Endangered Species Act Section 7(a)(2) Biological and Conference Opinion

Development and Production of Oil and Gas Reserves and Beginning Stages of Decommissioning within the Southern California Planning Area of the Pacific Outer Continental Shelf Region

NMFS Consultation Number: 2023-02183

Action Agencies: Bureau of Ocean Energy Management and Bureau of Safety and Environmental Enforcement

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?[1]	Is Action Likely to Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?[1]	Is Action Likely to Destroy or Adversely Modify Critical Habitat?
Marine Mammals					
Blue whale (Balaenoptera musculus)	Endangered	Yes	No	N.A.	N.A.
Fin whale (B. physalus)	Endangered	Yes	No	N.A.	N.A.
Humpback whale; Mexico Distinct Population Segment (DPS) (Megaptera novaeangliae)	Threatened	Yes	No	No	N.A.
Humpback whale; Central America DPS (M. novaeangliae)	Endangered	Yes	No	No	N.A.
Sperm whale (Physeter macrocephalus)	Endangered	No	N.A.	N.A.	N.A.
Sei whale (B. borealis)	Endangered	No	N.A.	N.A.	N.A.
Gray whale; Western North Pacific population	Endangered	No	N.A.	N.A.	N.A.

(Eschrichtius robustus)					
Killer whale, Southern Resident DPS (Orcinus orca)	Endangered	No	N.A.	N.A.	N.A.
North Pacific right whale (Eubalaena japonica)	Endangered	No	N.A.	N.A.	N.A.
Guadalupe fur seal (Arctocephalus townsendi)	Threatened	No	N.A.	N.A.	N.A.
Sea Turtles					
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	No	N.A.	No	N.A.
Loggerhead sea turtle; North Pacific Ocean DPS (*Caretta caretta*)	Endangered	No	N.A.	N.A.	N.A.
Olive ridley sea turtle (*Lepidochelys olivacea*)[2]	Endangered/ Threatened	No	N.A.	N.A.	N.A.
Green sea turtle; East Pacific DPS (*Chelonia mydas*)[3]	Threatened	Yes	No	Yes	No
Marine Fish					
Green sturgeon; Southern DPS (*Acipenser medirostris*)	Threatened	No	N.A.	N.A.	N.A.
Scalloped hammerhead shark; Eastern Pacific DPS (*Sphyrna lewini*)	Endangered	No	N.A.	N.A.	N.A.
Giant manta ray (*Manta birostris*)	Threatened	No	N.A.	N.A.	N.A.
Oceanic whitetip shark (*Carcharhinus longimanus*)	Threatened	No	N.A.	N.A.	N.A.
Marine Invertebrates					
White abalone (Haliotis sorenseni)	Endangered	No	N.A.	N.A.	N.A.
Black abalone (H. cracherodii)	Endangered	Yes	No	Yes	No
Sunflower sea star (Pycnopodia helianthoides)[4]	Threatened	No	N.A.	N.A.	N.A.
Salmonids					
Southern California Coast steelhead DPS	Endangered	No	N.A.	N.A.	N.A.

(*Oncorhynchus mykiss*)					
South-Central California Coast steelhead DPS (*O. mykiss*)	Threatened	No	N.A.	N.A.	N.A.

[1] Please refer to section 2.12 for the analysis of species or critical habitat that are not likely to be adversely affected by the Proposed Action.
[2]The breeding population from the Pacific coast of Mexico is listed as endangered; all other populations are globally listed as threatened.
[3]On July 19, 2023, NMFS proposed to designate critical habitat for the East Pacific DPS (88 FR 46572).
[4]On March 16, 2023, NMFS proposed to designate the sunflower sea star as a threatened species (88 FR 16212).

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

Issued By: ____
Christopher E. Yates
Assistant Regional Administrator for Protected Resources

Date: February 27, 2024

TABLE OF CONTENTS

Page

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

ACP	Area Contingency Plans
AHA	abalone habitat assessment
AIS	Automatic Identification System
ANL	Argonne National Laboratory
APD	Application for Permit to Drill
API	American Petroleum Institute
APM	Application for Permit to Drill
APPS	Authorizations and Permits for Protected Species
ARMs	Abalone Recruitment Modules
BA	Biological Assessment
Bbbl	Billion barrels of oil
bbl	barrel of oil (1 bbl = 42 gallons)
BIA	Biologically Important Area
BML	Below the mudline
BOEM	Bureau of Ocean Energy Management
BOEMRE	Bureau of Ocean Energy Management, Regulation and Enforcement
BOSL	Benioff Ocean Science Laboratory
BSEE	Bureau of Safety and Environmental Enforcement
CA/OR/WA	California/Oregon/Washington
CASWRB	California State Water Resources Control Board
CCE	California Current Ecosystem
CDFW	California Department of Fish and Wildlife
CDP	California Dispersant Plan
CFR	Code of Federal Regulations
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPPS	Permanent Commission of the South Pacific
CSA	Continental Shelf Associates
CV	Coefficient of Variation
DARRP	Damage Assessment, Remediation, and Restoration Program
DGN	drift gillnet fishery
DIP	demographically independent population
DOI	U.S. Department of the Interior
DP	dynamically positioned
DPPs	Development and production plans
DPS	Distinct Population Segment
DQA	Data Quality Act
DWH	Deepwater Horizon
EEZ	Exclusive Economic Zone
ENP	Eastern North Pacific
EPA	U.S. Environmental Protection Agency
EROS	Explosive Removal of Offshore Structures
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit

FR	Federal Register
GHGs	greenhouse gasses
GNOME	General NOAA Operational Modeling Environment
gpm	gallons per minute
GT	gross tons
GTC	Grupo Tortuguero de las Californias
HRC	Hawaii Range Complex
HSTT	Hawaii-Southern California Training and Testing
IAC	Inter-American Convention for the Protection and Conservation of Sea Turtles
IHA	Incidental Harassment Authorization
IMO	International Maritime Organization
INRMP	Integrated Natural Resources Management Plan
ITS	Incidental Take Statement
IUCN	International Union for the Conservation of Nature and Natural Resources
IWC	International Whaling Commission
LE	cumulative sound exposure level
LLC	Limited Liability Corporation
LOA	Letters of Authorization
M/SI	mortality/serious injury
MARINe	Multi-Agency Rocky Intertidal Network
MBNMS	Monterey Bay National Marine Sanctuary
MMPA	Marine Mammal Protection Act
MMS	Minerals Management Service
mtDNA	Mitochondrial DNA
NASEM	National Academies of Sciences, Engineering, and Medicine
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic & Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
NRDA	Natural Resource Damage Assessment
NWFSC	Northwest Fisheries Science Center
OCS	Outer Continental Shelf
OPC	Offshore Patrol Cutter
OPR	Office of Protected Resources
OSP	optimum sustainable population
OSPR	Office of Spill Prevention and Response
OSRO	oil spill removal organization
OSRP	Oil Spill Response Plan
PAH	Poly-cyclic Aromatic Hydrocarbon
PARS	Port Access Route Study
PBF	physical or biological features
PCBs	polychlorinated biphenyls
PCE	primary constituent element
PIT	Passive Integrated Transponder
PK	peak sound level
POCSR	Pacific OCS Region

PSOs	protected species observers
PTS	permanent threshold shifts
PWSA	Port and Waterways Safety Act
RAMP	Risk Assessment Mitigation Program
RCP	Regional Contingency Plan
RMS	root mean square
ROV	remotely operated vehicle
SAR	status assessment report
SBC	Southern British Columbia
SBNWR	Seal Beach National Wildlife Refuge
SCPA	Southern California Planning Area
SD	standard deviation
SDMs	species distribution models
SOCAL	Southern California Range Complex
SPLASH	Structure of Populations, Levels of Abundance and Status of Humpbacks
SPLs	sound pressure levels
SRKW	Southern Resident DPS killer whale
SSWS	sea star wasting syndrome
SWFSC	Southwest Fisheries Science Center
TAP	Trajectory Analysis Planner
TMMC	The Marine Mammal Center
TSS	Temporary threshold shift
TSSs	Traffic Separation Schemes
UASs	unoccupied aerial systems
UCSC	University of California at Santa Cruz
USCG	U.S. Coast Guard
USFWS	U.S. Fish and Wildlife Service
VOCs	volatile organic compounds
VSR	Vessel Speed Reduction
WCR	NMFS' West Coast Region
WCRO	NMFS' West Coast Regional Office
WNP	Western North Pacific

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 and conference opinion (Opinion) and incidental take statement (ITS) portions of this document in accordance with sections 7(a)-(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 402. The conference opinion concerning proposed critical habitat for green sea turtles and proposed listing for sunflower sea stars does not take the place of a biological opinion under section 7(a)(2) of the ESA unless and until the conference opinion is adopted as a biological opinion when the proposed critical habitat designation and/or listing becomes final. Adoption may occur if no significant changes to the action are made and no new information comes to light that would alter the contents, analyses, or conclusions of this Opinion.

Leasing, exploration, development, and production of offshore oil and gas (O&G) reserves on the Outer Continental Shelf (OCS) of the Pacific Coast began in the early 1960s. While the Bureau of Land Management initially was responsible for leasing areas of the OCS and the U.S. Geological Survey provided oversight for exploration, development, and production of offshore O&G reserves, the Minerals Management Service (MMS) was formed in 1982 to oversee all of these activities. In 2010 and subsequently in 2011, the Department of the Interior (DOI) split the Bureau of Ocean Energy Management, Regulation and Enforcement (which replaced MMS) into two new bureaus: Bureau of Ocean Energy Management (BOEM) and Bureau of Safety and Environmental Enforcement (BSEE). BOEM retains the authority for managing and issuing decisions on O&G leasing on the OCS as well as approval of exploration, development, and production plans and issuance of geological and geophysical permits. BSEE retains the authority to review and approve permits for drilling, rights-of-way, pipeline installations, and decommissioning of offshore structures as well as day-to-day inspection and enforcement actions associated with offshore O&G production.

A history of Pacific O&G ESA consultations is summarized in detail in the Biological Assessment (BA; section 1.2 of the revised BA submitted September, 2023) provided by BOEM and BSEE, including summaries of informal and formal consultations with NMFS, beginning in 1978, through 2014. In section 1.2 *Consultation History* below, we discuss more recent consultation activity. Consultations included the following activities: platform installation; O&G exploration, development (including individual Development and Protection Plans) and production activities; infrastructure repairs and replacements (e.g., pipelines and cables); proposed drilling into new oil fields from existing platforms; and conductor installations. Section 1.3 of the BA provides a summary of NMFS' ESA-listed trust species receiving ESA consultations in past years.

According to the most recent information provided by BOEM, there were 30 active leases, 14 of which are producing in the Southern California Planning Area (SCPA) (see *Action Area*), with

23 Federal platforms and 208 miles of pipelines that transport oil and gas to shore. Eight of these 23 platforms are no longer on active leases and are in the planning stages of decommissioning. Oil production rates peaked at more than 200,000 barrels per day in 1996 and declined in subsequent years to a production rate of about 50,000 barrels per day. In the last decade, due to various operations issues such as a pipeline rupture, the production has diminished to just over 7,000 barrels per day as of June 2023. Once operational issues are resolved, the daily production is expected to rebound to no more than 50,000 barrels per day but will continue to diminish through time. Gas production has followed a similar declining trend with a production rate of about 77 million cubic feet per day. Gas production has also been affected by a 2015 onshore pipeline failure, resulting in a temporary rate of just over 6.7 million cubic feet per day during 2022. Overall, O&G production in the SCPA is expected to continue to decline gradually over time, with drilling and production activities continuing if oil and gas can be produced in paying quantities.

There are now fewer than 400 active development wells at any given time, and this number is not expected to change substantially in the foreseeable future. However, with the advent of decommissioning activities, the number of active development wells may begin to decrease. Approximately 260 million barrels of oil and 540 billion cubic feet of natural gas are estimated to remain in O&G fields within reach of existing platforms in the SCPA.

1.2 Consultation History

On December 4, 2017, NMFS concluded informal ESA consultation with the Bureaus, concurring with the Bureaus' determination that proposed continuation of offshore oil and gas development and production activities in the SCPA was not likely to adversely affect ESA-listed species or designated critical habitat (WCR-2017-8143). The proposed action included: approval of oil and gas development and production plans and plan revisions, including discharges and emissions and support vessel and operator aircraft activity (BOEM); approval of applications for permit to drill and applications for permit to modify (BSEE); platform inspections (BSEE); and oil spill response equipment exercises (BSEE). BOEM did not consider oil spills to be a direct effect of the action, given that they are neither authorized nor intended to occur. BOEM did however consider that certain smaller oil spills could give rise to indirect effects of the action as a result of normal day-to-day platform operations, where small accidental discharges of hydrocarbons would be reasonably foreseeable. BOEM estimated that the maximum most likely spill volume for the Pacific Outer Continental Shelf Region (POCSR or Pacific Region) would be 200 bbl.

In October 2021, a spill of 588 bbl occurred from the Beta Unit of Amplify Energy Corporation's San Pedro pipeline P00547. ("Huntington Beach" oil spill). The Bureaus and NMFS agreed that a new consultation was warranted, given that Huntington Beach oil spill was larger than the maximum 200 bbl oil spill anticipated and analyzed by BOEM and addressed in NMFS' letter of concurrence, and also in light of new ESA listings of species and critical habitat after 2017. On April 19, 2022, the Bureaus sent a letter to NMFS requesting reinitiation of consultation on offshore oil and gas activities off California, given new information subsequent to and relevant to the 2017 informal consultation. In the April 2022 letter, the Bureaus requested concurrence with their determination that the proposed action is not likely to adversely affect ESA-listed species and their designated critical habitat.

On August 24, 2022, NMFS and the Bureaus entered into a stipulated stay agreement of litigation which established a schedule for completion of the reinitiated consultation, which was approved by the Court on August 27, 2022. *Center for Biological Diversity v. Haaland*, No. 2:22-cv-555, C.D. Cal., Docket Nos. 26-27. The lawsuit, filed in January 2022, alleges that NMFS and the Bureaus failed to comply with the ESA and Administrative Procedure Act with respect to the effects of offshore oil and gas activities in federal waters off California.

