within the action area. These future actions will be driven by a combination of economic conditions that characterized traditional natural resource-based industries, general resource demands associated with settlement of local and regional population centers, and the efforts of social groups dedicated to river restoration and use of natural amenities, such as cultural inspiration and recreational experiences.

Over time, the level of extraction of some natural resources and the associated habitat degradation in Oregon has declined and industry standards and regulatory requirements have improved. For instance, in 1971, Oregon passed the first comprehensive forest practices act in the nation. Although the Oregon Forest Practices Act and associated forest practice rules generally have become more protective of riparian and aquatic habitats over time, significant concerns remain over their ability to adequately protect water quality and salmon habitat.

While natural resource extraction within the Pacific Northwest may be declining, general resource demands are increasing with growth in the size and standard of living of the local and regional human population (Metro 2010, Metro 2011). Human population growth is a good proxy for multiple, dispersed activities and provides the best estimate of general resource demands because as local human populations grow, so does the overall consumption of local and regional natural resources. Between 2010 and 2018, the human population percentage increase of Coos, Douglas, and Jackson counties was 2.1%, 2.4%, and 8.1%, respectively.[12]

There are no known plans or trends associated with human population growth along the pipeline corridor. Much of it was routed purposely away from concentrations of people. A substantial amount of the area is administered by Federal land management agencies and small private holdings. Major human population growth is not anticipated.

[12] US Census Bureau data, available at: https://www.census.gov/quickfacts/fact/table/

Despite improving practices, future land management actions are reasonably certain to continue to have a depressive effect on aquatic habitat quality in the action area. Given the increasing ability for the restoration community at funding and implementing activities, restoration and recovery actions are also reasonably certain to continue. These activities are likely to provide significant benefits to habitat quality, albeit on a project by project basis.

2.6.2 Cumulative Effects – Estuarine Analysis Area

Information from Willapa Bay and Grays Harbor in Washington and Tillamook, Yaquina, and Coos bays in Oregon show that coastal communities are growing more slowly than the respective states overall, populations are relatively old, and the extractive natural resource industries (fishing, aquaculture, agriculture, forest products) are declining in importance relative to tourism, recreation, and retirement industries (Hupert *et al.* 2003). These trends suggest human uses of the estuaries are changing in character (Hupert *et al.* 2003). Residents choose to live in these communities to enjoy the views and scenery, experience rural living, to be near the ocean, and to recreate outdoors (Hupert *et al.* 2003). However, increased tourism and residential development can also impact estuary shorelines, water quality, and wildlife (Hupert *et al.* 2003).

The City of Coos Bay developed a land use plan in 2000 to guide future development. The plan postulates that: 1) The city will experience renewed growth from in-migration and commercial employment, 2) Additional housing will be needed, 3) Commercial and industrial areas will need to be redeveloped, and 4) Waterfront areas are an asset to commercial ventures.

The Coos Bay Estuary Management Plan (Plan) sets out the basis of land, water use, and community development regulations for lands lying within the estuary and its shorelands, as designated within the Plan. It designates appropriate areas for the location of various existing and future uses and activities. These plans postulate that there will be some growth in the future that may affect the quality of habitat within the Coos Bay estuary. However, these growth plans may or may not come to fruition.

Despite changes to less consumptive use of estuary resources, future uses are reasonably certain to continue to have a depressive effect on aquatic habitat quality in the action area. Given the increasing ability for the restoration community at funding and implementing activities, restoration and recovery actions are also reasonably certain to continue. These activities are likely to provide significant benefits to habitat quality, albeit on a project by project basis.

2.6.3 Cumulative Effects – Marine Analysis Area

For the purposes of this analysis, the action area includes the LNG vessel shipping traffic that overlaps with the continental shelf and slope. Shipping unrelated to the proposed action is reasonably certain to continue, but we have no information whether it will increase or decrease. Activities that may occur in these areas will likely consist of state government actions related to ocean use policy and management of public resources, such as fishing or energy development projects. Changes in ocean use policies are too uncertain and may be subject to sudden changes as political and financial situations develop. Furthermore, the marine analysis area is within an

active shipping lane. Thus, developments, such as aquaculture projects or installation of hydrokinetic projects, are unlikely.

2.6.4 Cumulative Effects – Summary

Resource-based activities such as timber harvest, agriculture, mining, fishing, shipping, and energy development are reasonably certain to continue to exert an influence on the quality of habitat in the action area. The intensity of this influence is difficult to predict and is dependent on many social and economic factors. However, the adoption of industry-wide standards to reduce environmental impacts and the shift away from resource extraction to a mixed economy should result in a gradual decrease in influence over time. Offsetting this decline will be human population growth. The human population of Oregon is expected to increase in the next several decades with a corresponding increase in natural resource consumption. Additional residential and commercial development and a general increase in human activities are expected to cause localized degradation of freshwater and estuarine habitat.

In contrast, interest in restoration activities is increasing, as is environmental awareness among the public. When we consider all these influences collectively, we expect trends in habitat quality to remain flat or improve gradually over time. In turn, this habitat trend will, at best, have a positive influence on population abundance and productivity for the species considered in this consultation. In a worst cases scenario, we expect cumulative effects will have a relatively neutral effect on population abundance trends. Similarly, we expect the quality and function of critical habitat PBFs to express a slightly positive to neutral trend over time as a result of the cumulative effects.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminishes the value of designated or proposed critical habitat for the conservation of the species.

2.7.1 Species

The status of each species considered in this opinion varies considerably from high risk to moderate risk. Similarly, the ESUs and DPSs affected by the proposed action vary considerably in their biological status. The species addressed in this opinion have declined due to numerous factors. One factor for decline of all species inhabiting the riverine and estuarine analysis areas is degradation of their habitat. Human development has caused significant negative changes to riverine and estuary habitat quality. Species in the marine analysis areas share factors related to ship traffic, mostly ship strikes and acoustic noise.

The environmental baseline of the riverine and estuarine analysis areas has been degraded by the effects of past land use, urbanization, and water development. The long-term decline of species inhabiting these areas reflects deteriorated habitat conditions. Many of the habitat changes resulting from land use practices over the last 150 years have stabilized, but continue to hinder recovery of the populations. Restoration activities have gained popularity in recent decades. Restoration actions may have short-term adverse effects, but generally result in long-term improvements to habitat conditions. The environmental baseline of the marine analysis area has been degraded by past human uses, such as shipping and fishing. Climate change is reasonably certain to exacerbate degraded conditions within all analysis areas in particular, increased summer temperatures and decreased summer flows in the riverine analysis area, and ocean acidification and sea level rise in the marine and estuarine analysis areas.

As described in the analysis of the effects of the action, the proposed action is reasonably certain to injure and/or harass SONCC coho salmon, OC coho salmon, eulachon, and green sturgeon as a result of construction, operation, and maintenance pipeline and terminal. The negative effects are either short-term or occur on small spatial scales. When combined with the beneficial effects from offsite mitigation activities, negative changes to population-level characteristics (such as spatial structure, diversity, abundance, and productivity) will not occur for any of these species.

As described in the analysis of the effects of the action, the proposed action is reasonably certain to harass, injure, and/or kill individual blue whales, fin whales, humpback whales, and sperm whales. Operation of the terminal requires LNG vessels coming to port. These vessels will not be traversing the action area but for the proposed action. With them, the vessels bring acoustic noise and an increased risk of ship strike. There will be an increase in ship strike risk for these whale species. However, the increase is small and the overall risk of strike is low. LNG carrier noise may expose these species to sound levels sufficient to cause behavioral disturbance. However, sound levels will be well below the peak and cumulative exposure levels found in NMFS (2018).

Cumulative effects from future state and private activities are reasonably certain to have a neutral to slightly positive effect over time on the species considered in this opinion. Resource-based activities will continue to adversely affect species, but industry-wide standards and shifts away from resource extraction will gradually decrease their effects over time. The human population in the action area is expected to continue to increase, counterbalancing the improved extraction standards and shift away from resource extraction to a mixed economy. We expect the public's growing environmental awareness will reduce the impacts of some activities affecting listed species. As interest in restoration activities continues, their positive effects are likely to continue.

For SONCC coho salmon and OC coho salmon, at the ESU scale, the status of individual populations determines the ability of the species to sustain itself or persist well into the future, thus impacts to individual populations are important to the survival and recovery of the species. Because the adverse effects caused by the proposed action are short-term or small in scale and the beneficial effects are long term and greater in scale, when we add them to the current population status, environmental baseline, and consider cumulative effects and climate change, we find the proposed action will not appreciably reduce the likelihood of the survival or recovery of the Coos, Coquille, and South Umpqua, populations of OC coho salmon, or the South Umpqua population of SONCC coho salmon. Given our conclusion that these populations will

not be impeded in recovery as a result of the proposed action, the proposed action will also not appreciably reduce the likelihood of the survival or recovery of SONCC coho salmon or OC coho salmon at the ESU level.

For eulachon, at the DPS scale, we found the adverse effects caused by the proposed action are short-term or small in scale and the beneficial effects are long term and greater in scale. When we add those effects to the current subpopulation status, environmental baseline, and consider cumulative effects and climate change, we find the proposed action will not appreciably reduce the likelihood of the survival or recovery of the Columbia River subpopulation. Given our conclusion that this subpopulation will not be impeded in recovery as a result of the proposed action, the proposed action will also not appreciably reduce the likelihood of the survival or recovery of eulachon at the DPS level.

The DPS of green sturgeon contains one population. Because the adverse effects caused by the proposed action are short-term or small in scale and the beneficial effects are long term and greater in scale, when we add them to the current population status, environmental baseline, and consider cumulative effects and climate change, we find the proposed action will not appreciably reduce the likelihood of the survival or recovery of the Sacramento River spawning population. Because the population is the sDPS, the proposed action will also not appreciably reduce the likelihood of the survival or recovery of southern DPS green sturgeon.