On February 27, 2023, the Bureaus submitted an updated biological assessment for the purpose of reinitiating consultation on existing and proposed continuation of oil and gas development and production activities on the POCSR. The Bureaus requested concurrence with their determination that their actions are not likely to adversely affect ESA-listed species or their designated critical habitat under NMFS' jurisdiction. The BA included updated information on: oil spill risk analysis to account for new information related to the October 2021 pipeline spill; consideration of newly designated critical habitat for the Central America and Mexico humpback whale DPSs; and a review of proposed actions for potential impacts to listed marine species to consider imposing vessel-based conditions, including 10-knot speed restrictions and night travel restrictions, on a permit-by-permit basis.

Following receipt and review of the Bureau's February 27, 2023, letter and BA, the agencies held meetings on March 30, April 24, and May 16, 2023, to clarify contents of the BA and to ensure timely progress toward completing the consultation.

On July 14, 2023, the Bureaus sent NMFS an updated BA for the purpose of reinitiating ESA Section 7 consultation for routine and ongoing O&G development activities off the coast of California. Based on ongoing discussions between the agencies, on September 1, 2023, the Bureaus sent a revised (updated) BA to NMFS which also included an assessment of the proposed action on proposed critical habitat for the East Pacific green turtle DPS, which was published in the Federal Register on July 19, 2023 (88 FR 46572), and assessment of the proposed action on sunflower sea stars, proposed for ESA listing as threatened on April 11, 2023 (88 FR 21600). Following review of the BA, on September 11, 2023, NMFS determined that the agency had sufficient information to initiate Section 7 consultation, with a reinitiation date of September 1, 2023. Pursuant to the court-ordered Stipulated Agreement, NMFS agreed to conclude the consultation on or before 180 days from receipt of the consultation package, which is February 28, 2024.

Since that time, NMFS and Bureau staff have had several informal discussions to clarify information contained in the BA, primarily information in the proposed action and information that would help NMFS analyze effects of the action. On February 7, 2024, NMFS sent a request via email requesting clarification of how aging infrastructure relates to the oil spill risk modeling that was provided in the BA (email from Dan Lawson, NMFS, to Rick Yarde, BOEM). On February 9, 2024, BOEM responded via email (email from Susan Zaleski, BOEM, to Dan Lawson, NMFS) providing their response. On February 13, 2024, NMFS shared a draft copy of the Terms and Conditions associated with the ITS of this Opinion with BOEM. Follow up conversations between BOEM staff and NMFS staff occurred via phone on February 16, 2024 and February 21, 2024, to discuss and confirm the details of those Terms and Conditions as feasible and implementable.

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the biological opinion and ITS would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

1.3 Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02).

BOEM/BSEE's Authorizations Relating to Ongoing Oil and Gas Development, Production, and Decommissioning Activities for the SCPA of the POCSR

This Opinion considers the effects of BOEM's and BSEE's respective authorizations of activities related to oil and gas development, production, and decommissioning activities for the SCPA of the POCSR (Figure 7 in Description of the *Action Area*). The description of the proposed action derives primarily from the BA (referenced as BOEM 2023; referred to as BA throughout) for oil and gas development activities off the coast of California provided by BOEM and BSEE. POCSR Offshore O&G development and production activities must be conducted in accordance with plans approved by BOEM [30 CFR 550.201].

The proposed action consists of authorizations of the following activities throughout the duration of the project: (1) development and production plan revisions; (2) discharges and emissions; (3) support vessel and aircraft activity; (4) applications for permits to drill and permits to modify drilling activities; (5) well conduction removal; (6) pipeline repair and replacement; (7) cable repair and replacement; (8) BSEE inspection program - helicopter flights (separate and added to support aircraft activity described in #3); (9) BSEE-initiated oil spill response equipment exercises; and (10) decommissioning and well-plugging. In addition, because oil spills may indirectly (i.e., accidentally) result as a result of ongoing O&G operations, we include a description of potential oil spills, given historical spills in the area as well as the oil spill trajectory tool developed by NOAA, in conjunction with the oil spill response tools that BOEM/BSEE typically use to contain or divert oil from sensitive habitats, including boom, skimmers, etc.

As described in section 1.4 of the BA, the Bureaus' SCPA extends from the Monterey/San Luis Obispo County line southward to the U.S.-Mexico border, including waters 3-200 miles from shore. As of June 2023, there were 30 active leases, 14 of which are producing in the SCPA, with 23 Federal platforms (Table 1) and 208 miles of pipelines that transport oil and gas to shore (Figures 1-4). Eight of these 23 platforms are no longer on active leases and are currently in the planning stages of decommissioning. The number of active development wells may begin to decrease with the onset of decommissioning activities. Nearly 260 million barrels of oil and 540 billion cubic feet of natural gas are estimated to remain in O&G fields within reach of existing platforms in the action area.

The Bureaus' BA did not define a definite period of time over which all project activities and actions making up the proposed action would occur. NMFS relies on a general assessment of how far into the future we can expect project activities to continue in order to provide a reasonable basis for making determinations and drawing conclusions about how oil and gas development, production, and decommissioning off the California coast may affect ESA-listed species and designated critical habitats. A key parameter is the amount of remaining reserves and accordingly far into the future production could occur and how far into the future decommissioning activities may begin. Generally, we consider the remaining reserves and production potential referenced in section 1.1 above. There are approximately 260 million barrels of oil and 540 billion cubic feet of natural gas estimated to remain available for production in O&G fields, and current production at full capacity could be around 50,000 barrels of oil and 77 million cubic feet of natural gas per day. Production rates are expected to vary, and over time production will likely diminish. However, we consider that at the current capacity it appears that the proposed action could last for 15-20 years[1]. Therefore, based on the best available information, this Opinion's effects assessments assume that at the current capacity, the range of actions and activities included in the proposed action will last for at least 20 years.

[1] Potential duration of production at current capacities estimated as follows: (1) 260 million barrels of oil / 50,000 barrels per day = 5,200 days, or 14.2 years; (2) 540 billion cubic ft of natural gas / 77 million cubic ft per day = 7,013 days, or 19.2 years.

Table 1. Unit or field names for groups of Oil & Gas platforms and the names of individual platforms in the action area.

Unit/Field Name	Platform Names
Point Pedernales	Irene
Point Arguello	Hidalgo, Harvest, Hermosa
Santa Ynez	Heritage, Harmony, Hondo
Dos Cuadras	A, B, C, Hillhouse
Beta	Edith, Elly, Ellen, Eureka
Carpinteria	Henry, Hogan, Houchin
Pitas Point	Habitat
Santa Clara	Gilda, Grace, Gail
Point Hueneme	Gina

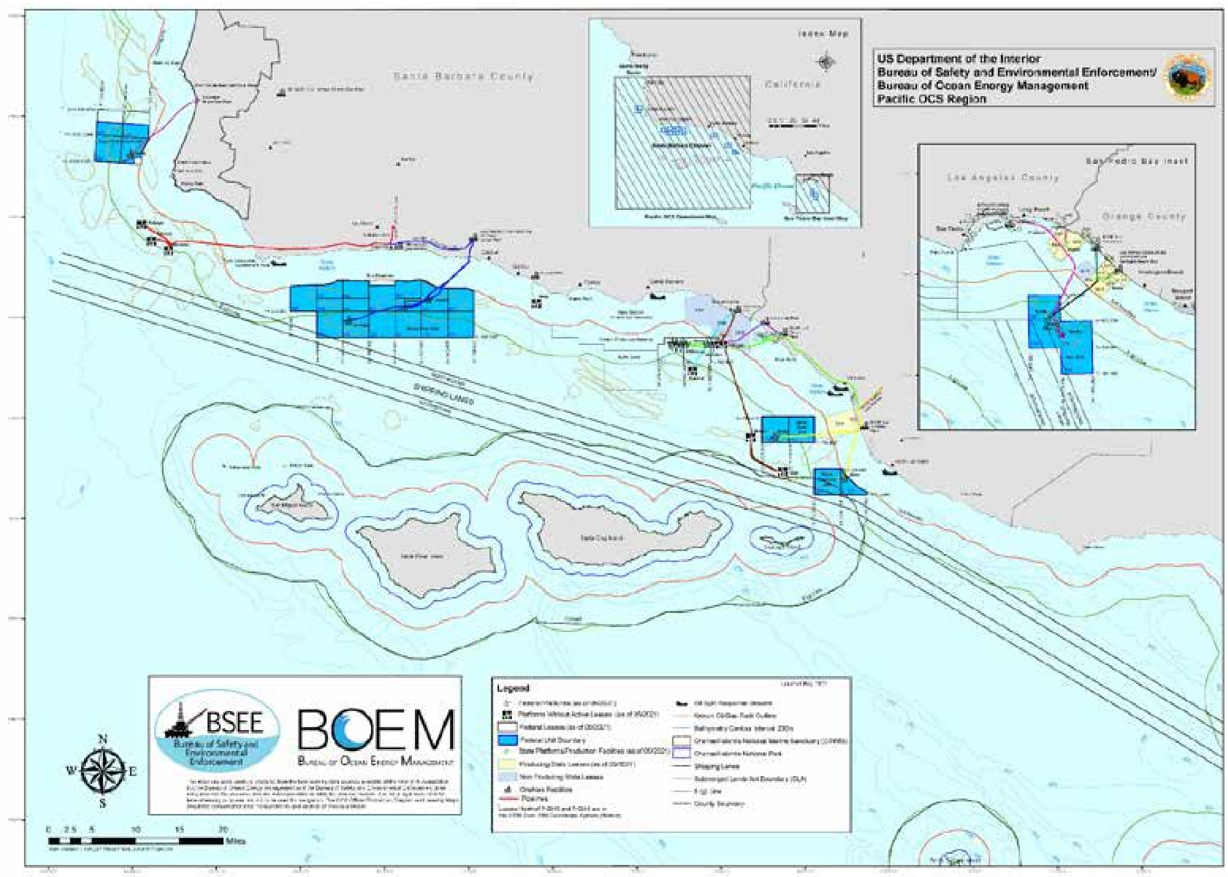

Figure 1. Existing platforms and pipelines in the Southern California Planning Area.

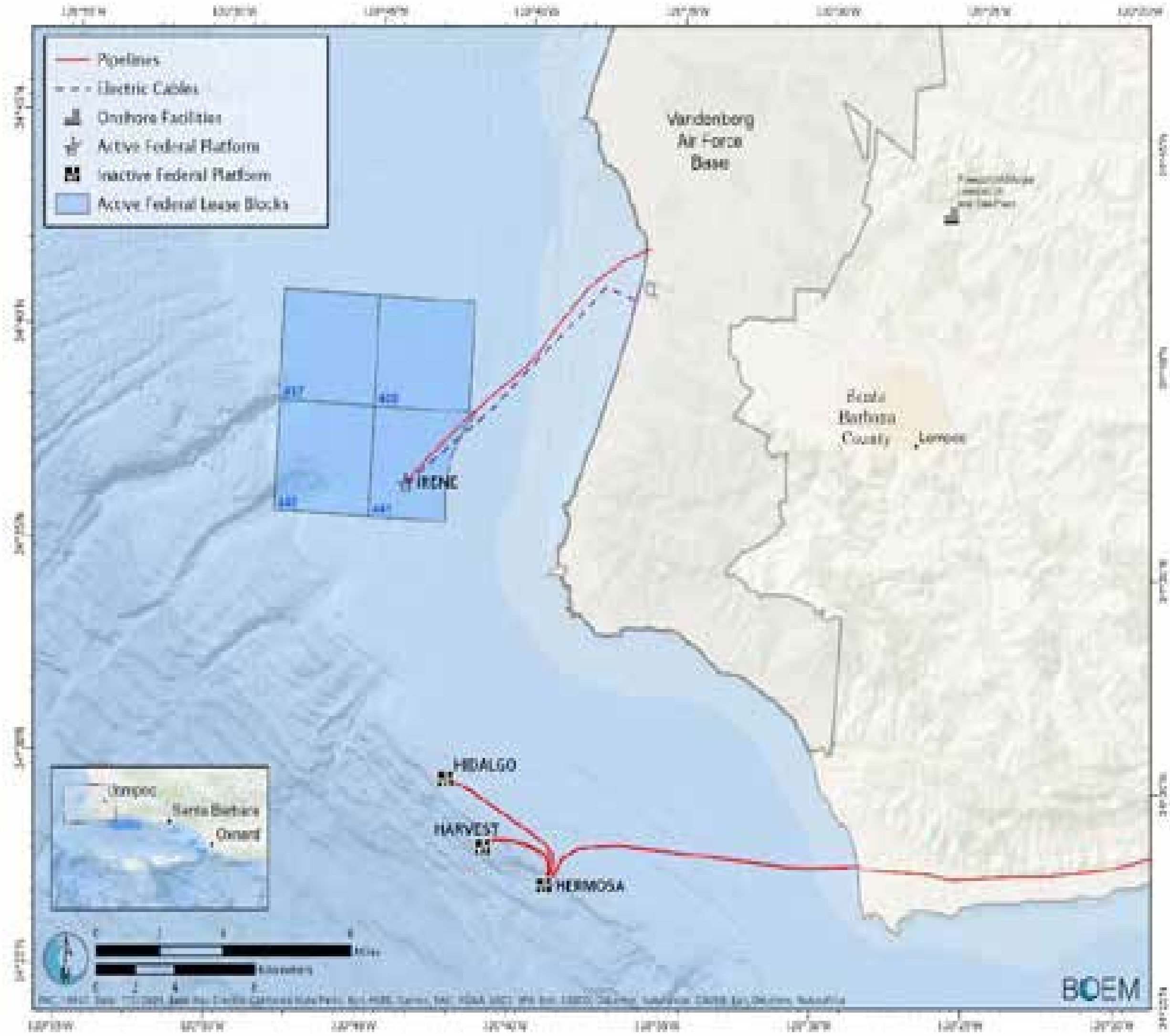

Figure 2. Locations of platforms, pipelines, and power cables and associated lease blocks in the Santa Maria Basin in the northwestern portion of the Southern California Planning Area.

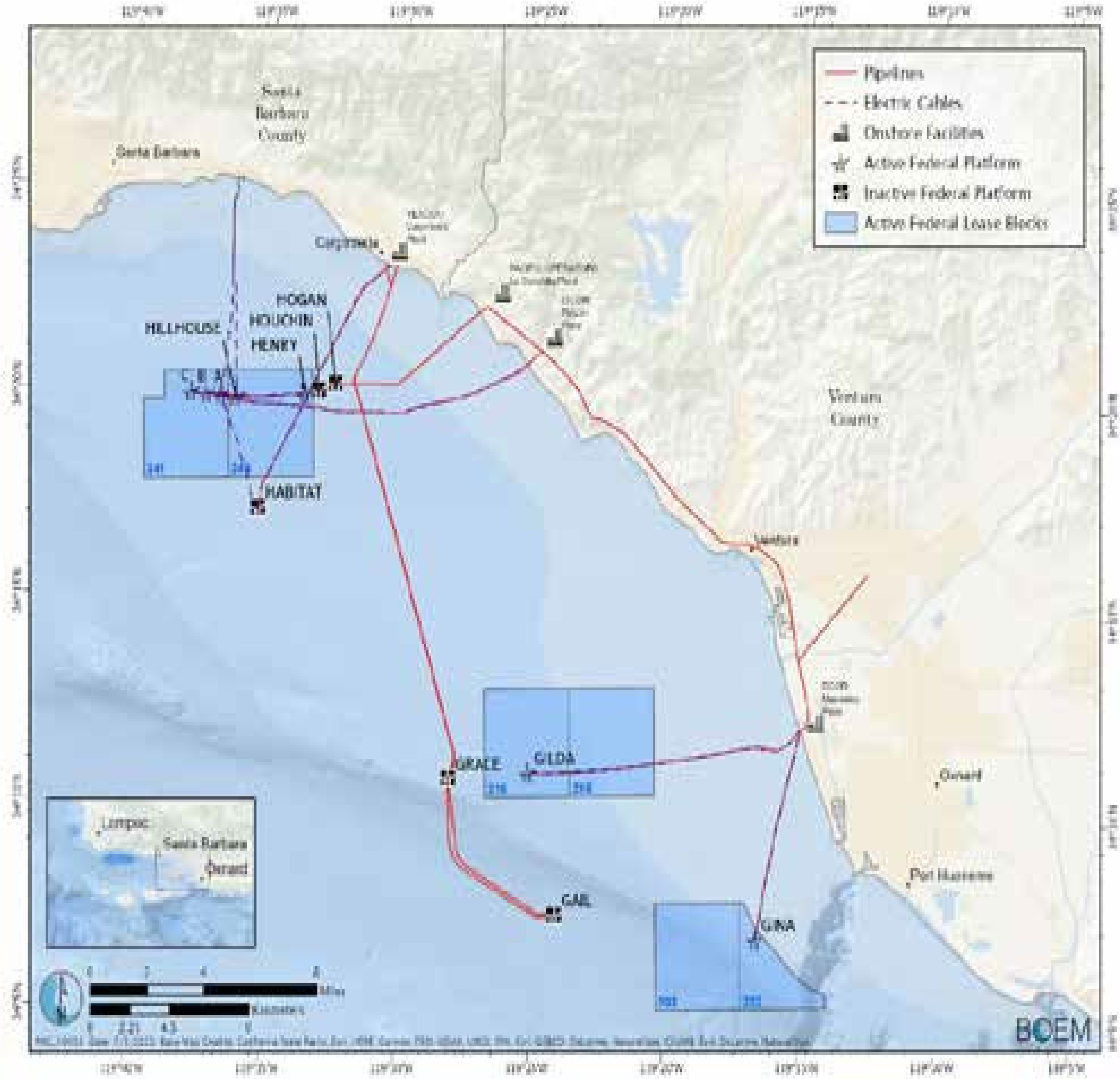

Figure 3. Locations of platforms, pipelines, and power cables and associated lease blocks in the Santa Barbara Channel in the central portion of the Southern California Planning Area.

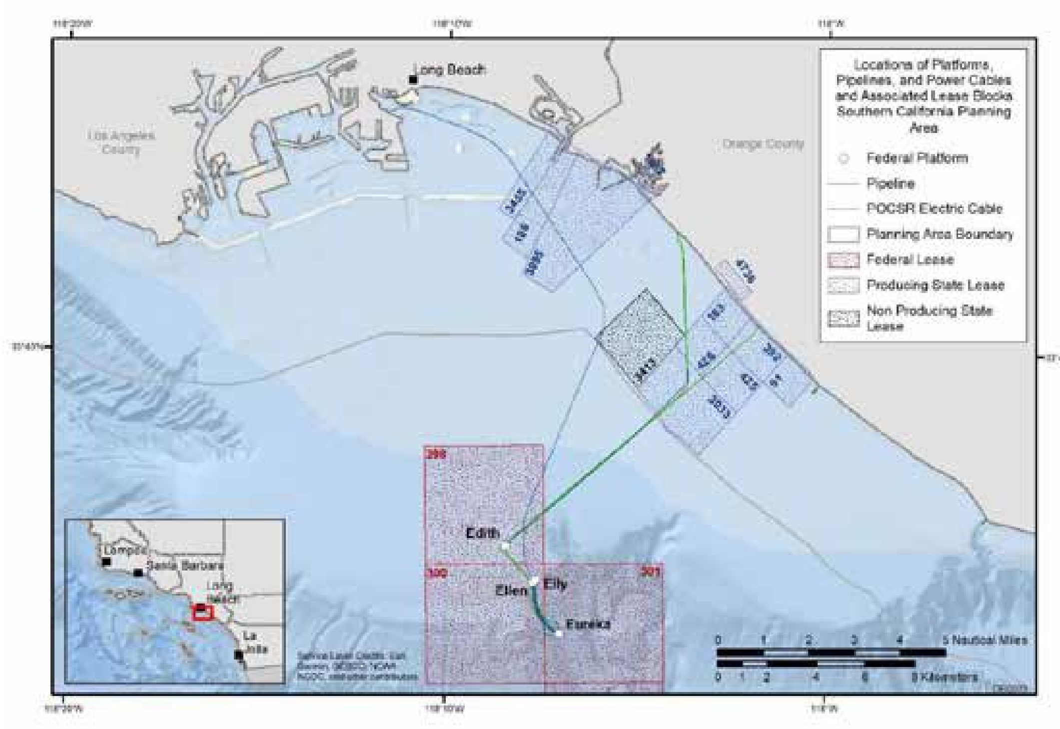

Figure 4. Locations of platforms, pipelines, and power cables and associated lease blocks in the San Pedro Bay at the southeastern end of the Southern California Planning Area.

NMFS considers this programmatic proposed action to be a "mixed programmatic" consultation because it would cover authorizations of some oil and gas activities by BOEM and BSEE that would not be subject to further ESA section 7 consultation beyond this Opinion (unless reinitiation is deemed necessary); and, the consultation also generally considers some future activities that would be authorized by BOEM and BSEE at a later time, and with respect to which, take of listed species is not exempted from section 9 take prohibitions until subsequent consultations for the actions are completed. *See* 50 C.F.R. §§ 402.02, 402.14(i)(6).

Specifically, decommissioning of oil and gas development infrastructure (described in section 1.3.10 *Decommissioning and Well Plugging*) is only in the beginning stages of planning, and final decommissioning plans will require further analysis when applications for decommissioning are submitted for approval by BOEM and BSEE. Individual consultations will occur when BOEM and BSEE consider approval for particular decommission plans as necessary, if those proposed activities "may affect" ESA listed species. BOEM and BSEE will implement decommissioning activities authorized under a subsequent National Environmental Policy Act (NEPA) and their own decision record. Even though additional consultation will be necessary for all decommissioning activities, BOEM proposed that decommissioning be included in this consultation at a programmatic level, so it can be generally analyzed to ensure it is not likely to jeopardize listed species and/or destroy or adversely modify designated critical habitats.

All other activities included in the proposed action are analyzed in this consultation for their effects to ESA-listed species and designated critical habitats (including species/habitats that are currently proposed), and would not be subject to further consultation unless reinitiation is warranted.

1.3.1 Approval of O&G Development and Production Plans and Revisions

Development and production plans (DPPs) in the SCPA describe the proposed infrastructure (e.g., platforms, pipelines, and power cables), activities, and general strategies for production of O&G. All major construction activities, under approved DPPs in the action area, have either been completed or are no longer being considered. New DPPs are not expected to be submitted without a new leasing program, but existing plans may be revised or supplemented if changes are necessary under BOEM's regulations [30 CFR 550.283]. As described in the BA, new leasing programs are not anticipated and are not part of this proposed action. As a result, new DPPs would likely require additional consultation in concert with implementation of a new leasing program, if effects to ESA-listed species and designated critical habitats may occur as a result.

1.3.2 Discharges and Emissions

BSEE regulations prohibit unauthorized discharges of pollutants into offshore waters [30 CFR 250.300]. Fluid and solid discharges from Federal O&G development and production facilities in southern California are authorized by the Environmental Protection Agency (EPA) under NPDES permit No. CAG280000. This permit authorizes 22 types of discharges from all Federal offshore platforms in southern California including: drilling muds and cuttings; produced water; well treatment, completion, and workover fluids (including fluids associated with hydraulic fracturing and acidization); deck drainage; sanitary wastes and domestic wastes; non-contact cooling water; and fire control test water (EPA 2014).

1.3.3 Support Vessel and Aircraft Activity

Offshore O&G development and production operations require regular personnel and equipment activity. Crew and supply boats commute between the coast and nearby offshore platforms approximately 30 times per day along pre-determined routes from Seal Beach Pier (Orange County), Terminal Island (Los Angeles County), Port Hueneme (Ventura County), Carpinteria Pier (Santa Barbara County), and Ellwood Pier (Santa Barbara County). Vessels are proposed to conduct an estimated 450 trips per month (5,400 trips/year) to the various platform groups (Table 2). Support vessels operate out of bases in the Santa Barbara Channel and Santa Maria Basin. Support vessels traveling to and from the four platforms in San Pedro Bay operate out of Long Beach, California. Both crew and supply boats average approximately 16 trips per week per platform (Bornholdt and Lear 1995, 1997).

Table 2. Estimated numbers of operator vessel trips per month to groups of platforms.

Platforms or groups of platforms visited	Departure location from shore	Estimated # trips per month	Estimated # of trips per year
Heritage, Hondo, Harmony (Santa Ynez Unit)	Goleta	26	312
A, B, C, Hillhouse, Habitat, Henry	Santa Barbara	87	1,044
A, B, C, Hillhouse, Habitat, Henry	Port Hueneme	30	360
Gina, Gilda	Port Hueneme	87	1,044
Hogan, Houchin	Carpinteria	43	516
Gail, Grace	Carpinteria	43	516
Edith, Ellen, Elly (Beta Unit)	Port of Los Angeles	134	1,608
Total		**450**	**5,400**

Vessels typically used in support activities may include: crew vessels, oil spill prevention and response vessels, platform supply vessels, anchor handling or tug supply vessels, diving support vessels, inspection maintenance and repair vessels, and vessels for remotely operated vehicle (ROV) support. Smaller vessels for spill prevention and response and crew transport may be 15 m (50 ft) in length and can operate at speeds of 25 knots (kn). Larger vessels, about 100 m (328 ft) in length, carry 6,289–12,579 bbl (barrels) of fuel and are powered by several powerful thrusters for maneuvering. These larger vessels travel at 10–16 kn.

OCS helicopter traffic in the Pacific Region operates primarily out of Santa Maria, Lompoc, and Santa Barbara airports. Most of this traffic has been to and from platforms in the western Santa Barbara Channel and Santa Maria Basin. Larger pieces of equipment and certain support services (e.g., commercial dive services) are mobilized from the Port of Long Beach, the Port of Los Angeles, Port Hueneme and, to a limited extent, Santa Barbara Harbor. BSEE inspectors use Camarillo Airport as a base of operations for their helicopter activities. In the past, helicopters averaged approximately 3 to 5 trips per week per platform (Bornholdt and Lear 1995, 1997). The use of helicopters has peaked and is expected to decrease through time as platforms are decommissioned. Assuming general helicopter traffic involves trips to/from platforms operating in the western Santa Barbara Channel and the Santa Maria Basin (16 platforms), and given that some trips may involve multiple platform destinations that are specific to particular units, we assume that approximately 2,500 round-trip flights occur each year to support the transport of personnel and supplies (16 x 3 trips/week x 52 weeks = 2,496). While a very conservative estimate of assuming 5 trips/week would yield 4,160 trips in a single year, we assume that the number of trips vary year-to-year (and will decline over time), yielding a more realistic estimate of 4 trips/week, or 3,328 trips over a year. We note that other activities described in subsequent sections involve the use of helicopters (sections 1.3.8 and 1.3.9) and the estimated number of round-trip flights per year due to all activities will be used to analyze effects to listed species.

1.3.4 Approval of Applications for a Permit to Drill and Permit to Modify

BOEM approves general plans for drilling for O&G, as included in exploration plans and DPPs. Drilling of individual wells must be reviewed and approved by BSEE (30 CFR 250.410). An Application for Permit to Drill (APD) is used to approve drilling specifications for new wells or modifications of existing wells. An Application for Permit to Modify (APM) is required when an approved APD is revised or materially changed. Well completion operations are conducted to establish, maintain, or restore production of a well and are generally approved with an APM. BSEE may also issue well completion to modify specific requirements. As described in the BA, BSEE will continue to review and approve APDs and APMs that are included in the operators' approved DPPs, so any existing or new APD or APMs associated with existing DPPs are considered part of this proposed action. Any APD or APMs that may be associated with new DPPs, which would require implementation of a new leasing program, are not considered part of the proposed action, as described above in section 1.3.1 *Approval of O&G Development and Production Plans and Revisions*.

1.3.4.1 Well Stimulation Treatments

Well stimulation treatments have previously been approved through permits to drill and/or modify. Treatments include: diagnostic fracture injection tests, hydraulic fracturing, acid fracturing, and matrix acidizing. A diagnostic fracture injection test involves the injection of typically less than 100 bbl of fracturing fluid at pressures high enough to initiate a fracture. In hydraulic fracturing, the injection of a fracturing fluid at pressure induces fractures within the producing formation. Upon release of pressure, the fracturing fluid is allowed to flow back to the surface platform. Key fluid additives (such as polymer gels, pH buffers, clay control additives, microbial biocides, and surfactants) aid in fluid recovery. In offshore applications, the base fracturing fluid is filtered seawater. Acid fracturing is similar to hydraulic fracturing except that an acid solution carves channels in the rock walls of the fractures, creating pathways for oil and gas to flow to the well. In matrix acidizing, an acid solution is injected into a rock and penetrates pores to break down sediments. After material dissolves, existing channels are opened and new ones are created, allowing oil and gas to move more freely.