Blue whales, fin whales, sperm whales and the two DPSs of humpback whales each contain one population. Because the increase in risk of ship strike is so low and LNG carrier noise is unlikely to result in permanent shifts in behavior, when we add these effects to the current population status, environmental baseline, and consider cumulative effects and climate change, we find the proposed action will not appreciably reduce the likelihood of the survival or recovery of any of these species' populations. Because the populations are the species or DPS, the proposed action will also not appreciably reduce the likelihood of the survival or recovery of blue whales, fin whales, sperm whales, and humpback whales.

2.7.2 Critical Habitat

SONCC coho salmon, OC coho salmon, and green sturgeon have designated critical habitat within the action area. The value of PBFs for their critical habitat has declined due to numerous factors, mostly related to human development. For SONCC coho salmon and OC coho salmon, critical habitat major factors include extensive loss of access to habitats and habitat changes resulting from land use practices. For green sturgeon, the major factor in coastal bays and estuaries is prey reduction.

The environmental baseline of the riverine and estuarine analysis areas has been degraded by the effects of past land use, urbanization, and water development. The long-term decline of species inhabiting these areas reflects deteriorated critical habitat conditions. Many of the changes to critical habitat resulting from land use practices over the last 150 years have stabilized, but continue to hinder recovery of the populations. Restoration activities have gained popularity in recent decades. Restoration actions may have short-term adverse effects, but generally result in long-term improvements to critical habitat conditions. The environmental baseline of the marine

analysis area has been degraded by past human uses, such as shipping and fishing. Climate change is reasonably certain to exacerbate degraded conditions within all analysis areas in particular, increased summer temperatures and decreased summer flows in the riverine analysis area, and ocean acidification and sea level rise in the marine and estuarine analysis areas.

As described in the analysis of the effects of the action, the proposed action will result in adverse impacts to SONCC coho salmon, OC coho salmon, and green sturgeon critical habitat as a result of construction, operation, and maintenance of the pipeline and terminal. The adverse effects will be short-term or only affect a very small portion of the critical habitat. The beneficial effects are long-lasting and will affect larger areas.

Cumulative effects from future state and private activities are reasonably certain to have a neutral to slightly positive effect over time on the critical habitat considered in this opinion. Resource-based activities will continue to adversely affect habitat, but industry-wide standards and shifts away from resource extraction will gradually decrease their effects over time. The human population in the action area is expected to continue to increase, counterbalancing the improved extraction standards and shift away from resource extraction to a mixed economy. We expect the public's growing environmental awareness will reduce the impacts of some activities affecting critical habitat. As interest in restoration activities continues, their positive effects are likely to continue.

Because the adverse effects caused by the proposed action are short-term or small in scale and the beneficial effects are long-term and greater in scale, when we add them to the current population status, environmental baseline, and consider cumulative effects and climate change, we find the proposed action will not appreciably diminish the value of any critical habitat for the conservation of these three species at the designation level. Thus, the critical habitats will retain their current ability to play their intended conservation role.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitats, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of SONCC coho salmon, OC coho salmon, green sturgeon, eulachon, blue whales, fin whales, humpback whales, or sperm whales or destroy or adversely modify designated critical habitat for SONCC coho salmon, OC coho salmon, or green sturgeon.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating,

feeding, or sheltering (50 CFR 222.102). “Incidental take” is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

The NMFS has not yet promulgated an ESA section 4(d) rule prohibiting take of threatened eulachon. Anticipating that such a rule may be issued in the future, we have included a prospective incidental take exemption for eulachon. The elements of this ITS for eulachon would become effective on the date on which any future 4(d) rule prohibiting take of eulachon becomes effective. Nevertheless, the amount and extent of eulachon incidental take, as specified in this statement, will serve as one of the criteria for reinitiation of consultation pursuant to 50 C.F.R. § 402.16(a), if exceeded.

This ITS provides a take exemption for the action agencies and applicants for any incidental take caused by consequences of the proposed action. This ITS does not include an exemption for any future incidental take of marine mammals caused by third party activities associated with LNG carrier traffic while in the ocean, such as ship strikes on marine mammals and increased noise resulting from carriers arriving or departing from the LNG terminal for the primary reason that the ESA does not allow NMFS to exempt incidental take of marine mammals where an authorization of the take is required and may be obtained under the MMPA

2.9.1 Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows:

SONCC coho salmon

Riverine Analysis Area
Work necessary for construction of a portion of the pipeline and some offsite mitigation activities will take place within and adjacent to aquatic habitats reasonably certain to be occupied by juvenile ESA-listed SONCC coho salmon. We found the proposed action is reasonably certain to cause incidental take of juvenile SONCC coho salmon resulting from:

a. Trapping and capture during work area isolation;
b. Harm from suspended sediment releases during work area isolation;
c. Harm from in-water construction of offsite mitigation actions;
d. Harm from riparian vegetation removal (increased stream temperatures, loss of LW recruitment); and
e. Harm from stormwater contaminants in runoff from contractor yards.

Trapping and capture of juvenile salmon during work area isolation. We estimated the total number of juveniles captured is 270 to allow in-water work isolation for the waterbody crossings. If more than this number are captured, there will be a reinitiation trigger.

By contrast, take caused by the habitat-related effects of this action cannot be accurately quantified as a number of fish because the distribution and abundance of SONCC coho salmon occurring within any particular stream reach affected by the proposed activities are not fully predictable, being affected by factors we cannot predict, such as habitat quality, competition, predation, and the previous year's spawning success. In such circumstances, we use take surrogates causally linked to the expected level and type of incidental take from the proposed action. For the habitat-related effects of the proposed action, the best available surrogates are as follows:

Suspended sediment releases during in-water work and in-water construction of offsite mitigation actions. Here, the best available incidental take surrogate for these two pathways is the duration of suspended sediment plumes at the 11 waterbody crossings where SONCC coho are present and the 9 in-water offsite mitigation sites. The analysis in the BA, and relied upon in the Opinion, modeled the potential plume associated with installing and removing isolation measures and concluded that suspended sediment generated during these activities will exceed Oregon water quality standards for no longer than 5 hours each. We expect in-water construction of offsite mitigation actions to result in similar plumes. This surrogate is connected causally to the amount of take that will occur because an increase in duration (over 5 hours) translates into a proportional increase in the impact to listed species (i.e., exposure time is one factor determining the severity of adverse effects from elevated suspended sediment). The duration of suspended sediment plumes can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger.

Riparian vegetation removal. Here, the best available incidental take surrogate associated with riparian vegetation removal is the linear extent of vegetation removal at each of the 75 waterbody crossings within river basins containing SONCC coho salmon. The proposed action indicated the linear extent of riparian area cleared to allow pipeline construction at each location is 75 feet. This surrogate is connected causally to the amount of take that will occur because an increase in linear distance (75 feet) translates into a proportional increase stream temperatures and loss of LW. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serves as a meaningful reinitiation trigger because implementation monitoring during crossing construction will document any exceedance and if reinitiation is warranted.

Stormwater contaminants in run-off from contractor yards. In the effects analysis, we assumed gravel surfaced facilities within 100 feet of streams will deliver stormwater contaminants during storms greater than the 2-year, 24-hour storm. There is one contractor yard within 100 feet of streams bearing SONCC coho salmon. As noted in our effects analysis, we expect stormwater from this yard to reach the adjacent stream and result in incidental take of SONCC coho salmon. The best available surrogate for incidental take caused by stormwater contaminants from this yard is delivery of untreated stormwater from this contractor yard to the adjacent stream during storms *smaller* than the 2-year, 24-hour event. This surrogate is connected causally to the amount of take that will occur because delivery of stormwater during smaller storms (less than the 2-year 24-hour event) translates into a proportional increase in contaminants delivered to listed species. The delivery of stormwater to streams can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger.

OC coho salmon

Riverine Analysis Area
Work necessary for construction of a portion of the pipeline and some offsite mitigation activities will take place within and adjacent to aquatic habitats reasonably certain to be occupied by juvenile ESA-listed OC coho salmon. We found the proposed action is reasonably certain to cause incidental take of juvenile OC coho salmon resulting from:

a. Trapping and capture during work area isolation;
b. Harm from suspended sediment releases during work area isolation;
c. Harm from in-water construction of offsite mitigation actions;
d. Harm from riparian vegetation removal (increased stream temperatures, loss of LW recruitment); and
e. Harm from stormwater contaminants in run-off from contractor yards.

Trapping and capture of juvenile salmon during work area isolation. We estimated the total number of juveniles captured is 1,055 to allow in-water work isolation for the waterbody crossings. If more than this number are captured, there will be a reinitiation trigger.

By contrast, take caused by the habitat-related effects of this action cannot be accurately quantified as a number of fish. This is because the distribution and abundance of OC coho salmon occurring within any particular stream reach or portion of Coos Bay affected by the proposed activities are not fully predictable, being affected by factors we cannot predict, such as habitat quality, competition, predation, and the previous year's spawning success. In such circumstances, we use take surrogates causally linked to the expected level and type of incidental take from the proposed action. For the habitat-related effects of the proposed action, the best available surrogates are as follows:

Suspended sediment releases during in-water work and in-water construction of offsite mitigation actions. Here, the best available incidental take surrogate for these two pathways is the duration of suspended sediment plumes at the 43 waterbody crossings where SONCC coho are present and the 51 in-water offsite mitigation sites. The analysis in the BA, and relied upon in the Opinion, modeled the potential plume associated with installing and removing isolation measures and concluded suspended sediment generated during these activities will exceed Oregon water quality standards for no longer than 6 hours each. We expect in-water construction of offsite mitigation actions will result in similar plumes. This surrogate is connected causally to the amount of take that will occur because an increase in duration (over 6 hours) translates into a proportional increase in the impact to listed species (i.e., exposure time is one factor determining the severity of adverse effects from elevated suspended sediment). The duration of suspended sediment plumes can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger.