No well stimulation treatments have been approved since 2014, and they have occurred infrequently historically. Of the more than 1,630 exploration and development wells drilled in Federal waters on the Pacific OCS between 1982 and 2014, only a small percentage involved hydraulically-fractured completions. These occurred on four of the 23 platforms in the SCPA. Three of these were in the Santa Barbara Channel, and the fourth was in the Santa Maria Basin. Only three matrix acidizing treatments, defined as well stimulation treatments, occurring in OCS waters during a similar time frame (between 1985 and 2011) have been identified in records. Those were conducted on two of the 23 platforms.

Currently, BSEE is currently enjoined by court order from approving any well stimulation treatments. However, this current situation could change during the course of this proposed action. As a result, the Bureaus have proposed this as a potential project activity, and consideration of potential effects from this activity are addressed in this Opinion.

1.3.5 Well Conductor Removal

BSEE may authorize removal of well conductors. Conductor removal may occur as a precursor before platform decommissioning. Removal involves conductor cutting below the mudline (BML) followed by conductor extraction and sectioning. Cutting would use high-pressure abrasive cutting to sever conductor tubing and any internal casing strings at 4.6 m (15 ft) or more BML. Abrasive cutting methods include using hydraulic pressure to pump an abrasive fluid composed of seawater and an abrasive material such as garnet or iron silicate to cut through conductor piping and casings. A typical conductor cut would require about seven hours and use about 1,600 kg (3,500 lb) of iron silicate abrasive (BOEM 2021), which would be discharged to the ocean. In deep water, mechanical cutting methods might be required to sever conductors. Conductor severing, hoisting, and segmenting equipment would be installed on a platform at the time of use. Marine growth would be cleaned off of conductor exteriors using high pressure water, and then discharged into the ocean.

As of April 2020, POCSR production platforms had from 12 to 64 conductors individually and 818 in all; 59 of which were empty conductor tubes through which wells had not been drilled (InterAct 2020). BSEE expects to review and approve conductor removals as additional platforms move toward decommissioning.

Mitigation Measures

BOEM proposes to implement vessel speed restrictions (10 knots) and Protected Species Observers (PSOs) on vessels operating during well conductor removals to minimize the risk of collisions with marine mammals during those operations. Previously, through consultation on well conductor removal activity, BOEM had proposed and implemented these measures along with additional measures for well conductor removal that are described below (NMFS 2020a (WCRO-2019-03765)). While the Bureau's BA did not include specific description of these additional mitigation measures for well conductor removal operations under this proposed action, on December 28, 2023, BOEM clarified their intention to including the following measures as part of the proposed action, which mirror the 2020 proposed mitigation/ monitoring for removing 62 24-inch diameter well conductor casings from three off-shore oil platforms known as the Point Arguello Unit, located on the OCS of the Santa Barbara Channel. For that proposed action, NMFS concurred with BOEM's determination that the action was not likely to adversely affect ESA-listed species or designated critical habitat (NMFS 2020a (WCRO-2019-03765)).

1. Specific crew members will be assigned to conduct visual clearance for ESA-listed whales (blue, fin, [sei] or humpback whales).

2. These crewmembers will:

   a. be trained with the Wildlife and Fisheries Training video generated by Pacific Offshore Operators, LLC;

   b. have visual acuity in both eyes (correction is permissible) sufficient to discern moving targets at the water's surface with ability to estimate target size and distance. Use of binoculars or spotting scope may be necessary;

   c. have the ability to communicate orally, by radio or in person, with project personnel to provide real time information on marine mammals observed in the area, as needed; and

   d. complete the form provided, as detailed as possible, describing conditions prior to, and after, the initial cut for each conductor, including any sighting event, during periods of visual clearance/inspection.

3. Visual clearance includes:

   a. 30-minute inspection of a 200 m clearance zone, made from the cutting site on the platform, seaward, to ensure no ESA-listed whales are within the clearance zone before initial cutting starts; and

   b. 30-minute inspection of a 200 m clearance zone, after initial cutting has been completed, made from the cutting site on the platform, in a seaward arc, to detect if any ESA-listed whales were exposed to cutting activities.

4. Clarification of various possible scenarios:

   a. If the 200 m zone is clear of ESA-listed whales for 30 minutes but initial cutting is delayed, for any reason, another 30 minute visual inspection/clearance of the 200 m clearance zone must be done.

   b. If no ESA-listed whales are seen within the 200 m clearance zone, cutting can be started immediately, and continue until completion.

   c. If an ESA-listed whale is sighted within the 200 m clearance zone, cutting will be delayed until the whale has moved more than 200 m away from the cutting site, at which time cutting may commence.

   d. If an ESA-listed whale is seen subsequent to the start of cutting, the crewmember assigned to visual duties must note the occurrence using the form provided, but cutting may continue.

5. Reporting requirements:

   a. All forms will be submitted to the BSEE compliance officer within 30 days after completion of all conductor removal activities.

   b. Any observations of injured or dead marine mammals, related or unrelated to the activities, will be immediately reported to NOAA's West Coast Region Stranding Hotline at 1-866-767-6114.

   c. Any observations of entangled marine mammals will be reported to the Entanglement Reporting Hotline at 1-877-767-9425 and/or the USCG: VHF Ch. 16.

1.3.6 Approval of Pipeline Repair and Replacement

Repair, replacement installation, modification, or removal of offshore O&G pipelines may require approval by BSEE. All planned pipelines in the SCPA currently necessary for production have been installed, but may require future repair. BOEMRE (2011) described activities for a pipeline replacement-installation project and assessed potential environmental impacts in the

SCPA. The primary vessel planned for the activity would be a dynamically positioned (DP) vessel, assisted by a crew boat and support vessel. DP vessels reduce impacts compared to a barge by eliminating anchoring activities and reducing the number of vessels needed for construction operations. Based on BOEMRE (2011) and Minerals Management Service (MMS 2008, 2009), the estimated project duration for pipeline repair and replacement installation would be approximately 30 days.

1.3.7 Approval of Cable Repair and Replacement

Repair, replacement installation, modification, removal, or abandonment of offshore O&G cables requires approval by BSEE through right-of-way permits. All planned cables in the SCPA have been installed. However, BSEE may receive requests for repair of existing cables. Project phases for repairs may include use of an ROV to locate areas to replace, make cuts to cable, cable lay in the right of way (including concrete mattress installation and/or span supports), and testing of repaired cable.

The primary vessel planned for the activity would be a DP vessel, assisted by a crew boat and support vessel. Estimated project duration for cable repair and replacement installation would be approximately 30 days.

1.3.8 BSEE Inspection Program: Helicopter Flights

BSEE inspectors are on duty every day of the year to ensure compliance with BOEM and BSEE requirements. BSEE maintains a contract for helicopter services for flights from Camarillo Airport to offshore platforms. Average BSEE flight usage over the last five years has been 45,000 to 50,000 miles per year, and approximately 200–300 platform visits per year. A platform visit includes travel of the helicopter between shore and BSEE inspection stops at one or more platforms. For April 1, 2021–March 31, 2022, there were 194 visits to the nine platform groups, with a range of 7 visits to Point Hueneme platforms and up to 53 visits to Dos Cuadras (Table 3). Moving forward, we anticipate that similar levels of helicopter activity will occur annually throughout the course of this proposed action, although we recognize that over time less flights may be required as oil and gas operations wind down and infrastructure is removed through decommissioning.

Table 3. Number of BSEE inspection visits via helicopter to O&G platforms in the action area between April 2021-March 2022.

Point Pedernales	Point Arguello	Santa Ynez	Dos Cuadras	Carpinteria	Pitas Point	Santa Clara	Point Hueneme	Beta	TOTAL
9	25	20	53	8	8	33	7	31	**194**

BSEE minimizes flight time by inspecting platforms in proximity to each other or dropping off inspectors at closer platforms before continuing to outlying platforms. Helicopter flight paths between points ideally minimize flight distance over land and water but necessarily vary with weather conditions. Transit flight heights are generally maintained at levels greater than 500 ft, unless safety concerns such as poor visibility necessitate a lower flight altitude.

We note that the BSEE inspection program involving helicopters is a separate action from the "Support Vessel and Aircraft Activity" (section 1.3.3), so the effects analysis of helicopter activity on ESA-listed species considers both of the activities associated with support and inspection services (added together) from coastal airports to the various offshore platforms.

1.3.9 BSEE Initiated Oil Spill Response Equipment Exercises

Offshore operators propose to implement oil spill response plans should an oil spill occur. BSEE periodically directs operators to deploy industry-owned oil spill response equipment listed in their response plans. Equipment deployed may include oil spill boom, mechanical skimmers, response vessels, oil storage equipment, aircraft, and marker buoys:

Booms are floating, physical barriers to oil, made of plastic, metal, or other materials, which slow the spread of oil and keep it contained. While booms can be seen above the waterline, they may have between 18 and 48 inches of material known as a "skirt" that hangs beneath the surface. The largest sizes of boom are used for offshore responses. Containment boom comes in lengths of 500 ft or more and can be connected together into lengths reaching 1,500 ft. Booms can be deployed directly from a facility by its assigned small boats or by an oil spill removal organization (OSRO) deployed to the scene. For offshore operations, booms may be deployed to completely encircle the platform or in various configurations (i.e., U-shape, V-shape, J-shape) by one to three vessels for corralling spilled oil. Booms deployed in nearshore and onshore environments generally are moored in place with the use of anchor and weight systems or onshore staking.

Skimmers are mechanical devices that remove free floating or corralled oil from the surface of the water. Depending on the specific model these devices can pump anywhere from 100 gallons per minute (gpm) to 1,000 gpm. Two general types are commonly used in the Pacific Region, weir skimmers and oleophilic surface skimmers. For offshore oil cleanup, weir and oleophilic skimmers are generally deployed and maneuvered by vessels through an oil slick to actively collect the oil. For example, a vessel can extend a short length of boom on a fixed arm (side collector) to herd oil to an inlet leading to a skimmer. As the vessel moves forward, oil is forced to accumulate in the apex of the boom where the skimmer is located, thereby concentrating the oil by increasing the amount of oil relative to water at the skimmer. Skimmers can also be deployed at an opening at the apex of two booms being towed between two vessels to recover oil that is forced into the apex. In this configuration, the collected oil is typically pumped to a storage barge or other vessel with containment tanks stationed near the apex.

Self-propelled vessels stationed specifically at offshore facilities or provided by an OSRO can engage in a variety of spill response activities. They serve as platforms to deploy and maneuver boom and mechanical skimmers, ferry equipment and personnel, conduct spill surveillance, apply dispersants, and to tow temporary oil storage devices and barges. Vessels used for these activities range in size from 12-ft boats to 207-ft oil spill response vessels. Some vessels used for spill response can achieve speeds up to 30 knots. They are usually dispatched within the first hour of a deployment exercise and achieve their highest speeds when transiting to the site of the simulated spill. Once on scene, vessels generally transit at very low speeds (0 to 5 kts) to conduct spill response operations.

Towable temporary oil storage devices are designed to hold and transport recovered oil from a spill site. They are made of rubber or polymer-coated fabrics of various weights and designs and have capacities that range from a few gallons to more than 300,000 gallons. In addition to the temporary oil storage devices, metal or inflatable barges (sometimes called mini-barges) designed for temporary oil storage can be towed or pushed by a vessel during an exercise. These barges generally have a maximum storage capacity of 250 bbl and can be of various lengths.

Helicopters are used for a number of spill response activities. During an exercise, they may be launched from the local Santa Barbara area to demonstrate remote sensing capabilities or simulate dispersant application in a designated offshore area. For exercises in the Pacific Region, a King Air BE90 aircraft in Concord, California and a C-130 aircraft in Mesa, Arizona could be activated to conduct a coordinated simulated dispersant application operation. In such an exercise, BSEE would request the activation of both assets so that the King Air could provide spotter information to the pilots of the C-130 as the latter aircraft sprayed water in simulated dispersant application runs. This type of coordinated air operations would occur during an actual spill response and BSEE would use an exercise to evaluate the response times and effectiveness of the coordinated operations under the Oil Spill Response Plan (OSRP).

Buoys may be used to demarcate the location of the simulated oil slick. They usually have a weighted, cone-shaped buoy body with a vertically extending narrow, fiberglass pole topped with a highly visible flag. Response vessels are to “capture the flag” to show success in a drill. Based on the number of oil spill response plans currently overseen by BSEE in the Pacific Region, normally three BSEE initiated oil spill exercises involving table-top scenarios and/or equipment deployments are conducted annually. However, more than three exercises may be initiated by BSEE if an owner/operator needs to be retested or if new or modified OSRPs are approved within the action area. Equipment deployments during an exercise generally occur for a few hours and rarely last longer than a day, and rarely at nighttime. BSEE personnel will observe the operation of these devices and generally will be satisfied with their performance when the skimmers are sufficiently drawing and discharging water from and to the marine environment.

1.3.10 Decommissioning

The BA provided a general overview of potential impacts associated with decommissioning, given that plans for decommissioning are uncertain and not sufficient to support complete analyses of potential impacts. As a result, when final decommissioning applications are submitted for review, further analysis and ESA consultation with NMFS will occur over each complete decommissioning plan submitted in the future, as necessary. However, decommissioning activities, including well plugging, are analyzed at the programmatic level.

All 23 existing offshore platforms and associated pipelines in the SCPA will be decommissioned eventually. The structures are generally grouped into two main categories depending upon their relationship to the platform/facilities (e.g., piles, jackets, caissons, templates, mooring devices) or the well (e.g., wellheads, casings, casing stubs). BSEE approves the permanent plugging of wells, full or partial removal of platforms and pipelines, and site clearance activities [30 CFR Subpart Q].

Detailed hypothetical decommissioning scenarios for individual platforms are described in BSEE's "Decommissioning Cost Update for Pacific OCS Region Facilities" (BSEE 2015). Environmental impacts of decommissioning are summarized and incorporated by reference: "Draft Programmatic Environmental Impact Statement for Oil and Gas Decommissioning Activities on the Pacific Outer Continental Shelf" (ANL 2022). Figure 5 provides an overview of O&G decommissioning.

As a precursor to platform decommissioning, the permanent abandonment of all the wells on a facility is required. This involves the plugging of the wells. BSEE is currently reviewing APDs that will assess the permanent abandoning of wells at several offshore facilities and BOEM would perform the National Environmental Policy Act (NEPA) analysis on these projects. Currently, 13 leases are terminated, 8 of which have facilities requiring decommissioning. Platform Habitat is currently in a state of preservation and may proceed to decommissioning within the next 10 years. Well-plugging and conductor-removal operations are underway on some of these platforms, and platform and related facility and pipeline decommissioning are expected to occur on them this decade.

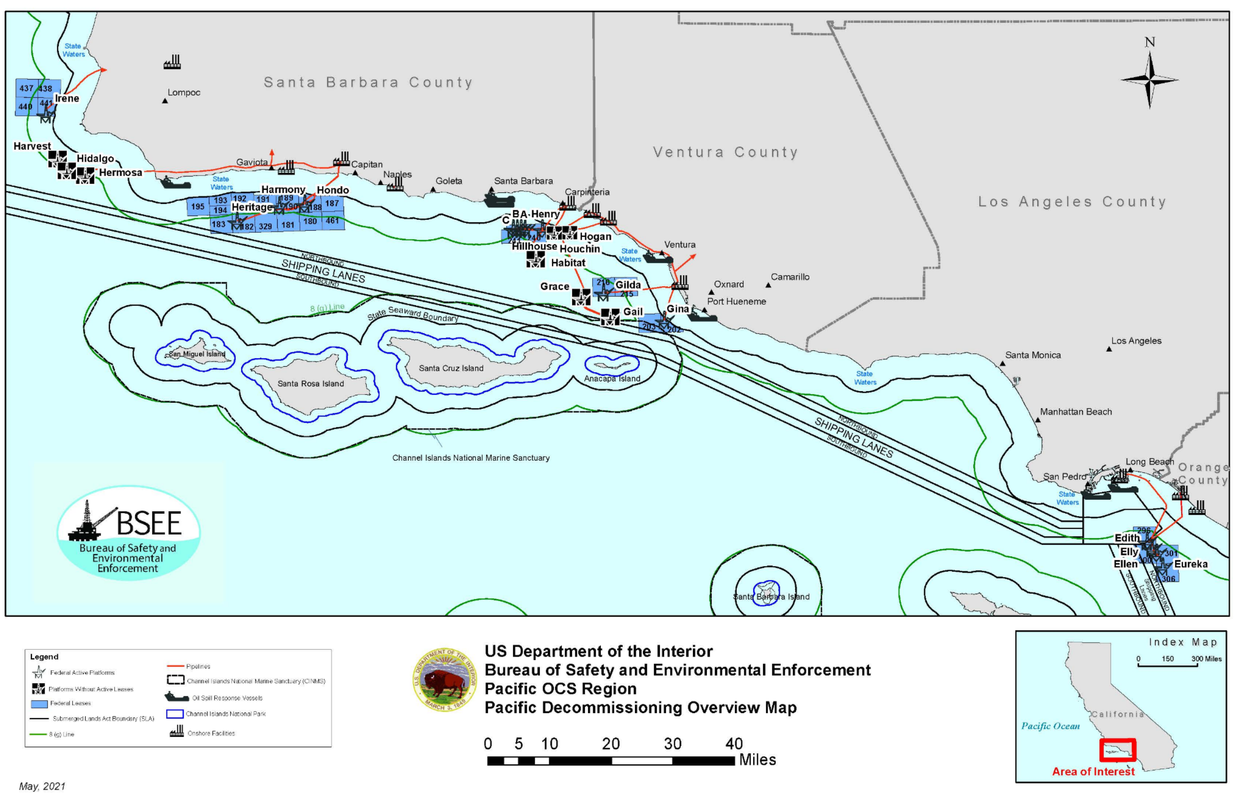

Figure 5: Pacific Oil and Gas Decommissioning Overview Map (for a larger-size, digital file of this figure, see: https://www.boem.gov/regions/pacific-ocs-region/oil-gas/pacific-oil-and-gas-decommissioning-activities)

Decommissioning of each platform can take more than a year, depending on the size of the platform, location, and equipment. All wells will be permanently abandoned, and well conductors and casings will be cut at a minimum of 15 ft below the sea floor. Later, O&G

processing equipment and deck modules will be removed and shipped, using derrick and cargo barges, to shore for disposal and then cut into smaller pieces for removal.

The devices used to cut structural components during decommissioning activities are classified as either nonexplosive or explosive, and they can be deployed and operated by divers, ROVs, or from the surface. Nonexplosive severing tools are used for a wide array of structure and well decommissioning targets in all water depths. Based on 10 years of historical data (1994-2003) from the Gulf of Mexico, nonexplosive severing is employed exclusively on about 37% of platform removals per year. Many removals in the Gulf of Mexico use explosive technologies either as a prearranged strategy or as a backup method.

Current decommissioning cost projections for the SCPA only consider nonexplosive severing tools for disassembly of platform components; however, the use of explosives cannot be completely excluded. Explosive removal of structures (EROS) generates pressure waves and acoustic energy that is the primary impact-producing factor on marine protected species during decommissioning (ANL 2022). Historically, explosive charges are used in about 63% of decommissioning operations in the Gulf of Mexico, often as a backup cutter when other methodologies prove unsuccessful. Offshore O&G facilities removed from California coastal waters have required both nonexplosive and explosive devices. Devices to be used for the future removal of Federal O&G facilities in the SCPA have not yet been proposed.

After all decommissioning work is completed and the structure is salvaged, operators are required to perform site-clearance work to ensure that the sea floor of their lease(s) have been restored to pre-lease conditions. Operators have the option of either trawling with commercial nets or conducting diver/high resolution sonar surveys of the lease site.

Partial removal of offshore platforms is also a possibility. BSEE supports and encourages the reuse of obsolete O&G structures as artificial reefs and is a cooperating agency in the implementation of the National Artificial Reef Plan. In California, any proposed reefing is subject to State legislation that would allow this activity. Structure removal permit applications requesting a departure from decommissioning regulations under the Rigs-to-Reefs Policy (BSEE Interim Policy Document 2013-07) undergo technical and environmental reviews for approval, as necessary to minimize the potential for adverse effects to sensitive habitat and communities in the vicinity of the structure and proposed artificial reef site.

As final decommissioning applications are submitted for review, further analysis and consultation will occur that take into consideration the specifics of those proposed actions.

Additional Activities Considered

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would cause the following activities:

If an oil spill occurs, as a result of the proposed action, there is an expectation that oil spill response activities will be initiated by a large number of federal, state, local, and private entities, depending on the scale of oil spill and concerns surrounding potential impacts. Generally, emergency oil spill response activities off of California are managed under the Region IX

Regional Contingency Plan (RCP), implemented by the U.S. Coast Guard (USCG) and EPA in partnership with over 50 agencies, including federal, state, local, industry and environmental participants. As a result, we consider the potential impacts and benefits of oil spill response activities that would be expected to occur, with any oil spill that occurs as a consequence of the proposed action, as part of analysis of the potential effects of oil spills on ESA-listed species and critical habitats, in this Opinion.

2. ENDANGERED SPECIES ACT: BIOLOGICAL AND CONFERENCE 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 to 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 provide 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 reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

In this biological opinion, we analyze the likely adverse effects resulting from the proposed action on the following species: blue whales, fin whales, Central America Distinct Population Segment (DPS) and Mexico DPS humpback whales, East Pacific DPS green sea turtles, and black abalone. We also analyze the likely adverse effects from the proposed action on designated critical habitat for black abalone and proposed critical habitat for East Pacific DPS green sea turtles (see section 2.5).

The Bureaus determined the proposed action is not likely to adversely affect: North Pacific right whales, sei whales, Southern Resident killer whales, sperm whales, western North Pacific gray whales, Guadalupe fur seals, olive ridleys, leatherbacks, North Pacific Ocean DPS loggerheads, southern DPS green sturgeon, southern California DPS steelhead, South-Central California coast DPS steelhead, oceanic whitetip sharks, giant manta rays, Eastern Pacific DPS scalloped hammerhead sharks, sunflower sea stars, and white abalone. The Bureaus also determined the proposed action is not likely to adversely affect designated critical habitat for Central America and Mexico DPS humpback whales, and leatherback sea turtles. Our analysis is documented in the "*Not Likely to Adversely Affect*" determinations section (section 2.12).

2.1 Analytical Approach

This biological opinion includes a jeopardy analysis which relies upon the regulatory definition of "to jeopardize the continued existence of" a listed species, which is "to engage in an action that 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 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion also relies on the regulatory 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 green sea turtles and black abalone use(s) the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the 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 ESA Section 7 implementing regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision 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:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly 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; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

The proposed action for this consultation is a mixed programmatic action as defined by 50 CFR 402.02. For the purposes of an incidental take statement, a mixed programmatic action approves actions that will not be subject to further section 7 consultation, and also approves a framework for the development of future actions that are authorized, funded, or carried out at a later time, and any take of a listed species would not occur unless and until those future actions are authorized, funded, or carried out and subject to further section 7 consultation. This proposed action approves a range of oil and gas development and production activities that are analyzed in this biological opinion and will not be the subject of future individual consultations (unless reinitiation is warranted). We provide an incidental take exemption and associated reasonable and prudent measures and terms conditions for take resulting from the activities in the ITS in this document.

Authorization of final decommissioning plans and decommissioning activities (section 1.3.10 *Decommissioning*) will be addressed by future consultations if those actions may affect listed species or critical habitat. To complete our jeopardy and adverse modification analysis, we generally consider the potential effects of these activities based on how decommissioning of oil and gas infrastructure has occurred in other places, and how those impacts have been evaluated in previous consultations, to predict, to the degree we can, the general type and scale of any future impacts from decommissioning under the proposed project on listed species and critical habitat. For uncertain decommissioning activities that will be the subject of future consultations, we do not try to predict exactly what will happen at a particular action site in the future. We reserve the ability to assess in future consultation, based on the additional information available at that time, whether such actions would jeopardize the continued existence of listed species or destroy or adversely modify critical habitat. Take associated with such actions, if any, may be exempted as appropriate in future ITSs.

For characterizing this proposed action, NMFS relies upon data provided by the Bureaus in their September 1, 2023, BA. We reviewed other biological opinions on O&G activities (e.g., in Alaska and the Gulf of Mexico) and other analyses of activities with similar types of effects as O&G activities (e.g., vessel strikes) to understand the risk of the proposed action to ESA-listed species and critical habitat. For information on the *Status* and *Environmental Baseline*, we also relied on marine mammal stock assessment reports, recovery plans, status reviews, published scientific literature, other publicly available information, and unpublished data available to NMFS, such as stranding records of marine mammals and sea turtles.

2.2 Rangewide Status of the Species and Critical Habitat

This Opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, 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' "reproduction, numbers, or distribution" for the jeopardy analysis 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 function of the PBFs that are essential for the conservation of the species.

One factor affecting the range-wide status of ESA-listed species and aquatic habitat at large is climate change. Climate change has received considerable attention in recent years, with growing concerns about global warming and the recognition of natural climatic oscillations on varying time scales, such as long-term shifts like the Pacific Decadal Oscillation or short-term shifts, such as El Niño or La Niña. Evidence suggests that the productivity in the North Pacific (Quinn and Niebauer 1995; MacLeod 2009) and other oceans could be affected by changes in the environment. Important ecological functions such as migration, feeding, and breeding locations may be influenced by factors such as ocean currents and water temperature. Any changes in these factors could render currently used habitat areas unsuitable and new use of previously unutilized or unavailable habitats may be a necessity for displaced individuals. Changes to climate and oceanographic processes may also lead to decreased productivity in different patterns of prey distribution and availability. Such changes could affect individuals that are dependent on those affected prey.

NMFS has conducted climate vulnerability assessments for many of its protected species (Lettrich et al. in 2020). The potential impacts of climate and oceanographic change on whales and other marine mammals will likely affect habitat availability and food availability. Site selection for migration, feeding, and breeding may be influenced by factors such as ocean currents and water temperature. For example, there is some evidence from Pacific equatorial waters that sperm whale feeding success and, in turn, calf production rates are negatively affected by increases in sea surface temperature (Smith and Whitehead 1993; Whitehead 1997). Any changes in these factors could render currently used habitat areas unsuitable. Changes to climate and oceanographic processes may also lead to decreased prey productivity and different patterns of prey distribution and availability. Research on copepods has shown their distribution may be shifting in the North Atlantic due to climate changes (Hays et al. 2005). Different species of marine mammals will likely react to these changes differently. For example, range size, location, and whether or not specific range areas are used for different life history activities (e.g. feeding, breeding) are likely to affect how each species responds to climate change (Learmouth et al. 2006).

Based upon available information, it is likely that sea turtles are being affected by climate change. Sea turtle species are likely to be affected by rising temperatures that may affect nesting success and skew sex ratios, as some rookeries are already showing a strong female bias as warmer temperatures in the nest chamber leads to more female hatchlings (Kaska et al. 2006; Chan and Liew 1995). Rising sea surface temperatures and sea levels may affect available nesting beach areas as well as ocean productivity. Based on climate change modeling efforts in the eastern tropical Pacific Ocean, for example, Saba et al. (2012) predicted that the Playa Grande (Costa Rica) leatherback nesting population would decline 7% per decade over the next 100 years. Changes in beach conditions are expected to be the primary driver of the decline, with hatchling success and emergence rates declining by 50-60% over the next 100 years in that area (Tomillo et al. 2012). Sea turtles are known to travel within specific isotherms and these could be affected by climate change and cause changes in their bioenergetics, thermoregulation, prey availability, and foraging success during the oceanic phase of their migration (Robinson et al. 2008; Saba et al. 2012). While the understanding of how climate change may impact sea turtles is building, there is still uncertainty and limitations surrounding the ability to make precise predictions about or quantify the threat of future effects of climate change on sea turtle populations (Hawkes et al. 2009).

Two factors affecting the rangewide status of black abalone and its critical habitat are climate change and ocean acidification. Climate change effects may increase susceptibility to disease, reduce kelp growth, and alter the distribution of rocky intertidal habitat along the coast. Sea level rise could alter the distribution and availability of rocky intertidal habitat. Ocean acidification can affect reproduction, development, growth, and survival of black abalone, as well as the growth of important algal species.