Riparian vegetation removal. Here, the best available incidental take surrogate associated with riparian vegetation removal is the linear extent of vegetation removal at each of the 117 waterbody crossings within river basins containing OC coho salmon. The BA indicated the linear extent of riparian areas cleared at each location is 75 feet. This surrogate is connected causally to the amount of take that will occur because an increase in linear distance (75 feet) translates into a

proportional increase in stream temperatures and loss of LW. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serves as a meaningful reinitiation trigger because implementation monitoring during crossing construction will document any exceedance and if reinitiation is warranted.

Stormwater contaminants in run-off from contractor yards. In the effects analysis, we assumed gravel surfaced facilities within 100 feet of streams will deliver stormwater contaminants during storms greater than the 2-year, 24-hour storm. There are two contractor yards within 100 feet of streams bearing OC coho salmon. As noted in our effects analysis, we expect stormwater from these yards to reach the adjacent stream and result in incidental take of OC coho salmon. The best available surrogate for incidental take caused by stormwater contaminants from these yards is delivery of untreated stormwater from this contractor yard to the adjacent stream during storms *smaller* than the 2-year, 24-hour event. This surrogate is connected causally to the amount of take that will occur because delivery of stormwater during smaller storms (less than the 2-year 24-hour event) translates into a proportional increase in contaminants delivered to listed species. The delivery of stormwater to streams can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger.

Estuarine Analysis Area
Activities necessary for construction and operation of the terminal, a portion of the pipeline, some offsite mitigation activities will take place within and adjacent to estuarine habitats reasonably certain to be occupied by ESA-listed OC coho salmon. We found the proposed action is reasonably certain to cause incidental take of OC coho salmon resulting from:

a) Entrainment, increased suspended sediment, and loss of food resources from initial dredging of the navigation improvement areas, access channel, and eelgrass mitigation area, and future dredging for maintenance of the access channel and berthing slip;
b) Loss of food resources from construction of other structures;
c) Harm from in-water construction of offsite mitigation actions;
d) Entrainment and impingement in LNG carrier intake ports;
e) Stranding by LNG carrier ship wake;
f) Acoustic impacts from pile driving; and
g) Stormwater discharge from impervious surfaces.

Construction and maintenance dredging. Here, the best available incidental take surrogate associated with construction and maintenance dredging is the area disturbed. Because the amount of take increases with the area disturbed by dredging, this surrogate is proportional to extent of incidental take attributable to this project.

- Initial construction
    - Navigation improvement areas: 27 acres
    - Access channel and MOF: 25 acres
    - Eelgrass mitigation area: 9.3 acres
- Maintenance dredging
    - Navigation improvement areas: 27 acres
    - Access channel, MOF, and berthing slip: 37.3 acres

This metric can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serves as a meaningful reinitiation trigger because implementation monitoring, which occurs continuously during construction and maintenance dredging, will document any exceedance and if reinitiation is warranted.

Loss of food resources from construction of other structures. Here, the best available incidental take surrogate associated with construction of other structures is the area disturbed. These structures would permanently displace habitat which would otherwise produce forage for OC coho salmon. Because the amount of harm increases with the area disturbed, this surrogate is proportional to extent of incidental take attributable to this project.

- Pile dike apron: 3.8 acres
- Trans-Pacific Parkway widening: 0.5 acres
- Temporary dredged material offloading areas: 4.2 acres

This metric can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serve as a meaningful reinitiation trigger because implementation monitoring, which occurs continuously during construction, will document any exceedance and if reinitiation is warranted.

Harm from in-water construction of offsite mitigation actions. Here, the best available incidental take surrogate associated with construction of offsite mitigation actions is the area disturbed to construct the proposed amount of offsite mitigation. Because the amount of harm from suspended sediment plumes and temporary loss of food resources increases with the area disturbed, this surrogate is proportional to extent of incidental take attributable to this project.

- Tidal portion of the Kentuck Aquatic Restoration Site: 92 acres
- Freshwater portion of the Kentuck Aquatic Restoration Site: 9.1 acres
- Eelgrass mitigation area: 9.3 acres

This metric can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serves as a meaningful reinitiation trigger because implementation monitoring, which occurs continuously during construction, will document any exceedance and if reinitiation is warranted.

Entrainment and impingement in LNG carrier intake ports. Here, the best available incidental take surrogate associated with loss of individuals in intake ports is the number of vessels calling on the terminal per year, 120. This surrogate is connected causally to the amount of take that will occur because an increased number of vessels translate into a proportional increase in the number of injuries and deaths of listed species. This metric can also be easily monitored allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serves as a meaningful reinitiation trigger because

although it is not anticipated, the facility has the potential capacity for greater than 120 vessels per year and the number of vessels is continuously monitored.

Vessel wake stranding. We determined LNG carriers will produce wakes that will strand some OC coho salmon individuals. It is not possible to monitor the actual number of fish stranded due to the length of shoreline, difficulty in accessing and walking it, the small probability of finding a fish that is stranded, and the likelihood an avian predator will find it first. Based on all of this, we are instead using an incidental take surrogate. Here, the best available incidental take surrogate associated with vessel wake stranding is the number of vessels calling on the terminal per year, 120. This surrogate is connected causally to the amount of take that will occur because an increased number of vessels translate into a proportional increase in the probability and number of wake strandings. This metric can also be easily monitored allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serves as a meaningful reinitiation trigger because although it is not anticipated, the facility has the potential capacity for greater than 120 vessels per year and the number of vessels is continuously monitored.

Acoustic impacts. The proposed action will require up to 3,000 impact hammer strikes on steel pile per day. We assume no more than 1,600 strikes (maximum 800 strikes per rig, no more than two rigs) within 500 feet of each other. Thus, the best available incidental take surrogate associated with acoustic impacts is 1,600 impact hammer strikes per day on steel pile within 500 feet of each other. This surrogate is connected causally to the amount of take that will occur because increased impact hammer strikes on steel pile translate into a proportional increase in the injury or harassment of listed species. This metric can also be easily monitored allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serves as a meaningful reinitiation trigger because implementation monitoring, which occurs continuously during pile driving, will document any exceedance and if reinitiation is warranted.

Stormwater discharge from impervious surfaces. In the effects analysis, we assumed gravel surfaced contractor yards within 100 feet of waterbodies will deliver stormwater contaminants during storms greater than the 2-year, 24-hour storm. There are six contractor yards adjacent to Coos Bay. As noted in our effects analysis, we expect stormwater from this yard to reach the adjacent stream and result in incidental take of OC coho salmon. The best available surrogate for incidental take caused by stormwater contaminants from these yards is delivery of untreated stormwater from this contractor yard to the adjacent stream during storms *smaller* than the 2-year, 24-hour event. This surrogate is connected causally to the amount of take that will occur because delivery of stormwater during smaller storms (less than the 2-year 24-hour event) translates into a proportional increase in contaminants delivered to listed species. The delivery of stormwater to streams can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger.

The proposed action will treat stormwater from the terminal site, Trans-Pacific Parkway/US 101 intersection, APCO disposal sites, and roads affected by construction at the Kentuck Aquatic Restoration Site. For these sites, the best available incidental take surrogate associated with stormwater contaminants is the level of water quality impairment occurring when the stormwater

facilities are properly functioning. This proper function can be assured by adequate stormwater facility operation, inspection, and maintenance according to the design manual and/or manufacturers' recommendations. This surrogate is connected causally to the amount of take that will occur because compliance with the design manual and/or manufacturers' recommendations correlates with the level of stormwater treatment assumed in this Opinion. The compliance with the design manual and/or manufacturers' recommendations can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger.

Green sturgeon

Estuarine Analysis Area
Activities necessary for construction and operation of the terminal, a portion of the pipeline, and some offsite mitigation activities will take place within and adjacent to estuarine habitats reasonably certain to be occupied by ESA-listed green sturgeon. We found the proposed action is reasonably certain to cause incidental take of green sturgeon resulting from:

a) Increased suspended sediment, and loss of food resources from initial dredging of the navigation improvement areas, access channel, and eelgrass mitigation area, and future dredging for maintenance of the access channel and berthing slip;
b) Loss of food resources from construction of other structures;
c) Harm from in-water construction of offsite mitigation actions;
d) Acoustic impacts from pile driving;
e) Stormwater discharge from impervious surfaces.

Take caused by the habitat-related effects of this action cannot be accurately quantified as a number of fish. This is because the distribution and abundance of green sturgeon occurring within any particular portion of Coos Bay affected by the proposed activities are not fully predictable, being affected by factors we cannot predict, such as habitat quality, competition, and predation. In such circumstances, we use take surrogates causally linked to the expected level and type of incidental take from the proposed action. For the habitat-related effects of the proposed action, the best available surrogates are as follows:

Construction and maintenance dredging. Here, the best available incidental take surrogate associated with construction and maintenance dredging is the area disturbed. Because the amount of take increases with the area disturbed by dredging, this surrogate is proportional to extent of incidental take attributable to this project.

- Initial construction
    - Navigation improvement areas: 27 acres
    - Access channel and MOF: 25 acres
    - Eelgrass mitigation area: 9.3 acres
- Maintenance dredging
    - Navigation improvement areas: 27 acres
    - Access channel, MOF, and berthing slip: 37.3 acres

This metric can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it

nevertheless serve as a meaningful reinitiation trigger because implementation monitoring, which occurs continuously during construction and maintenance dredging, will document any exceedance and if reinitiation is warranted.

Loss of food resources from construction of other structures. Here, the best available incidental take surrogate associated with construction of other structures is the area disturbed. These structures would permanently displace habitat which would otherwise produce forage for green sturgeon. Because the amount of take increases with the area disturbed, this surrogate is proportional to extent of incidental take attributable to this project.

- Pile dike apron: 3.8 acres
- Trans-Pacific Parkway widening: 0.5 acres
- Temporary dredged material offloading areas: 4.2 acres

This metric can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serve as a meaningful reinitiation trigger because implementation monitoring, which occurs continuously during construction, will document any exceedance and if reinitiation is warranted.

Harm from in-water construction of offsite mitigation actions. Here, the best available incidental take surrogate associated with construction of offsite mitigation actions is the area disturbed to construct the proposed amount of offsite mitigation. Because the amount of harm from suspended sediment plumes and temporary loss of food resources increases with the area disturbed, this surrogate is proportional to extent of incidental take attributable to this project.

- Tidal portion of the Kentuck Aquatic Restoration Site: 92 acres
- Freshwater portion of the Kentuck Aquatic Restoration: 9.1 acres
- Eelgrass mitigation area: 9.3 acres

This metric can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serve as a meaningful reinitiation trigger because implementation monitoring, which occurs continuously during construction, will document any exceedance and if reinitiation is warranted.

Acoustic impacts. The proposed action will require up to 3,000 impact hammer strikes on steel pile per day. We assume no more than 1,600 strikes (maximum 800 strikes per rig, no more than two rigs) within 500 feet of each other. Thus, the best available incidental take surrogate associated with acoustic impacts is 1,600 impact hammer strikes per day on steel pile within 500 feet of each other. This surrogate is connected causally to the amount of take that will occur because increased impact hammer strikes on steel pile translate into a proportional increase in the impact to listed species. This metric can also be easily monitored allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serves as a meaningful reinitiation trigger because implementation

monitoring, which occurs continuously during pile driving, will document any exceedance and if reinitiation is warranted.

Stormwater discharge from impervious surfaces. In the effects analysis, we assumed gravel surfaced contractor yards within 100 feet of waterbodies will deliver stormwater contaminants during storms greater than the 2-year, 24-hour storm. There are six contractor yards adjacent to Coos Bay. As noted in our effects analysis, we expect stormwater from these yards to reach the adjacent stream and result in incidental take of green sturgeon. The best available surrogate for incidental take caused by stormwater contaminants from these yards is delivery of untreated stormwater from this contractor yard to the adjacent stream during storms *smaller* than the 2-year, 24-hour event. This surrogate is connected causally to the amount of take that will occur because delivery of stormwater during smaller storms (less than the 2-year 24-hour event) translates into a proportional increase in contaminants delivered to listed species. The delivery of stormwater to streams can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger.

The proposed action will treat stormwater from the terminal site, Trans-Pacific Parkway/US 101 intersection, APCO disposal sites, and roads affected by construction at the Kentuck Aquatic Restoration Site. For these sites, the best available incidental take surrogate associated with stormwater contaminants is the level of water quality impairment occurring when the stormwater facilities are properly functioning. This proper function can be assured by adequate stormwater facility operation, inspection, and maintenance according to the design manual and/or manufacturers' recommendations. This surrogate is connected causally to the amount of take that will occur because compliance with the design manual and/or manufacturers' recommendations correlates with the level of stormwater treatment assumed in this Opinion. The compliance with the design manual and/or manufacturers' recommendations can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger.

Eulachon

Estuarine Analysis Area

Activities necessary for construction and operation of the terminal, a portion of the pipeline, and some offsite mitigation activities will take place within and adjacent to estuarine habitats reasonably certain to be occupied by ESA-listed eulachon. We found the proposed action is reasonably certain to cause incidental take of eulachon resulting from:

a) Entrainment and increased suspended sediment from initial dredging of the navigation improvement areas, access channel, and eelgrass mitigation area, and future dredging for maintenance of the access channel and berthing slip;
b) Harm from in-water construction of offsite mitigation actions;
c) Entrainment and impingement in LNG carrier intake ports;
d) Stranding by LNG carrier ship wake;
e) Acoustic impacts from pile driving;
f) Stormwater discharge from impervious surfaces.

Construction and maintenance dredging. Here, the best available incidental take surrogate associated with construction and maintenance dredging is the area disturbed. Because the amount

of take increases with the area disturbed by dredging, this surrogate is proportional to extent of incidental take attributable to this project.

- Initial construction
    - Navigation improvement areas: 27 acres
    - Access channel and MOF: 25 acres
    - Eelgrass mitigation area: 9.3 acres
- Maintenance dredging
    - Navigation improvement areas: 27 acres
    - Access channel, MOF, and berthing slip: 37.3 acres

This metric can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serve as a meaningful reinitiation trigger because implementation monitoring, which occurs continuously during construction and maintenance dredging, will document any exceedance and if reinitiation is warranted.

<u>Harm from in-water construction of offsite mitigation actions</u>. Here, the best available incidental take surrogate associated with construction of offsite mitigation actions is the area disturbed to construct the proposed amount of offsite mitigation. Because the amount of harm from suspended sediment plumes and temporary loss of food resources increases with the area disturbed, this surrogate is proportional to extent of incidental take attributable to this project.

- Tidal portion of the Kentuck Aquatic Restoration Site: 92 acres
- Freshwater portion of the Kentuck Aquatic Restoration: 9.1 acres
- Eelgrass mitigation area: 9.3 acres

This metric can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serve as a meaningful reinitiation trigger because implementation monitoring, which occurs continuously during construction, will document any exceedance and if reinitiation is warranted.

<u>Entrainment and impingement in LNG carrier intake ports</u>. Here, the best available incidental take surrogate associated with loss of individuals in intake ports is the number of vessels calling on the terminal per year, 120. This surrogate is connected causally to the amount of take that will occur because an increased number of vessels translate into a proportional increase in the number of injuries and deaths of listed species. This metric can also be easily monitored allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serves as a meaningful reinitiation trigger because although it is not anticipated, the facility has the potential capacity for greater than 120 vessels per year and the number of vessels is continuously monitored.

<u>Vessel wake stranding</u>. We determined LNG carriers will produce wakes that will strand some eulachon individuals. It is not possible to monitor the actual number of fish stranded due to the length of shoreline, difficulty in accessing and walking it, the small probability of finding a fish

that is stranded, and the likelihood an avian predator will find it first. Based on all of this, we are instead using an incidental take surrogate. Here the best available incidental take surrogate associated with vessel wake stranding is the number of vessels calling on the terminal per year, 120. This surrogate is connected causally to the amount of take that will occur because an increased number of vessels translate into a proportional increase in the probability and number of wake strandings. This metric can also be easily monitored allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serves as a meaningful reinitiation trigger because although it is not anticipated, the facility has the potential capacity for greater than 120 vessels per year and the number of vessels is continuously monitored.

Acoustic impacts. The proposed action will require up to 3,000 impact hammer strikes on steel pile per day. We assume no more than 1,600 strikes (maximum 800 strikes per rig, no more than two rigs) within 500 feet of each other. Thus, the best available incidental take surrogate associated with acoustic impacts is 1,600 impact hammer strikes per day on steel pile within 500 feet of each other. This surrogate is connected causally to the amount of take that will occur because increased impact hammer strikes on steel pile translate into a proportional increase in the impact to listed species. This metric can also be easily monitored allowing the surrogate to serve as a clear reinitiation trigger. Although this surrogate is somewhat coextensive with the proposed action, it nevertheless serves as a meaningful reinitiation trigger because implementation monitoring, which occurs continuously during pile driving, will document any exceedance and if reinitiation is warranted.

Stormwater discharge from impervious surfaces. In the effects analysis, we assumed gravel surfaced contractor yards within 100 feet of waterbodies will deliver stormwater contaminants during storms greater than the 2-year, 24-hour storm. There are six contractor yards adjacent to Coos Bay. As noted in our effects analysis, we expect stormwater from this yard to reach the adjacent stream and result in incidental take of eulachon. The best available surrogate for incidental take caused by stormwater contaminants from these yards is delivery of untreated stormwater from this contractor yard to the adjacent stream during storms *smaller* than the 2-year, 24-hour event. This surrogate is connected causally to the amount of take that will occur because delivery of stormwater during smaller storms (less than the 2-year 24-hour event) translates into a proportional increase in contaminants delivered to listed species. The delivery of stormwater to streams can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger.

The proposed action will treat stormwater from the terminal site, Trans-Pacific Parkway/US 101 intersection, APCO disposal sites, and roads affected by construction at the Kentuck Aquatic Restoration Site. For these sites, the best available incidental take surrogate associated with stormwater contaminants is the level of water quality impairment occurring when the stormwater facilities are properly functioning. This proper function can be assured by adequate stormwater facility operation, inspection, and maintenance according to the design manual and/or manufacturers' recommendations. This surrogate is connected causally to the amount of take that will occur because compliance with the design manual and/or manufacturers' recommendations correlates with the level of stormwater treatment assumed in this Opinion. The compliance with

the design manual and/or manufacturers' recommendations can also be easily monitored, allowing the surrogate to serve as a clear reinitiation trigger.

Blue whales, fin whales, humpback whales, and sperm whales

The proposed action is reasonably certain to harm individual blue whales, fin whales, humpback whales, and sperm whales due to shipping associated with operation of the proposed action. The best available incidental take surrogate associated with shipping is the number of vessels calling on the terminal per year, 120. This surrogate is connected causally to the amount of take that will occur because an increase in vessel calls translates into a proportional increase in underwater noise and the risk of ship strike to these species. While somewhat coextensive with the proposed action, this metric serves as a valid reinitiation trigger because although it is not anticipated, the facility has the potential capacity for greater than 120 vessels per year and can also be easily monitored. As explained in the introduction to this section, the ITS does not include an exemption for any future incidental take of marine mammals caused by third party activities associated with LNG carrier traffic.

2.9.2 Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to any of the species considered in this opinion or destruction or adverse modification of their critical habitat.