We consider the ongoing implications of climate change as part of the status of ESA-listed species. Where necessary or appropriate, we consider whether impacts to species resulting from the proposed action could potentially influence the resiliency or adaptability of those species to deal with climate change that we believe is likely over the foreseeable future. We note that the proposed action does not have a defined time horizon, which is challenging when analyzing the potential for the proposed action and its associated effects to also be influenced by a changing climate, although we anticipate that it will last at least the next 20 years.

2.2.1 Fin Whale

Fin whales were listed as endangered worldwide under the precursor to the ESA, the Endangered Species Conservation Act of 1969, and remained on the list of threatened and endangered species after the passage of the ESA in 1973 (35 FR 8491). Currently there is no designated critical habitat for fin whales. A recovery plan was completed in 2010 (NMFS 2010) and the most recent 5-year status review was completed in 2019, where, based on the best available scientific and commercial information, NMFS recommended that the fin whale should be downlisted from endangered to threatened under the ESA because the magnitude of threats are low and their immediacy is non-imminent (NMFS 2019a). Fin whales feed on planktonic crustaceans, including *Thysanoessa* sp. euphausiids and *Calanus* sp. copepods, and schooling fish, including herring, capelin and mackerel (Aguilar 2009). Fin whales' association with the continental slope is common, perhaps due to abundance of prey (Schorr et al. 2010). However, fin whales aggregate to areas with large amounts of prey regardless of water depth. For example, fin whales can feed in more shallow waters during the day (less than 330 feet), and feed in deeper waters at night (can be greater than 1,320 feet; EPA 2017).

Fin whales are distributed widely in the world's oceans and occur in both the northern and southern hemispheres. In the northern hemisphere, they migrate from high Arctic feeding areas to low latitude breeding and calving areas. In the Atlantic Ocean, fin whales have an extensive distribution from the Gulf of Mexico and Mediterranean Sea northward to the arctic. The North Pacific population summers from the Chukchi Sea to California, and winters from California southward. Fin whales have also been observed in the waters around Hawai'i. Fin whales can occur year-round off California, Oregon, and Washington (Carretta et al. 2023). Information suggests fin whales are present year-round in southern California waters with movements into central California and Baja California and returning to the Southern California Bight (Bight), as evidenced by individually-identified whales being photographed in all four seasons, and including one satellite tracked individual with movement from south Baja California by February and north to Monterey area by June (Falcone and Schorr 2013). Širovic et al. (2017) propose the possibility of a southern California resident population through acoustic data along with their seasonal movements, although this is not yet clear. Additional telemetry studies would be necessary to fully flesh out the population stocks along with genetics and acoustics (Martien et al. 2020). The fin whales most likely to be observed within the action area are identified as part of the CA/OR/WA stock as defined under the MMPA.

Population Status and Trends: Although reliable and recent estimates of fin whale abundance are available for large portions of the North Atlantic Ocean, this is not the case for most of the North Pacific Ocean and Southern Hemisphere. The status of populations in both of these ocean basins in terms of present population size relative to "initial" (pre-whaling, or carrying capacity) level is uncertain. Fin whales in the entire North Pacific are estimated to be less than 38 percent of historic carrying capacity of the region (Mizroch et al. 1984). The best estimate of fin whale abundance in California, Oregon, and Washington waters out to 300 nautical miles is 11,065 (Coefficient of Variation (CV)=0.405) animals, where species distribution models (SDMs) from 1991-2018 line-transect survey data were used to estimate the density of cetaceans in the California Current Ecosystem (Becker et al. 2020a; Carretta et al. 2023). While this estimate is greater than previously posited by Nadeem et al. (2016) and Moore and Barlow (2011) who applied Bayesian trend analysis, it remains consistent with their conclusions of an increasing population for this stock. SDMs are used for this region as a stable method for estimating densities which incorporate both the changes in species abundance and habitat shifts over time (Becker et al. 2016, 2017, 2020b; Redfern et al. 2017). However, the new abundance estimates are substantially higher than earlier estimates because the new analysis incorporates lower estimates of detection probability (Barlow 2015). There is now evidence of recovery in California coastal waters. Evidence of their increased abundance came from line transect surveys off California and within the California Current (extending from CA, along OR, and WA) between 1991 and 2018 (Moore and Barlow 2011, Nadeem et al. 2016, Becker et al. 2020a), with an estimated mean annual abundance increase of 7.5% from 1991 to 2014 off California, Oregon, and Washington (Nadeem et al. 2016). However, it remains unclear what to attribute the growth to: immigration or their birth and death rates (Carretta et al. 2023).

Threats: A comprehensive list of general threats to fin whales is detailed in the Recovery Plan (NMFS 2010) and updated in the most recent 5-year status review (NMFS 2019a). Obvious threats to fin whales besides vessel interactions and fishery entanglements include reduced prey abundance due to overfishing or other factors (including climate change and competition with other baleen whales), habitat degradation, and disturbance from low-frequency noise, including ship traffic and airguns. Because little evidence of entanglement in fishing gear exists, and large whales such as the fin whale may often die later and drift far enough not to strand on land after such incidents, it is difficult to estimate the numbers of fin whales killed and injured by gear entanglements.

Documented ship strike deaths and serious injuries are derived from actual counts of fin whale carcasses and should be considered minimum values, although Rockwood et al. (2017) recently published efforts to generate plausible estimates of ship strike mortality for several whale species, including fin whales, along the U.S. west coast (see Section 2.4 *Environmental Baseline*). Continued research around vessel traffic pattern inconsistencies may inform our understanding of the mitigation of vessel strike risks with Redfern et al. (2019) who suggested consideration of both the reduction of vessel speeds along with expanded areas of avoidance.

The threats to fin whales due to underwater noise, pollutants, marine debris, and habitat degradation, are difficult to quantify, although recent studies are finding concerning levels of persistent organic pollutants (Pinzone et al. 2015) and microplastics, including plastic additives (Fossi et al. 2012), in the blubber of fin whales, and there is a growing concern that the increasing levels of anthropogenic noise in the ocean may be a habitat concern for fin whales that use low frequency sound to communicate.

Conservation: There are several international agreements in place to protect fin whales. For example, part of the International Whaling Commission's (IWC) function is to set catch limits for commercial whaling, which have been set at zero since 1985. Even before then, fin whales have been nominally protected from commercial whaling since 1966 by the IWC. The ban on commercial whaling has likely been a key conservation measure that has allowed fin whales to recover and continue to increase in the North Pacific, although limited harvest of fin whales outside the IWC framework has occurred. Fin whales are currently listed as Appendix I under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which is aimed at protecting species at risk from unregulated international trade. Appendix I includes species threatened with extinction which are or may be affected by trade; therefore, trade of Appendix I species is only allowed in exceptional circumstances. The International Union for the Conservation of Nature and Natural Resources (IUCN) Red List identifies and documents those species most in need of conservation if global extinction rates are to be reduced. The last assessment for fin whales was conducted in 2018; fin whales continued to be classified as "vulnerable" (Cooke 2018a).

The International Maritime Organization (IMO) is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships. One way that the IMO facilitates efficient and safe passage for ships is by establishing Traffic Separation Schemes (TSSs), which are voluntary routing measures aimed at separating opposing traffic streams and encouraging the flow of vessels in and out of port within designated traffic lanes. The IMO also designates regions as "Particularly Sensitive Sea Areas" and "Areas to be Avoided" for various ecological, economic or scientific reasons. The IMO was approached for the first time regarding conservation of an endangered whale species in 1998 for the North Atlantic right whale (*Eubalaena glacialis*). Since then the IMO has been approached with nations' proposals to establish or amend routing measures in various locations to reduce the threat of vessel collision with endangered whales, including fin whales. USCG is responsible for making recommendations to the IMO, and for establishing and modifying shipping lanes within U.S. waters. When considering changes, the USCG will initiate a Port Access Route Study (PARS), and recommendations for shifting or modifying shipping lanes are presented to the IMO for approval. IMO-endorsed modifications to TSSs have been established in areas off San Francisco/Oakland, off Santa Barbara and Los Angeles/Long Beach. Most recently, in January 2023, the IMO adopted a U.S. proposal to increase protections for blue, fin and humpback whales off southern California, which took effect in the summer of 2023. The modifications include a 13 nautical mile extension of the existing TSS in the Santa Barbara Channel, resulting in vessels lining up in deeper waters where there are lower concentrations of whales which should help reduce the risk from ship strikes. In addition, an area to be avoided by vessels was expanded by more than 2,000 nm^2 and will cover approximately 4,476 nm^2 of important foraging habitat off Point Conception and Point Arguello in Santa Barbara County, CA. Recently, the Santa Barbara Channel Whale Heritage Area was added as a World Heritage Area. This includes waters within the Channel Islands National Park and Channel Islands National Marine Sanctuary, putting greater emphasis on responsible whale watching and furthering outreach and education efforts to conserve foraging large whales, such as fin whales.

2.2.2. Humpback Whale

Humpback whales are found in all oceans of the world and migrate from high latitude feeding grounds to low latitude calving areas. Humpbacks primarily occur near the edge of the continental slope and deep submarine canyons, where upwelling concentrates zooplankton near the surface for feeding. Humpback whales feed on euphausiids and various schooling fishes, including herring, capelin, sand lance, and mackerel (Clapham 2009).

Humpback whales were listed as endangered under the Endangered Species Conservation Act in June 1970 (35 FR 18319) and remained on the list of threatened and endangered species after the passage of the ESA in 1973 (35 FR 8491). On September 8, 2016, NMFS published a final rule to divide the globally listed endangered humpback whale into 14 DPSs and place four DPSs as endangered and one as threatened (81 FR 62259). NMFS has identified two DPSs of humpback whales that may be found off the coast of California. These are the Mexico DPS (found all along the U.S. West Coast) which is listed as threatened under the ESA; and the Central America DPS (found predominantly off the coasts of Oregon and California) which is listed as endangered under the ESA. A recovery plan for humpbacks (globally listed as endangered at the time) was issued in November 1991 (NMFS 1991). Given the change in status of humpback whales throughout the world, NMFS is currently updating a DPS-specific recovery plan for three ESA-listed DPSs found in U.S. waters of the Pacific Ocean: Central America, Mexico, and the Western North Pacific.

Critical habitat for the endangered Central America DPS and the threatened Mexico DPS of humpback whales within waters off the U.S. West Coast was designated on April 21, 2021 (86 FR 21082). Essential features for both DPSs were identified as prey species, including euphausiids and small pelagic schooling fishes such as Pacific sardine (*Sardinops sagax*), northern anchovy (*Engraulis mordax*) and Pacific herring (*Clupea pallasii*). Critical habitat for the Central America DPS of humpback whales contains approximately 48,521 square nautical miles (nm^2) of marine habitat in the North Pacific Ocean within the portions of the California Current off the coasts of Washington, Oregon, and California. Specific areas designated as critical habitat for the Mexico DPS of humpback whales contain approximately 116,098 nm^2 of marine habitat in the North Pacific Ocean, including areas within portions of the eastern Bering Sea, Gulf of Alaska, and California Current Ecosystem.

The final 2022 SAR (Carretta et al. 2023) defined two new humpback whale stocks off the U.S. west coast: the Central America/Southern Mexico-CA/OR/WA stock and the Mainland Mexico-CA/OR/WA stock. While NMFS will continue to evaluate the relationship between the humpback whale DPSs and recognized "demographically independent populations"[2] (DIPs;

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[2] NMFS' Guidelines for Preparing Stock Assessment Reports Pursuant to the 1994 Amendments to the MMPA specify that a stock under the MMPA should comprise a demographically independent population (DIP), where "demographic independence" is to mean that "…the population dynamics of the affected group is more a consequence of births and deaths within the group (internal dynamics) rather than immigration or emigration (external dynamics). Thus, the exchange of individuals between population stocks is not great enough to prevent the depletion of one of the populations as a result of increased mortality or lower birth rates (NMFS 2016a).

Martien et al. 2019), we rely heavily on the most recent SAR and the most recent publicly available information in assessing the status (including abundance and trends) of the two listed DPSs, and in considering the proportional risk of anthropogenic activities on humpbacks found within the action area.

Humpback whales found along the U.S. West Coast spend the winter primarily in coastal waters of Mexico and Central America, and the summer/fall along the U.S. West Coast from California to British Columbia. As a result, both the endangered Central America DPS and the threatened Mexico DPS at times travel and feed off California and may be exposed to oil and gas activities. In July 2021, NMFS WCR updated a memo outlining evaluation of the distribution and relative abundance of ESA-listed DPSs that occur in the waters off the U.S. West Coast using the best available scientific information available, which included genetic analyses (Lizewski et al. 2021; Martien et al. 2020; 2021), photo-identification analyses, (Calambokidis and Barlow 2020; Wade 2017; 2021) and species distribution models (Becker et al. 2020b; NMFS 2021). NMFS (2021) recommended that for ESA Section 7 analyses, the WCR should apply a proportional approach based on the most recent abundance information on the CA/OR/WA stock from Calambokidis and Barlow (2020) and the proportions of the various DPSs feeding off CA/OR (and WA/Southern British Columbia) (Wade 2021). NMFS recommended considering that for actions occurring off the coast of California and Oregon, 42 percent of the humpback whales that could be affected by a proposed action would be members of the endangered Central America DPS and 58 percent would be members of the threatened Mexico DPS. The most recent SAR for humpback whales used the same underlying information for apportioning human impacts among the newly proposed humpback stock delineations, as required under the MMPA (Carretta et al. 2023).

Recently, Wade et al. (2022) reanalyzed the same data collected during a comprehensive photo-identification study of humpback whales throughout the Pacific from 2004-2006 and revised estimates of abundance and migratory destinations for North Pacific humpback whales in both summer and winter destinations. Several scenarios were explored to identify migratory destinations, including winter breeding areas, which resulted in some scenarios splitting Mexico into two areas, increasing winger areas from four to five. A multi-state mark recapture model was used to estimate abundance estimates and movement (proportion of humpback whale populations moving between summer and winter areas) estimates. Because multiple scenarios were analyzed using various models, the results showed varying abundance estimates and proportions, particularly for the two listed DPSs feeding off California and Oregon. Because these abundance estimates and proportions have yet to be considered and reviewed by the Pacific Scientific Review Group for consideration in a revised SAR for humpback stocks found off CA/OR/WA, we will consider the Wade (2021) abundance and proportion estimates, which are also included in the 2022 final SAR (Carretta et al. 2023).