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

1. Minimize incidental take salvaging fish from isolated work.
2. Minimize incidental take from pile driving.
3. Minimize incidental take from riparian vegetation removal.
4. Minimize incidental take from suspended sediment.
5. Minimize incidental take from dredging.
6. Minimize incidental take from vessel wake stranding.
7. Minimize incidental take from stormwater discharge.
8. Minimize incidental take by ensuring offsite mitigation actions are completed.
9. Conduct monitoring sufficient to document the proposed action does not exceed the parameters analyzed in the effects section or the extent of take described above, and report monitoring results to NMFS.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and FERC, Corps, USFS, BLM, Coast Guard, and the Applicants must comply with them in order to implement the RPMs (50 CFR 402.14). The FERC, Corps, USFS, BLM, Coast Guard, and the Applicants also have a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. To implement reasonable and prudent measure #1 (salvaging fish), for all isolation events, FERC, the Corps, and the Applicants shall ensure, and on their lands, the BLM and USFS shall ensure:
    a. Staff working with the salvage operation must have the necessary knowledge, skills, and abilities to ensure the safe handling of all ESA-listed fish.
    b. At least one seining pass is made to maneuver fish out of the isolation area without capturing them.
    c. Seining will be conducted by, or under the supervision of a fishery biologist with at least 100 hours of experience in such efforts.
    d. Electrofishing will continue within isolated areas during dewatering until all fish are removed.
    e. All electrofishing complies with NMFS (2000).
    f. Electrofishing equipment is in good working condition. Operators have gone through the manufacturer's preseason checks, adhere to all provisions, and record major maintenance work in a log.
    g. A crew leader having at least 100 hours of electrofishing experience in the field using similar equipment must train the crew and supervise all electrofishing.
    h. The electrofishing settings must be recorded in a logbook along with conductivity, temperature, and other variables affecting efficiency along with observations on fish condition.

2. To implement reasonable and prudent measure #2 (in-water pile driving), FERC, the Corps, and the Applicants shall ensure:
    a. An impact hammer is only used if absolutely necessary.
    b. When using an impact hammer to drive or proof steel piles, one of the following sound attenuation methods must be used:
        i. Completely isolate the pile by dewatering the area around the pile.
        ii. If water velocity is 1.6 feet per second or less, surround the pile with a confined or unconfined bubble curtain that distributes small air bubbles around 100% of the piling perimeter for the full depth of the water column.
        iii. If water velocity is greater than 1.6 feet per second, surround the pile with a confined bubble curtain (e.g., a bubble ring surrounded by a fabric or non-metallic sleeve) that distributes air bubbles around 100% of the piling perimeter for the full depth of the water column.

   c. Anytime using an impact hammer, monitor sound pressure levels to ensure cumulative levels do not exceed 183 dB at 522 feet from the piles being driven. If sound pressure levels approach cumulative effects, cease driving for the day.

3. To implement reasonable and prudent measure #3 (riparian vegetation removal), for all stream crossings, FERC, the Corps, and the Applicants shall ensure, and on their lands, the BLM and USFS shall ensure:
   a. A monitor is present during clearing to ensure no more than 75 linear feet of riparian vegetation are cleared within 200 feet of streams.
   b. At least 25% of each LW piece placed is within the ordinary high-water mark of the stream.
   c. The minimum diameter of LW meets the criteria in Table 6.
   d. The minimum length of LW is 1.5 times the bankfull width if a rootwad is attached, 2 times the bankfull width if a rootwad is not attached.
   e. At least half of the LW would be provided with attached root wads.
   f. For all deficit or undersupplied LW in the LW plan, the applicant will install pieces in coho salmon-bearing streams within the same 5th field. These pieces may or may not be at other crossing locations.
   g. Payments to other entities in lieu of placement is not permitted.
   h. No riprap is used at crossing sites, only bioengineered methods (such as LW) shall be used for bank protection or flow control.

4. To implement reasonable and prudent measure #4 (suspended sediment), FERC, the Corps, and the Applicants shall ensure:
   a. Suspended sediment monitoring occurs hourly at all times during dredging for construction.
   b. In the estuary, if suspended sediment levels exceed the following levels, dredging shall cease until suspended sediment returns to background levels:
      i. For access channel construction - at lower tidal velocities (0.2 knots), values would not exceed 30 milligrams per liter (mg/l) outside of 200 meters, and at high tidal velocity (1.9 knots) less than 50 mg/l in 200 meters.
      ii. For the four marine waterway modification sites – if a hopper style suction dredge is used, 500 mg/l at 1.0 mile, if a hydraulic cutter suction dredge or mechanical clamshell dredge is used 500 mg/l at 0.1 mile.
      iii. For the eelgrass mitigation site a change above background at 360 feet in any direction.
   c. Suspended sediment monitoring occurs hourly at every waterbody crossing.
   d. At waterbody crossings, if suspended sediment levels exceed the following durations, all construction shall cease until suspended sediment returns to background levels:
      i. 5 hours in the Rogue River basin.
      ii. 6 hours in the Coos, Coquille, and Umpqua river basins.

5. To implement reasonable and prudent measure #5 (dredging), FERC, the Corps, and the Applicants shall ensure:
    a. For any dredging with a hopper dredge or hydraulic cutterhead, the draghead or cutterhead will remain on the bottom to the greatest extent possible.
    b. It may only be raised 3 feet off the bottom for brief periods when the cutterhead or draghead has to be purged.

6. To implement reasonable and prudent measure #6 (vessel wake stranding):
    a. Under the LNG Vessel Transit Management Plan and Facility Security Plan, the Coast Guard shall ensure LNG carriers travel at speeds no greater than 9 knots between RM 1 and the terminal.
    b. The Applicants shall monitor vessel speeds through the navigational channel to ensure LNG carriers travel at speeds no greater than 9 knots between RM 1 and the terminal. This may be done in conjunction with logbooks maintained by Coastal pilots or tugboat operators.
    c. The Applicants shall monitor shallow sloped beaches between RM 1 and the terminal one round trip per month to determine if vessel wake stranding is occurring.

7. To implement reasonable and prudent measure #7 (stormwater), FERC and the Applicants shall ensure:
    a. Stormwater from all impervious surfaces is treated prior to entering any stream.
    b. Graveled surfaces are considered impervious.
    c. This includes all temporary contractor yards, rock source and disposal sites, above ground facilities, and off-site parking lots such as the Myrtlewood park and ride.
    d. Meet the treatment standard of 100% infiltration or at least 50% of the 2-year, 24-hour storm.
    e. Monitor stormwater at all impervious surfaces throughout project construction or as long as the facility is used by the Applicants, whichever is longer. Monitoring consists of spot-checking all stormwater facilities to determine if they drain within 48 hours after any major rainfall event (*i.e.*, greater than 1.5 inches of rain over a 24-hour period at the closest weather station).
    f. If water continues to pond after 48 hours, sources of possible clogging shall be identified and corrected within 7 days. Record the dates and details of any such events.
    g. Report any failure to drain within 48 hours to NMFS within 30 days, including a description of the remedy.
    h. Conduct routine maintenance (*e.g.*, debris removal, soil amendment, vegetation removal and replanting, mowing, sediment removal, tilling, etc.) throughout the year to ensure that stormwater treatment facilities function as appropriate to remove stormwater pollutants. Record the dates and types of maintenance done.

8. To implement reasonable and prudent measure #8 (offsite mitigation actions):
    a. The FERC, Corps, and the Applicants shall ensure successful completion of the following:

    i. Restoring tidal connectivity to 72 acres at the Kentuck Aquatic Restoration Site;
    ii. Re-establishing floodplain connectivity to 2.7 acres of Kentuck Creek at the Kentuck Aquatic Restoration Site; and
    iii. Establishing 2.7 acres of eelgrass habitat.
  b. The FERC, USFS, BLM, and the Applicants shall ensure successful completion of the following:
    i. The Applicants' proposed offsite mitigation on BLM lands in Attachment 2 of their CMP; and
    ii. The Applicants' proposed offsite mitigation on USFS lands in Attachment 11 of their CMP.

9. To implement reasonable and prudent measure #9 (monitoring and reporting):
  a. The FERC, Coast Guard, Corps, and the Applicants shall ensure the following monitoring will occur:
    i. The number of SONCC coho salmon and OC coho salmon captured during salvage of work area isolations (FERC, Corps, Applicants);
    ii. Suspended sediment plumes during dredging, work area isolation, and in-water construction of riverine analysis area offsite mitigation actions, according to 4a and 4c above (FERC, Corps, Applicants);
    iii. Riparian vegetation removal, according to 3a. above (FERC, Corps, Applicants);
    iv. All stormwater discharge, according to 7e. above (FERC, Corps, Applicants);
    v. Acreage of all construction and maintenance dredging (FERC, Corps, Applicants);
    vi. Acreage of lost food resources from construction of other structures (FERC, Corps, Applicants);
    vii. Acreage of constructed offsite mitigation in the estuarine analysis area(FERC, Corps, Applicants);
    viii. LNG carrier speeds, according to 6b. above (FERC, Coast Guard, Applicants);
    ix. Stranding by LNG carrier ship wake, according to 6c. above (FERC, Coast Guard, Applicants);
    x. Sound pressure levels when using an impact hammer, according to 2c. above (FERC, Corps, Applicants); and
    xi. Sound pressure levels outside of isolated areas any time blasting is used at waterbody crossings (FERC, Corps, Applicants).
  b. The FERC, USFS, BLM, and the Applicants shall ensure monitoring successful completion of the Applicants proposed offsite mitigation on USFS and BLM lands.
  c. The FERC, Coast Guard, Corps, and the Applicants shall ensure immediate reporting to NMFS if any of the following occurs:
    i. The total number of SONCC coho salmon captured during salvage of work area isolations exceeds 270 (FERC, Corps, Applicants);

ii. The total number of OC coho salmon captured during salvage of work area isolations exceeds 1,055 (FERC, Corps, Applicants);
iii. Suspended sediment plumes during dredging exceed any of the levels in 4b. above (FERC, Corps, Applicants);
iv. Suspended sediment plumes during work area isolation, and in-water construction of riverine analysis area offsite mitigation actions exceed the levels in 4d. above (FERC, Corps, Applicants);
v. Riparian vegetation removal exceeds 75 linear feet at any waterbody crossing (FERC, Corps, Applicants);
vi. Any stormwater facility fails to drain within 48 hours, according to 7f. above (FERC, Applicants);
vii. Acreage of any construction or maintenance dredging exceeds (FERC, Corps, Applicants):
    1. Initial construction
        a. Navigation improvement areas: 27 acres
        b. Access channel and MOF: 25 acres
        c. Eelgrass mitigation area: 9.3 acres
    2. Maintenance dredging
        a. Navigation improvement areas: 27 acres
        b. Access channel, MOF, and berthing slip: 37.3 acres
viii. Acreage disturbed by construction of other structures exceeds (FERC, Corps, Applicants):
    1. Pile dike apron: 3.8 acres;
    2. Trans-Pacific Parkway widening: 0.5 acres; or
    3. Temporary dredged material offloading areas: 4.2 acres.
ix. Acreage of constructed offsite mitigation in the estuarine analysis area fails to exceed (FERC, Corps, Applicants):
    1. Restoring tidal connectivity to 72 acres at the Kentuck Aquatic Restoration Site;
    2. Reestablishing floodplain connectivity to 2.7 acres of Kentuck Creek at the Kentuck Aquatic Restoration Site; or
    3. Establishing 2.7 acres of eelgrass habitat.
x. LNG carrier speed between RM 1 and the terminal exceeds 9 knots (FERC, Coast Guard, Applicants);
xi. Stranding by LNG carrier ship wake occurs (FERC, Coast Guard, Applicants);
xii. The number of impact hammer strikes per day on steel pile within 500 feet of each other exceeds 1,600 (FERC, Corps, Applicants);
xiii. Cumulative sound pressure levels when using an impact hammer exceed 183 dB at 522 feet from the piles being driven (FERC, Corps, Applicants); or
xiv. Sound pressure levels from in-water blasting outside of isolated areas exceed 7.3 pounds per square inch (FERC, Corps, Applicants).

d. The Applicants will ensure a monitoring report is submitted to NMFS by September 1 of each year that describes the previous year's implementation of the proposed action. At a minimum, the report will document:

i. A summary of terminal and pipeline construction activities, including:
    1. The number of each type of in-water pile placed;
    2. The number of impact hammer strikes;
    3. Progress of offsite mitigation construction; and
    4. Number of waterbody crossings.

ii. A summary of terminal and pipeline operation activities, including:
    1. Number of LNG carrier round trips; and
    2. Maintenance dredging completed.

iii. All information in 9a. through 9c. above.

2.10 Conservation Recommendations

Section 7(a) (1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

The following are NMFS' recommendations:

- The Coast Guard should continue to work with NMFS helping to educate mariners and make them aware of whales and other marine species along the West Coast and across the country.
- The Coast Guard should continue to work with NMFS and other partners (e.g., through the ECHO project) on actions to reduce the impact of vessel traffic on endangered and threatened marine species.
- The Coast Guard should continue to work with NMFS' marine mammal stranding coordinator and network volunteers to locate, track, and respond to marine species in distress.
- The Applicants should construct eelgrass mitigation beds at least one growing season prior to disrupting any existing beds to avoid temporal impacts associated with loss of eelgrass habitat.
- The Applicants should construct the Kentuck Aquatic Restoration Site at least one growing season prior to access channel dredging in Coos Bay to avoid temporal habitat losses associated with construction.

2.11 Reinitiation of Consultation

This concludes formal consultation for the Jordan Cove Liquefied Natural Gas Project and Pacific Connector Gas Pipeline Project.

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the identified action is subsequently modified in a manner that

causes an effect to the listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.12 "Not Likely to Adversely Affect" Determinations

This determination for southern resident killer whales, right whales, sei whales, gray whales, green sea turtle, leatherback sea turtle, olive ridley sea turtle, loggerhead sea turtle, proposed southern resident killer whale critical habitat, proposed humpback whale critical habitat, and leatherback sea turtle critical habitat was prepared by us pursuant to section 7(a)(2) of the ESA, implementing regulations at 50 CFR 402 and agency guidance for preparation of letters of concurrence.

The applicable standard to find that a proposed action is not likely to adversely affect listed species or critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or completely beneficial. Discountable effects are those extremely unlikely to occur. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs or where alteration of any PBFs of critical habitat reduces those features' ability to support listed species' conservation needs in the action area. Beneficial effects are contemporaneous positive effects without any adverse effect on the listed species or critical habitat. In terms of critical habitat, completely beneficial effects are positive only: an action cannot be deemed wholly beneficial if it has any adverse effect on critical habitat.

The proposed action and the action area for this consultation are described in the Introduction to this document (Sections 1.3 and 1.4).

<u>Southern Resident Killer Whales</u>

There are only two confirmed cases of southern resident killer whale injuries and deaths due to boat strikes since 2005 (Carretta *et al*. 2019). There was documentation of a whale-boat collision in Haro Strait in 2005 which resulted in a minor injury to a whale. In 2006, whale L98 was killed during a vessel interaction. It is important to note that L98 had become habituated to regularly interacting with vessels during its isolation in Nootka Sound. Both of these collisions were from small vessels. There are two other cases that may or may not be caused by boat strike, but for purposes of this biological opinion (assuming worst-case scenario) we will assume they are. In 2012, a moderately decomposed juvenile female (L-112) was found dead near Long Beach, WA. A full necropsy determined the cause of death was blunt force trauma to the head, however the source of the trauma could not be established (Carretta *et al*. 2019). Similarly, in 2016, a young adult male (J34) was found dead in the northern Georgia Strait. His injuries were consistent with those incurred during a vessel strike, though a final determination has not been made (Carretta *et al*. 2019).

Although the range of southern resident killer whale overlaps with the action area, few sightings of them occur of the coast of Oregon. From 1982-2016, of the 49 confirmed sightings of southern resident killer whales in coastal waters off the western U.S., only eight occurred off of Oregon (NMFS 2019). No documented southern resident killer whale deaths or strandings have occurred near the action area. The relatively small action area, low presence of killer whale in the

action area, and the lack of interactions with large ships through reporting or the stranding network, with none near the action area, leads us to conclude that risk of collision from vessels is discountable.

The sound from the large ocean going vessels (OGVs) is largely low frequency sound that does not overlap with the most sensitive hearing range of killer whales. Vessel sound may still be audible to the whales, but any disturbance from the sound of passing OGVs is expected to be short-term, transitory, and insignificant. Therefore, acoustic effects of the proposed action will be insignificant on southern resident killer whales and proposed southern resident killer whale critical habitat.

The proposed action may affect southern resident killer whale s indirectly by reducing availability of their primary prey, Chinook salmon. The proposed activities are not expected to produce a measurable effect on the abundance, distribution, diversity, or productivity of Chinook salmon at either the population or species level. Given the total quantity of prey available to southern resident killer whales throughout their range, this reduction in prey is extremely small, and is not anticipated to be different from zero by multiple decimal places (based on NMFS previous analyses of the effects of in-river salmon harvest on Southern Resident killer whales, e.g. NMFS No. WCR-2017-7164). Because the reduction is so small, there is also a low probability that any juvenile Chinook salmon killed by the proposed activities would have later (in 3-5 years' time) been intercepted by the killer whales across their vast range in the absence of the proposed activities. Therefore, the anticipated reduction of salmonids associated with the proposed action would result in an insignificant reduction in adult equivalent prey resources for southern resident killer whales and an insignificant effect on proposed southern resident killer whale critical habitat.

North Pacific Right Whales

North Pacific right whales are rarely found off the U.S. West Coast and have primarily been documented foraging in the Bering Sea and the Gulf of Alaska, where critical habitat was designated in 2006. Due to the rare occurrence of North Pacific right whales in the action area it is extremely unlikely there would be an interaction between North Pacific right whales and LNG carriers. Therefore, the risk of ship strikes and effects from vessel sound on North Pacific right whales is discountable.

Sei Whales

Sei whales have a global distribution and occur in the North Atlantic Ocean, North Pacific Ocean, and Southern Hemisphere. The species is cosmopolitan, but with a generally anti-tropical distribution centered in the temperate zones. Sei whales are distributed far out to sea in temperate regions of the world and do not appear to be associated with coastal features (Caretta *et al.* 2013). The action area extends approximately 12 nautical miles off the coast of Oregon to the edge of the Continental shelf and slope. Due to the rare occurrence of Sei whales in the action area it is extremely unlikely there would be an interaction between Sei whales and LNG carriers. Therefore, the risk of ship strikes and effects from vessel sound on sei whales is discountable.

Western North Pacific Gray Whales
Off the Oregon and Washington coasts, the occurrence of Eastern North Pacific gray whales is common, with the most recent population estimate (2015/2016) during southbound surveys being 26,960 (2018 Stock Assessment Report). The Eastern North Pacific stock was delisted from the ESA in 1993, therefore we are not analyzing the Eastern North Pacific stock in this opinion.

Western North Pacific gray whales feed during summer and fall in the Okhotsk Sea off northeast Sakhalin Island, Russia, and in the Bering Sea off southeastern Kamchatka (2018 Stock Assessment Report). The Western North Pacific gray whales are rare, with a population estimate of only 290 individuals (2018 Stock Assessment Report). Recently, information from tagging, photo-identification, and genetic studies show that Western North Pacific gray whales have been observed migrating in the winter to the eastern North Pacific off the outer coast of North America from Vancouver, B.C to Mexico (Lang 2011, Mate *et al.* 2011, Weller *et al.* 2012). Although there is potential for Western North Pacific gray whales to occur in the action area, the available data on their migration patterns and low abundance indicate their occurrence is rare.

Due to the rare occurrence of Western North Pacific gray whales in the action area, it is extremely unlikely there would be an interaction between Western North Pacific gray whales and LNG carriers. Therefore, the risk of ship strikes and effects from vessel sound on Western North Pacific gray whales is discountable.

Humpback Whale Proposed Critical Habitat
The marine analysis area within the action area is proposed critical habitat for humpback whales. The only PBF designated for critical habitat is prey. As described above in the effects to species section, the terminal area will discharge treated stormwater and treated sanitary waste into the industrial wastewater pipeline. The wastewater effluent will contain contaminants that could affect prey resources of humpback whales. However, the affected area is so small (500 feet) any change in forage will be insignificant.