Based on the best available information, all of the whales from the Central America DPS appear to migrate to feed only off the U.S. West Coast. Conversely, whales from the Mexico DPS migrate in varying proportions to the U.S. West Coast, British Columbia, and various areas off Alaska. Based on the management objectives of the MMPA to delineate marine mammal stocks[3], NMFS has determined that stocks should represent "DIPs" (Martien et al. 2019). Within the ESA-listed DPSs in the Pacific Ocean, multiple lines of evidence indicate that the animals migrating to and along the U.S. West Coast from waters off mainland Mexico comprise a single DIP, and could possibly be considered a stand-alone stock under the MMPA (Martien et al. 2021). In the waters off California and Oregon, this DIP co-occurs with a newly described DIP of animals originating from waters off of Central America and southern Mexico (Taylor et al. 2021). In waters off of Washington and southern British Columbia (outside of the action area), animals from the Hawai'i DPS also occur; however, their status as a separate DIP within the Hawai'i DPS has not been established.

Given the identification of two DIPs (also termed "migratory herds" that share both wintering and feeding areas by Martien et al. 2020) within the endangered Central America and the threatened Mexico DPSs, Curtis et al. (2022) recently estimated the abundance of the Central America/Southern Mexico DIP. Although the Central America DPS is comprised of those whales that winter along the Pacific coast of Central America from Panama to Guatemala (Bettridge et al. 2015), this DIP's wintering area is understood to extend north into southern Mexico to at least the state of Guerrero, with animals sighted as far north as Michoacán and Colima (Taylor et al. 2021). Given that this DIP forages exclusively off the U.S. West Coast, and given the most recent abundance estimate for the CA/OR/WA stock of humpbacks, we can use a proportional approach to estimate the likelihood of a whale occurring in the action area and affected by oil and gas activities originating from Central America/Southern Mexico and/or mainland Mexico. This will be discussed in more detail in Population Status and Trends sections below.

<u>Population Status and Trends:</u> NMFS-WCR reviewed the best available scientific information on the distribution and abundance of the two DPSs foraging off the U.S. West Coast. There are two primary lines of evidence for the origin of humpback whales found off the U.S. West Coast: photo identification catalogs and genetic identification of sampled individuals.

Wade et al. (2016) estimated abundance within all sampled winter breeding and summer feeding areas in the North Pacific and estimated migration rates between these areas using a comprehensive photo-identification study of humpback whales in 2004-2006 during the "SPLASH" (Structure of Populations, Levels of Abundance and Status of Humpbacks) project. Further revisions and refinements were made in Wade (2021) and, as mentioned earlier, more recently in Wade et al. (2022) as part of the ongoing comprehensive assessment of humpback whales by the International Whaling Commission (IWC). The revised results led to different estimates of abundance for both the breeding (winter) and feeding (summer) grounds and different estimates of the proportional representation of animals from the different breeding grounds foraging off areas of the U.S. West Coast. We note that the SPLASH surveys were conducted over 15 years ago, which indicates that those abundance estimates are outdated; specifically, they are greater than 8 years old, which is not considered a reliable estimate of current abundance, as summarized in NMFS' Guidelines for Preparing Stock Assessment Reports (NMFS 2016a; NMFS 2023a). For the 2004-2006 humpback populations, the Wade (2021) revised abundance estimate for the Central America DPS is 755 (CV=0.242) animals, and

[3] The term stock, as defined by statute under the MMPA, means a group of marine mammals of the same species or smaller taxa in a common spatial arrangement that interbreed when mature.

the revised abundance estimate for the Mexico DPS is 2,913 (CV=0.066) animals, using the Multistrata model (N_{multi}) (which uses both winter and summer data; Table 4 in Wade 2021).

Recent analyses by Calambokidis and Barlow (2020) updated humpback whale abundance estimates for the previously defined (2021 SAR (Carretta et al. 2022)) CA/OR/WA stock of humpbacks, which included 2018 survey data. Capture-recapture models for humpback whales off CA/OR showed a dramatic increase in recent years, with a trend for the population starting in 1989 (~500 animals) through 2018 increasing an average 7.5% per year, with a higher rate of increase in the late 2000s[4]. While multiple abundance estimates for humpbacks along the U.S. West Coast were reported, the most recent (i.e., 2018) estimate of 4,973 whales (with a standard error of 239 and lower and upper 20th percentile values of 4,776 to 5,178 whales) was produced for CA/OR based on the Chao model using rolling 4-year periods for the last four most recent available years (2015-2018; Table 3 in Calambokidis and Barlow 2020). While the estimates of humpback whale abundance for WA/SBC were also presented (1,593 animals, standard error of 108) and showed increases, particularly in recent years and extending into the Salish Sea, the abundance estimate for the U.S. West Coast only included CA/OR. There are two main reasons why the authors did not add the two estimates from both foraging areas. First, the WA/SBC estimate included a fairly large number of animals that would be outside U.S. waters, since some of the major areas of concentration were just north of the U.S. border. Animals outside of U.S. waters are generally not included in abundance estimates generated for SARs under the MMPA[5]. Secondly, there is some interchange between the CA/OR and the WA/SBC areas, which would mean that each individual estimate is to some degree including a portion of animals from the other area (J. Calambokidis, Cascadia Research Collective, personal communication, September 2020).

The final 2021 SAR for humpback whale stocks off the U.S. West Coast was replaced using the new stock delineations finalized in the 2022 SAR (Carretta et al. 2023). Based on new information from Curtis et al. (2022) on abundance estimates for the Central America-Southern Mexico-CA/OR/WA stock, new Potential Biological Removal (PBR) levels relevant for both the Central America-CA/OR/WA and Mexico-CA/OR/WA stocks are summarized below along with their relevance to the Central America and Mexico DPS status.

<u>Threats:</u> A comprehensive list of general threats to humpback whales is detailed in the Recovery Plan (NMFS 1991) and the 2015 status review (Bettridge et al. 2015). Similar to other large whales, humpbacks throughout the North Pacific Ocean are potentially affected by loss of habitat, loss of prey (for a variety of reasons including climate variability), underwater noise, and pollutants. Substantial coastal development is occurring in many regions throughout the range of

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[4] These estimates will further be evaluated and tested in the future with results from planned Bayesian models and an analysis of the 2018 sighting survey conducted by NMFS. A "SPLASH 2" program is also underway, with increased field efforts off southern Mexico and Central America, as well as workshops to update the databases and analyses.

[5] Note that they may be included when estimates are based on mark-recapture for transboundary stocks such as humpback whales. The 2019 SARs included the abundance estimate for WA/SBC feeding group of humpback whales (n=526) and then this estimate was prorated for the time spent outside of U.S. waters (where data are available) to calculate the potential biological removal level (J. Carretta, NMFS-SWFSC, personal communication, December 2020).

the two listed DPSs considered in this biological opinion, and noise associated with construction (e.g., pile driving, blasting or explosives) has the potential to affect humpbacks by generating sound levels that may disturb humpback whales or adversely affect their hearing. Port construction may result in a higher volume of ship traffic. Contaminants, including heavy metals, persistent organic pollutants, effluent, airborne contaminants, plastics and other marine debris can affect humpback whales through the accumulation of lipophilic compounds in their blubber (e.g., pesticides such as DDT) and may have detrimental effects, including disease susceptibility, neurotoxicity, and reproductive and immune impairment. Humpbacks may also ingest or become entangled in marine debris. Whale watching and scientific research may also disturb or harm humpback whales through disruption of essential biological functions, harassment or injury from inadvertent close approaches or application of tags, etc. In general, anthropogenic sound has increased in all oceans over the last 50 years, and is thought to have doubled each decade in some areas of the ocean over the last 30 years or so. Low-frequency sound comprises a large proportion of this increase, stemming from a variety of sources, including shipping, oil and gas exploration, and military activities. Detrimental effects associated with anthropogenic sound include hearing loss, masking, and temporary threshold shifts in hearing, so social communication could be impacted, as well as fluctuations in stress hormones, change in behavior such as departure from prime foraging areas or alteration in migratory routes or timing. Given the sensitivities of humpbacks to low and mid-frequency sounds, researchers may be able to detect changes and adverse effects to individuals; however, population-level impacts on cetaceans in general has not been confirmed and is difficult to detect on a large scale, including long time-frames.

Little is known of the anthropogenic threats to the two listed humpback whale DPSs while they are outside of U.S. waters and on their breeding grounds. When we do have reports of injured or dead whales reported off Canada and Mexico entangled in gear originating from the United States, these reports are included in the SAR. Given their long migrations between feeding and breeding grounds, we assume both DPSs are subject to the anthropogenic threats summarized above, but any reports (particularly published reports) are rare to nonexistent.

Entanglement in fishing gear poses a significant threat to individual humpback whales throughout the Pacific Ocean. For fisheries interactions/entanglements off the U.S. West Coast, pot and trap fishery entanglements are the most prevalent source of serious injury and mortality, and reported entanglements increased considerably in 2014. Between 1982 and 2013, NMFS' confirmed stranding/sighting records of entangled whales (all species) averaged around 9 whales/year. Entanglement reports spiked between 2014 and 2017 with an average of 41 confirmed entanglements/year (Saez et al. 2021). Given the estimated proportion of the two DPSs foraging off the U.S. west coast, we can break down fishery interactions prorated to both the Central America and the Mexico DPSs. As shown in Figure 3 of Saez et al. (2021), historically, the majority of confirmed entanglements were reported in southern California (within the action area). However, beginning in 2014, many, if not the majority of reported entanglements have been reported in central California, likely due in part to increasing interactions with fixed gear fisheries with the extensive use of vertical lines that are prominent throughout the U.S. West Coast outside of southern California (e.g., Dungeness crab fisheries). The 2022 SAR provides an overview of humpback whale interactions in commercial fishing gear from 2016-2020 (unless noted otherwise), with many of the interactions and associated serious mortality likely attributed to fisheries outside of the action area. However, with many of the fisheries interactions attributed to unknown fisheries, and without known locations of where the entanglement originated, we will combine all of the fishery information together in one table in the *Environmental Baseline* section, where the action area includes the southern half of California. We intend to use the prorations based on Wade (2021) to generate estimates of take and associated serious mortality.

The estimated impact of fisheries on the Central America and Mexico DPSs is likely underestimated, since the mortality or serious injury of large whales due to entanglement in gear may go unobserved because whales swim away with a portion of the net, line, buoys, or pots. Non-commercial fisheries may include tribal and recreational fisheries as well as marine debris (including research buoys) but are likely responsible for a small fraction of all entanglements. Details of the interactions are summarized in the *Environmental Baseline* section 2.4.1.1.

Humpback whales, especially calves and juveniles, are highly vulnerable to ship strikes (Stevick et al. 1999) and other interactions with non-fishing vessels. Off the U.S. West Coast, humpback whale distribution overlaps significantly with the transit routes of large commercial vessels, including cruise ships, large tug and barge transport vessels, and oil tankers in the action area. Whale watching boats and research activities directed toward whales may have direct or indirect impacts on humpback whales as harassment may occur, preferred habitats may be abandoned, and fitness and survivability may be compromised if disturbance levels are too high. Over the past 30 years, our known (and considered minimum) estimate of vessel strikes of large whales is considered low. Given the estimated proportions of the two DPSs foraging off the U.S. West Coast, a breakdown of documented vessel strikes prorated to both the Central America and the Mexico DPSs are summarized individually, in the subsections below. More details of interactions between vessels and humpback whales is provided in the *Environmental Baseline* section 2.4.1.2.

<u>Conservation</u>: There are several international agreements in place to protect humpback whales. For example, part of the IWC's function is to set catch limits for commercial whaling, which have been set at zero since 1985. Even before then, the North Pacific humpback whales have been nominally protected from commercial whaling since 1966 by the IWC. Illegal catches continued in the region for several years after protection but the last substantial catches occurred in 1968 (IUCN 2018). Since that time, the IWC's Scientific Committee has developed a stock assessment and catch limit methodology ("revised management procedure) with the goal of providing information on catch limits consistent with maintaining sustainable populations. Catch limits for humpback whales have been allowed for some aboriginal whaling, but not within the North Pacific Ocean. The ban on commercial whaling has likely been a key conservation measure that has allowed humpbacks to recover and continue to increase in most areas of the North Pacific. Humpback whales are currently listed as Appendix I under CITES, which is aimed at protecting species at risk from unregulated international trade. Appendix I includes species threatened with extinction which are or may be affected by trade; therefore, trade of Appendix I species is only allowed in exceptional circumstances. The IUCN Red List identifies and documents those species most in need of conservation if global extinction rates are to be reduced. The last assessment for humpback whales was conducted in 2018; humpbacks continued to be classified as "least concern" (Cooke 2018b).

As described above, the IMO recently adopted a U.S. proposal to increase protections for blue, fin and humpback whales off southern California, which took effect in the summer of 2023. The modifications include a 13 nautical mile extension of the existing TSS in the Santa Barbara Channel, resulting in vessels lining up in deeper waters where there are lower concentrations of whales, which should help reduce the risk from ship strikes. In addition, an area to be avoided by vessels (traffic exclusion zone) was expanded by more than 2,000 nm^2 and covers approximately 4,476 nm^2 of important foraging habitat off Point Conception and Point Arguello in Santa Barbara County, CA. Within the traffic separation scheme, which is near the Channel Islands National Marine Sanctuary, NOAA asks merchant ships to voluntarily slow down to 10 knots or less on all primary approaches to the port of Los Angeles/Long Beach from May to December.

Domestically, all marine mammals (including humpbacks) are protected by the MMPA. Any "take" of a marine mammal requires approval of NMFS, with some exceptions. ESA-listed marine mammals receive additional protections under the MMPA from activities such as commercial fishing. The Mexico DPS also forages in Alaskan waters, and under the authority of the ESA and the MMPA, NMFS issued a final rule effective in 2001 making it unlawful for anyone (i.e., vessels) to approach humpback whales within 100 yards or disrupt their normal behavior in Alaska (66 FR 29502). Off the U.S. West Coast, there are five national marine sanctuaries that provide additional protection for both humpback whale DPSs: the Olympic Coast (3,188 mi^2), the Greater Farallones (3,295 mi^2), Cordell Bank (1,286 mi^2), Monterey Bay (6,094 mi^2), and the Channel Islands (1,470 mi^2). In general, the sanctuaries provide additional protection within their waters that may restrict acoustic impacts, discharge of pollutants, cruise ships, fishing (through marine protected areas, for example), offshore wind energy development, oil and gas development, vessel traffic, etc., all of which benefit humpback whales when foraging within sanctuary waters.