Green Sea Turtles
Green sea turtles use open ocean convergence zones and coastal areas for benthic feeding of macroalgae and sea grasses. There are no known resting areas along the U.S. West Coast. In the eastern North Pacific, green sea turtles commonly occur south of Oregon, but have been sighted as far north as Alaska (NMFS and USFWS 1998a). Stranding reports indicate that the green sea turtle appears to be a resident in waters off San Diego Bay, California (NMFS and USFWS 1998a) and in the San Gabriel River and surrounding waters in Orange and Los Angeles counties, California. Although there is potential for green sea turtles to occur along the Washington and Oregon coasts, available data indicate that occurrence is likely to be rare in the action area.

Due to the rare occurrence of green sea turtles in the action area it is extremely unlikely there would be an interaction between green sea turtles and LNG carriers. Therefore, the risk of ship strikes on green sea turtles is discountable.

Loggerhead Sea Turtles
Loggerhead sea turtles inhabit continental shelves, bays, estuaries, and lagoons in the Atlantic, Pacific, and Indian Oceans (NMFS and USFWS 1998b). On the U.S. West Coast, most sightings of loggerhead turtles are of juveniles. Most sightings are off California; however, there are also a few sighting records from Washington and Alaska (Bane 1992). There are no known resting areas along the U.S. West Coast. Although there is potential for loggerhead sea turtles to occur along the Washington and Oregon coasts, available data indicate that occurrence is likely to be rare in the action area.

Due to the rare occurrence of loggerhead sea turtles in the action area it is extremely unlikely there would be an interaction between loggerhead sea turtles and LNG carriers. Therefore, the risk of ship strikes on loggerhead sea turtles is discountable.

Olive Ridley Sea Turtles
Olive ridley sea turtles have a mostly pelagic distribution, but they have been observed to inhabit coastal areas. They are the most common and widespread sea turtle in the eastern Pacific. On the U.S. West Coast, they primarily occur off California, although stranding records indicate olive ridleys have been killed by gillnets and boat collisions in Oregon and Washington waters (NMFS and USFWS 1998c). In the eastern Pacific, nesting largely occurs off southern Mexico and northern Costa Rica (NMFS and USFWS 1998c). Although there is potential for olive ridley sea turtles to occur along the Oregon coast, available data indicate that occurrence is likely to be rare in the action area.

Due to the rare occurrence of olive ridley sea turtles in the action area it is extremely unlikely there would be an interaction between olive ridley sea turtles and LNG carriers. Therefore, the risk of ship strikes on olive ridley sea turtles is discountable.

Leatherback Sea Turtles
We do not have reliable abundance estimates for the foraging population of leatherback sea turtles in Oregon and Washington waters. Greatest densities are found off central California and in waters off the Columbia River (Benson *et al*. 2011). These areas have oceanographic retention areas or upwelling shadows that create favorable habitat for leatherback sea turtle prey, mainly cnidarians (medusae, siphonophores) and tunicates (salps, pyrosomas) (NMFS and USFWS 1998d). The critical habitat analytical review team (CHART) identified the Columbia River plume (46th parallel) and the Heceta Bank (44th parallel) as two important foraging areas off the Oregon Coast (NMFS 2012). Suchman and Brodeur (2005) indicated favorable habitat for leatherbacks at Heceta Bank and Cape Blanco (about 45 miles south of Coos Bay). These areas are productive due to conditions conducive to growth of gelatinous prey (Benson 2011).

Aerial surveys conducted by NMFS and results of experimental driftnet fishery interactions off Oregon and Washington between 2003 and 2011 resulted in very few sightings of leatherback sea turtles. All but one sighting were close to or above the 45th parallel (NMFS unpublished data). Coos Bay is located at the 43rd parallel. Given the low number of sightings along the Oregon Coast and the lack of favorable foraging conditions off Coos Bay, it is reasonable that few leatherback sea turtles occur in the action area.

Due to their relatively low occurrence, an interaction between them and LNG carriers transiting through the action area is extremely unlikely. Therefore, effects on leatherback sea turtles or their designated critical habitat from the proposed action are discountable.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the FERC and descriptions of EFH for Pacific Coast groundfish (Pacific Fishery Management Council [PFMC] 2005), coastal pelagic species (CPS) (PFMC 1998), and Pacific Coast salmon (PFMC 2014) contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The proposed action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of groundfish, coastal pelagic species, and Pacific salmon (PFMC 2005, PFMC 1998, PFMC 2014). In addition, the Coos Bay estuary is a Habitat Area of Particular Concern because estuaries are nutrient-rich and biologically-productive, providing a critical nursery ground for many species managed by the PFMC.

3.2 Adverse Effects on Essential Fish Habitat

The ESA portion of this document describes the adverse effects of this proposed action on coho salmon, green sturgeon, and eulachon. This ESA analysis of effects is also relevant to EFH. Based on information provided by the action agency and the analysis of effects presented in the ESA portion of this document, we conclude the proposed action will adversely affect designated EFH due to construction and operation of the proposed action.

3.2.1 Riverine Analysis Area

Potential adverse effects to Pacific salmon EFH include:

- Acoustic shock from blasting pipe trench through bedrock streambeds;
- Underwater noise produced during use of a track hoe or impact hammer if fish are proximate to the construction site;
- Inadvertent release of drilling mud during HDD construction;
- Migration blockage during in-stream construction;
- Suspended sediment generated during construction activities;
- Capturing juveniles during salvage operations from in-water work isolation areas;
- Stream bank and unstable hillslope erosion;
- Reduction of food resources due to reduction of freshwater stream invertebrates;
- Reduction of shade from removal of riparian vegetation (increase water temperature);
- Hydrostatic testing and risk of test water entering streams;
- Introduction and/or re-distribution of aquatic nuisance species through hydrostatic testing;
- Accidental release of fuels and entry of other petroleum products into surface waters;
- Channel migration, avulsion, widening, and/or streambed scour;
- Effects to hyporheic exchange and hyporheic zones;
- Run-off from new permanent access roads, new temporary access roads, existing access roads and temporary extra work areas;
- Application of herbicides to control noxious weeds near waterbodies;
- Improved channel complexity from LW placement;
- Reduced suspended sediment from road decommissioning and improvement;
- Improved shade and stream cover from riparian vegetation planting and fencing projects; and
- Improved migration from fish passage projects.
- Removal of riparian vegetation affecting recruitment of LW; and
- Run-off from contractor yards, rock source and disposal sites, and aboveground facilities.

3.2.2 Estuarine Analysis Area

Potential adverse effects to groundfish, coastal pelagic, and Pacific salmon EFH include:

- Suspended sediment from in-water construction;
- Suspended sediment from initial and maintenance dredging;
- Re-suspending contaminated sediments during dredging;
- Suspended sediment from LNG carrier prop wash and ship wake;
- Erosion runoff from Coos Bay upland facility;
- Introduction of exotic, invasive species from ballast water;
- Inadvertent release of drilling mud during HDD construction;
- Entrainment and impingement in LNG carriers' intake port;
- Entrainment of food organism in LNG carriers' intake port;

- Temperature effects from LNG carriers' cooling water discharge;
- Facility lighting during construction and operation;
- Habitat and food source effects related to construction and maintenance of the slip, access channel, marine waterway modifications, and pile dike rock apron development;
- Shading effects from over-water structures;
- Suspended sediment potentially released from construction activities during HDD across Coos Bay and Coos River;
- Stormwater discharge from impervious surfaces;
- Acoustic effects from impact driving in-water pile;
- Stranding by LNG carrier ship wake; and
- Entrainment from dredging.

3.2.3 Marine Analysis Area

Potential adverse effects to groundfish, coastal pelagic, and Pacific salmon EFH include:

- Increased acoustic noise from transiting vessels;
- Fuel or oil spills at sea;
- Entrainment and impingement in LNG carriers' intake port (coastal pelagics only);
- Entrainment of food organism in LNG carriers' intake port; and
- Contaminant discharge from the industrial wastewater pipeline.

3.3 Essential Fish Habitat Conservation Recommendations

The following ten conservation measures are necessary to avoid, mitigate, or offset the impact of the proposed action on the above described impacts to EFH. Eight of these conservation recommendations are a subset of the ESA terms and conditions.

1. FERC, the Corps, and the Applicants should minimize adverse effects from in-water pile driving by implementing the following recommendations:
    a. An impact hammer is only used if absolutely necessary.
    b. When using an impact hammer to drive or proof steel piles, one of the following sound attenuation methods must be used:
        i. Completely isolate the pile by dewatering the area around the pile.
        ii. If water velocity is 1.6 feet per second or less, surround the pile with a confined or unconfined bubble curtain that distributes small air bubbles around 100% of the piling perimeter for the full depth of the water column.
        iii. If water velocity is greater than 1.6 feet per second, surround the pile with a confined bubble curtain (e.g., a bubble ring surrounded by a fabric or non-metallic sleeve) that distributes air bubbles around 100% of the piling perimeter for the full depth of the water column.
    c. Anytime using an impact hammer, monitor sound pressure levels to ensure cumulative levels do not exceed 183 at522 feet from the piles being driven. If sound pressure levels approach cumulative effects, cease driving for the day.

2. For all stream crossings, FERC, the Corps, and the Applicants should, and on their lands, the BLM and USFS should minimize adverse effects from riparian vegetation removal by implementing the following:
    a. A monitor is present during clearing to ensure no more than 75 linear feet of riparian vegetation are cleared within 200 feet of streams.
    b. At least 25% of each LW piece placed is within the ordinary high water mark of the stream.
    c. The minimum diameter of LW meets the criteria in Table 6.
    d. The minimum length of LW is 1.5 times the bankfull width if a rootwad is attached, 2 times the bankfull width if a rootwad is not attached.
    e. At least half of the LW would be provided with attached root wads.
    f. For all deficit or undersupplied LW in the LW plan, the applicant will install pieces in coho salmon-bearing streams within the same 5th field. These pieces may or may not be at other crossing locations.
    g. Payments to other entities in lieu of placement is not permitted.
    h. No riprap is used at crossing sites, only bioengineered methods (such as LW) should be used for bank protection or flow control.
3. FERC, the Corps, and the Applicants should minimize adverse effects from suspended sediment by implementing the following:
    a. Suspended sediment monitoring occurs hourly at all times during dredging for construction.
    b. In the estuary, if suspended sediment levels exceed the following levels, dredging should cease until suspended sediment returns to background levels:
        i. For access channel construction - at lower tidal velocities (0.2 knots), values would not exceed 30 milligrams per liter (mg/l) outside of 200 meters, and at high tidal velocity (1.9 knots) less than 50 mg/l in 200 meters.
        ii. For the four marine waterway modification sites – if a hopper style suction dredge is used, 500 mg/l at 1.0 mile, if a hydraulic cutter suction dredge or mechanical clamshell dredge is used 500 mg/l at 0.1 mile.
        iii. For the eelgrass mitigation site a change above background at 360 feet in any direction.
    c. Suspended sediment monitoring occurs hourly at every waterbody crossing.
    d. At waterbody crossings, if suspended sediment levels exceed the following durations, all construction should cease until suspended sediment returns to background levels:
        i. 5 hours in the Rogue River basin.
        ii. 6 hours in the Coos, Coquille, and Umpqua river basins.
4. FERC, the Corps, and the Applicants should minimize adverse effects from dredging by implementing the following:
    a. For any dredging with a hopper dredge or hydraulic cutterhead, the draghead or cutterhead will remain on the bottom to the greatest extent possible.
    b. It may only be raised 3 feet off the bottom for brief periods when the cutterhead or draghead has to be purged.

5. To minimize adverse effects from vessel wake stranding:
    a. Under the LNG Vessel Transit Management Plan and Facility Security Plan, the Coast Guard shall ensure LNG carriers travel at speeds no greater than 9 knots between RM 1 and the terminal.
    b. The Applicants should monitor vessel speeds through the navigational channel to ensure LNG carriers travel at speeds no greater than 9 knots between RM 1 and the terminal. This may be done in conjunction with logbooks maintained by Coastal pilots or tugboat operators.
    c. The Applicants should monitor shallow sloped beaches between RM 1 and the terminal one round trip per month to determine if vessel wake stranding is occurring.
6. FERC and the Applicants should minimize adverse effects from stormwater by implementing the following:
    a. Stormwater from all impervious surfaces is treated prior to entering any stream.
    b. Graveled surfaces are considered impervious.
    c. This includes all temporary contractor yards, rock source and disposal sites, above ground facilities, and off-site parking lots such as the Myrtlewood park and ride.
    d. Meet the treatment standard of 100% infiltration or at least 50% of the 2-year, 24-hour storm.
    e. Monitor stormwater at all impervious surfaces throughout project construction or as long as the facility is used by the Applicants, whichever is longer. Monitoring consists of spot-checking all stormwater facilities to determine if they drain within 48 hours after any major rainfall event (*i.e.*, greater than 1.5 inches of rain over a 24-hour period at the closest weather station).
    f. If water continues to pond after 48 hours, sources of possible clogging should be identified and corrected within 7 days. Record the dates and details of any such events.
    g. Report any failure to drain within 48 hours to NMFS within 30 days, including a description of the remedy.
    h. Conduct maintenance (*e.g.*, debris removal, soil amendment, vegetation removal and replanting, mowing, sediment removal, tilling, etc.) throughout the year to ensure that stormwater treatment facilities function as appropriate to remove stormwater pollutants. Record the dates and types of maintenance done.
7. To minimize adverse effects of habitat loss by ensuring offsite mitigation actions are completed:
    a. The FERC, Corps, and the Applicants should ensure successful completion of the following:
        i. Restoring tidal connectivity to 72 acres at the Kentuck Aquatic Restoration Site;
        ii. Re-establishing floodplain connectivity to 2.7 acres of Kentuck Creek at the Kentuck Aquatic Restoration Site; or
        iii. Establishing 2.7 acres of eelgrass habitat.
    b. The FERC, USFS, BLM, and the Applicants should ensure successful completion of the following:
        i. The Applicants proposed offsite mitigation on BLM lands in Attachment 2 of their CMP.

    ii. The Applicants proposed offsite mitigation on USFS lands in Attachment 11 of their CMP.

8. Ensure completion of a monitoring and reporting program to confirm the program is meeting the objective of limiting adverse effects by implementing the following:
    a. The FERC, Coast Guard, Corps, and the Applicants should ensure the following monitoring will occur:
        i. The number of SONCC coho salmon and OC coho salmon captured during salvage of work area isolations (FERC, Corps, Applicants);
        ii. Suspended sediment plumes during dredging, work area isolation, and in-water construction of riverine analysis area offsite mitigation actions, according to 4a and 4c above (FERC, Corps, Applicants);
        iii. Riparian vegetation removal, according to 3a. above (FERC, Corps, Applicants);
        iv. All stormwater discharge, according to 7e. above (FERC, Corps, Applicants);
        v. Acreage of all construction and maintenance dredging (FERC, Corps, Applicants);
        vi. Acreage of lost food resources from construction of other structures (FERC, Corps, Applicants);
        vii. Acreage of constructed offsite mitigation in the estuarine analysis area(FERC, Corps, Applicants);
        viii. LNG carrier speeds, according to 6b. above (FERC, Coast Guard, Applicants);
        ix. Stranding by LNG carrier ship wake, according to 6c. above (FERC, Coast Guard, Applicants);
        x. Sound pressure levels when using an impact hammer, according to 2c. above (FERC, Corps, Applicants); and
        xi. Sound pressure levels outside of isolated areas any time blasting is used at waterbody crossings (FERC, Corps, Applicants).
    b. The FERC, USFS, BLM, and the Applicants should ensure monitoring successful completion of the Applicants proposed offsite mitigation on USFS and BLM lands.
    c. The FERC, Coast Guard, Corps, and the Applicants should ensure immediate reporting to NMFS if any of the following occurs:
        i. Suspended sediment plumes during dredging exceed any of the levels in 4b. above (FERC, Corps, Applicants);
        ii. Suspended sediment plumes during work area isolation, and in-water construction of riverine analysis area offsite mitigation actions exceed the levels in 4d. above (FERC, Corps, Applicants);
        iii. Riparian vegetation removal exceeds 75 linear feet at any waterbody crossing (FERC, Corps, Applicants);
        iv. Any stormwater facility fails to drain within 48 hours, according to 7f. above (FERC, Applicants);

v. Acreage of any construction or maintenance dredging exceeds (FERC, Corps, Applicants):
    1. Initial construction
        a. Navigation improvement areas: 27 acres
        b. Access channel and MOF: 25 acres
        c. Eelgrass mitigation area: 9.3 acres
    2. Maintenance dredging
        a. Navigation improvement areas: 27 acres
        b. Access channel, MOF, and berthing slip: 37.3 acres

vi. Acreage disturbed by construction of other structures exceeds (FERC, Corps, Applicants):
    1. Pile dike apron: 3.8 acres;
    2. Trans-Pacific Parkway widening: 0.5 acres; or
    3. Temporary dredged material offloading areas: 4.2 acres.

vii. Acreage of constructed offsite mitigation in the estuarine analysis area fails to exceed (FERC, Corps, Applicants):
    1. Restoring tidal connectivity to 72 acres at the Kentuck Aquatic Restoration Site;
    2. Reestablishing floodplain connectivity to 2.7 acres of Kentuck Creek at the Kentuck Aquatic Restoration Site; or
    3. Establishing 2.7 acres of eelgrass habitat.

viii. LNG carrier speed between RM 1 and the terminal exceeds 9 knots (FERC, Coast Guard, Applicants);

ix. Stranding by LNG carrier ship wake occurs (FERC, Coast Guard, Applicants);

x. The number of impact hammer strikes per day on steel pile within 500 feet of each other exceeds 1,600 (FERC, Corps, Applicants);

xi. Cumulative sound pressure levels when using an impact hammer exceed 183 dB at 522 feet from the piles being driven (FERC, Corps, Applicants); or

xii. Sound pressure levels from in-water blasting outside of isolated areas exceed 7.3 pounds per square inch (FERC, Corps, Applicants).

d. The Applicants will ensure a monitoring report is submitted to NMFS by September 1 of each year that describes the previous year's implementation of the proposed action. At a minimum, the report will document:

i. A summary of terminal and pipeline construction activities, including:
    1. The number of each type of in-water pile placed;
    2. The number of impact hammer strikes;
    3. Progress of offsite mitigation construction; and
    4. Number of waterbody crossings.

ii. A summary of terminal and pipeline operation activities, including:
    1. Number of LNG carrier round trips; and
    2. Maintenance dredging completed.

iii. All information in 9a. through 9c. above.

9. Minimize adverse effects from loss of eelgrass habitat by constructing the eelgrass mitigation beds at least one growing season prior to disrupting any existing beds to avoid temporal impacts associated with loss of eelgrass habitat.
10. Minimize adverse effects from loss of benthic habitat by constructing the Kentuck Aquatic Restoration Site at least one growing season prior to access channel dredging in Coos Bay to avoid temporal habitat losses associated with construction.

Several impacts identified above have already been minimized in the proposed action, or cannot be minimized. For example, vessel ballast and cooling water intakes cannot be screened to adequately prevent entrainment/impingement. However, fully implementing these EFH conservation recommendations will protect, by avoiding or minimizing the adverse effects described in this document for designated EFH for Pacific coast salmon, Pacific coast groundfish and coastal pelagic species as much as possible.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, FERC, Corps, USFS, BLM, and Coast Guard must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The Federal action agencies must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are all the Federal action agencies this opinion is addressed to. Individual copies of this opinion were provided to these agencies and the Applicants. The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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