In 2015, a working group was formed to address large whale (humpback whales in particular) and leatherback entanglements in the California Dungeness crab fishery. Members of the working group included non-governmental organizations, industry, biologists, and state and federal representatives. Together, they developed a Risk Assessment Mitigation Program (RAMP) to reduce the risk of entanglements of blue whales, humpback whales, and leatherback turtles. The CDFW finalized RAMP regulations on November 1, 2020 (14 CFR Sec. § 132.8) which requires the agency Director to evaluate the risk of entanglement and the need for management action at least monthly during the fishing season (November 1-June 30). The regulations include triggers for management actions, (e.g., fishery closures, advisories, depth constraints, gear requirements, alternative gear) if entanglements of the three key species are confirmed or concentrations of these species are observed.

The states of California, Oregon, and Washington are currently applying for a permit to allow the states' Dungeness crab fishery to incidentally take humpback whales (and blue whales and leatherbacks) through section 10 of the ESA. Section 10 requires the states to develop a conservation plan that would describe the anticipated impact of the requested take levels and how the state agencies will minimize those impacts (e.g. establishing an entanglement detection network, implementing a lost/abandoned gear retrieval program, implementing electronic vessel position monitoring, gear marking, testing innovative gear).

2.2.2.1 Mexico DPS Humpback Whale

The Mexico DPS consists of whales that breed along the Pacific coast of Mexico, the Baja California Peninsula and the Revillagigedos Islands. This DPS feeds across a broad geographic range from California to the Aleutian Islands, with concentrations in California-Oregon, northern Washington-southern British Columbia, northern and western Gulf of Alaska and Bering Sea feeding grounds. The Mexico DPS was determined to be discrete based on significant genetic differentiation as well as evidence for low rates of movements among breeding areas in the North Pacific given sightings information. The DPS was determined to be significant due to the gap in breeding grounds that would occur if this DPS were to go extinct and the marked degree of genetic divergence to other populations (Bettridge et al. 2015).

Population Status and Trends: The Mexico DPS of humpback whales, which occurs throughout U.S. West Coast and within the action area, was estimated to be 6,000 to 7,000 animals from the SPLASH project (Calambokidis et al. 2008) and in the most recent status review (Bettridge et al. 2015). More recently, Wade (2021) estimated the abundance of the Mexico population (DPS) to be 2,913 (CV=0.242) based on revised analysis of the available data from 2004-2006. Because the abundance estimates for the Mexico DPS were derived from the ~15 year old SPLASH project, NMFS (2021a) generated a more current estimate of the abundance using most recent data from Calambokidis and Barlow (2020), which was included in the 2021 SAR (Carretta et al. 2022). Based on an assumed (and conservative) 6 percent annual growth rate from the Wade (2021) abundance estimate from 2006, NMFS (2021a) estimated the minimum abundance estimate for the total Mexico DPS to be around 6,981 animals, but there could be a higher abundance of approximately 9,000 animals (or more) based on recent growth rate estimates used in the SARs.

As described above, Martien et al. (2021) delineated the Mainland Mexico-CA/OR/WA DIP based on two strong lines of evidence indicating demographic independence: genetics and movement data. The 2022 SAR (Carretta et al. 2023) designated the DIP as a “stock” because available data make it feasible to manage it as a stock and because there are conservation and management benefits to doing so. Given the Curtis et al. (2022) abundance estimate for whales wintering in southern Mexico and Central America (1,496) and the most recent estimate of humpback whales foraging off the U.S. West Coast (4,973; Calambokidis and Barlow 2020), the estimated abundance for the Mainland Mexico-CA/OR/WA stock is 3,477 animals (CV=0.101), with a minimum estimate of 3,185 whales, taken as the lower 20th percentile of the difference. The stock trend for this particular stock could not be estimated since two stocks of humpbacks utilize the area (Carretta et al. 2023). However, given the most recent annual growth rate estimated by Calambokidis and Barlow (2020) of 8.2 %/year, we can assume that if the Central America/Southern Mexico - CA/OR/WA stock is only growing at around 1.6%/year (Curtis et al. 2022), that the Mainland Mexico – CA/OR/WA stock is likely increasing at a level near or greater than 5-6%, which is similar to trend estimates in earlier SARs. The current net productivity rate for this stock is unknown. However, as stated in the final 2022 SAR (Carretta et al. 2023), the theoretical maximum net productivity rate can be taken to be at least as high as the maximum observed for the combined stocks, or 8.2% annually (Calambokidis and Barlow 2020), though it could be higher if one of the stocks is growing faster than another.

Given the information described above, the calculated PBR for this stock is 65 animals/year (Carretta et al. 2023). Ryan et al. (2019) notes that humpbacks are present in central California waters at least 8 months annually, with the beginning half of December and the ending half of April representing "transition months," where whales are moving in/out of the region (summarizing sighting and acoustic data). Assuming 8 months of residency time in U.S. West Coast waters, or 2/3 of the year, this yields a PBR in U.S. waters of 43 whales per year for this stock (Carretta et al. 2023).

At this time, the current total abundance of the entire Mexico DPS is currently unknown, beyond the estimates of 6,000-7,000 made using data from over fifteen years ago. Likely, given the growth rates that have been observed for the portion of this DPS that occurs off the U.S. West Coast since that time, the population of the DPS has likely increased significantly as well. The threats for the Mexico DPS have been generally summarized above, and more information from activities that affect this population in the action area will be described further in section 2.4 *Environmental Baseline*.

2.2.2.2 Central America DPS Humpback Whale

The Central America DPS is composed of humpback whales that breed along the Pacific coast of Costa Rica, Panama, Guatemala, El Salvador, Honduras and Nicaragua (Bettridge et al. 2015), although new evidence has shown that humpback whales found off southern Mexico belong to the "Central American population unit," which migrates north to the feeding areas of the U.S. West Coast using a migratory corridor along mainland Mexico to the mouth of the Gulf of California along the Baja California Peninsula (Martínez Aguilar et al. 2011). Martien et al. (2020) also introduced that DIPs of humpbacks are delineated as "migratory herds" that share both wintering (breeding) and feeding grounds. The Central America DIP's wintering ground is understood to extend into southern Mexico, and therefore is termed the Central America/Southern Mexico-CA/OR/WA DIP for its wintering area and its feeding area off CA/OR/WA (Taylor et al. 2021), which will likely describe the "stock," as defined under the MMPA. Therefore, while the Central America DPS is defined by Bettridge et al. (2015) and the final rule identifying the 14 DPSs of humpbacks (81 FR 62260; September 16, 2016) under the ESA, we consider the inclusion of southern Mexico humpbacks and the abundance estimate recently published by Curtis et al. (2022), using photo-identification data collected in their wintering area from 2019 to 2021. However, NMFS will continue to evaluate the relationship between the humpback whale DPSs and recognized DIPs moving forward.

<u>Population Status and Trend</u>: The Central America DPS of humpback whales occurs throughout the U.S. west coast and the action area, although individuals are more likely to be found off the coast of California and Oregon. Earlier estimates of abundance for the Central America DPS ranged from approximately 400 to 600 individuals (Bettridge et al. 2015; Wade et al. 2016), although Wade (2021) reanalyzed the SPLASH data to estimate the abundance estimate for the Central America DPS at 755 (CV=0.242). We note that, similarly as with the Mexico DPS, the abundance estimate was derived from the 15+ year old SPLASH project data.

Recently, Curtis et al. (2022) published new information regarding the abundance estimate of the Central America/Southern Mexico DPS, which has resulted in significant changes to the final 2022 SAR (Carretta et al. 2023). First, the "Central America/Southern Mexico – California/Oregon/Washington DIP" has been identified as a "stock," as defined under the MMPA. This was based on the two strong lines of evidence indicating demographic independence: genetics and movement data (Taylor et al. 2021). Second, the Curtis et al. (2022) abundance estimate for this stock was incorporated into the 2022 SAR. Using spatial capture-recapture methods based on photographic data collected between 2019 and 2021, researchers estimated the abundance of this stock to be 1,496 (CV=0.171) whales, which represents the best estimate of the Central America/Southern Mexico-CA/OR/WA stock of humpback whales. The minimum population estimate was taken as the lower 20th percentile of the capture-recapture estimates from Curtis et al. (2022), or 1,284 whales. Given the inclusion of whales from southern Mexico in the current estimate, Curtis et al. (2022) derived a population growth rate based on the differences between the 2004-2006 estimate (755 animals, CV=0.242; Wade 2021) and the current estimate by excluding whales in southern Mexico waters in the spatial recapture model. This yielded an annual growth rate for this stock of 1.6% (SD=2.0%) for the Central America/Southern Mexico-CA/OR/WA stock; however, this estimate has high uncertainty. As described in the final 2022 SAR (Carretta et al. 2023), the maximum net productivity level can be taken to be at least as high as the maximum observed the two stocks summering off California and Oregon (for which most of the mark-recapture estimates were based on), or 8.2%, although it could be higher if one of the stocks is growing faster than the other.

In the 2022 SAR, the PBR for this stock was calculated to be 5.2 animals. Assuming 8 months of residency time as described above, the total PBR for this stock (5.2) is prorated by two-thirds (8/12 months), to yield a PBR in U.S. waters of 3.5 whales per year (Carretta et al. 2023).

The threats for the Central America DPS have been generally summarized above, and more information from activities that affect this population in the action area will be described further in section 2.4 *Environmental Baseline*.

2.2.3 Blue Whale

Blue whales were listed as endangered worldwide under the precursor to the ESA, the Endangered Species Conservation Act of 1969, and remained on the list of threatened and endangered species after the passage of the ESA in 1973 (35 FR 8491). Currently there is no designated critical habitat for blue whales. Blue whales make seasonal migrations between feeding and breeding locations, with their distribution often linked to patterns of aggregated prey. Like other baleen whales, the seasonal and inter-annual distribution of blue whales is strongly associated with both static and dynamic oceanographic features such as upwelling zones that aggregate krill (*Euphausia pacifica*; Croll et al. 2005).

Blue whales are currently separated into three subspecies in the North Pacific, North Atlantic, and Southern Hemisphere. Their population structure has been studied through photo identification, acoustic, and genetic analyses showing both geographic isolation and overlap of some subpopulations. The MMPA identifies geographic stocks of marine mammals, which are groups of marine mammals of the same species or smaller taxa in a common spatial arrangement that interbreed when mature. The MMPA requires the monitoring and management of marine mammals on a stock-by-stock basis rather than entire species, populations, or distinct population segments. For this Opinion, we will analyze effects at the ESA-listed global population level, but will rely heavily upon information from the near annual stock assessment reports (SARs) for the Eastern North Pacific (ENP) stock of blue whales that is identified as one of the nine blue whale management units in the NMFS 2020b blue whale recovery plan, as well as the most recent 5-year status review completed in 2020 (NMFS 2020c) and other scientific information available regarding the abundance of blue whales along the U.S. west coast.

The blue whales most likely to be observed within the action area are identified as part of the ENP stock. Tagging and photo identification studies have shown that the feeding population off southern California also migrates as far south as the equator to feed in the eastern tropical Pacific (Mate 1999). These findings have been confirmed through vocal analyses, where the same call type representing the ENP stock have been recorded in the Gulf of Alaska south to the Costa Rica Dome (Stafford et al. 2001; Calambokidis et al. 2009). Recently, Irvine et al. (2014) documented the multi-year satellite track of a blue whale first tagged off California. This animal had very strong site fidelity to particular feeding areas in southern and northern California. In fact, this animal made excursions from one prey field to another, suggesting it was foraging on local increases in prey density and further demonstrating the importance of feeding areas off California to the ENP blue whale stock.

Population Status and Trends: Though still depleted compared to historical abundance, blue whale abundance appears to be increasing in most if not all regions during the past several decades, although the data for most areas are sparse and uncertain (Calambokidis and Barlow 2020; Branch 2007). The current global mature population size is uncertain, but estimated to be in the range of 5,000-15,000 mature individuals (NMFS 2020c). Although there is insufficient data available to assess the present status in most parts of the North Pacific, the feeding stock of blue whales off the U.S. west coast has been estimated by line-transect and mark-recapture methods. Generally, the highest abundance estimates from line-transect surveys occurred in the mid-1990s, when ocean conditions were colder than present-day (Carretta et al. 2021). Since that time, line-transect abundance estimates within the California Current have declined, while estimates from mark- recapture studies have increased or remained stable (Carretta et al. 2021). Evidence for a northward shift in blue whale distribution includes increasing numbers of blue whales found in Oregon and Washington waters during 1996-2014 line-transect surveys (Barlow 2016) and satellite tracks of blue whales in Gulf of Alaska and Canadian waters between 1994 and 2007 (Bailey et al. 2009). Calambokidis and Barlow (2020) estimated blue whale abundance for the U.S. west coast at 1,898 whales, based on updated photographic ID data through 2018 using mark-recapture methods. Becker et al. (2020a) estimated blue whale abundance at 670 whales, using habitat-based species distribution models from line-transect data collected from 1991 to 2018.

The mark-recapture estimate (1,898) is considered the best estimate of abundance for 2018 due to its higher precision and because estimates based on line-transect data reflect only animal densities within the study area at the time surveys are conducted (Carretta et al. 2021). To put this in context, NMFS (2020b) established recovery criteria for the ENP blue whale management unit as at least 2,000 animals for downlisting and 2,500 for de-listing. Population trends must also be stable or increasing for downlisting.

Threats: Blue whales experienced intensive whaling throughout the 20th century, and the threat of directed hunting remains. Other threats that may be affecting blue whales with at least a potential for population-level consequences or are significant enough to contribute to the species' extinction risk include ship strikes, entanglement in marine debris and fishing gear, anthropogenic noise, and loss of prey base due to climate and ecosystem change (NMFS 2020c). Recovery of the globally listed blue whale population is contingent upon all nine management units meeting the relevant criteria described in the blue whale recovery plan (NMFS 2020b).

It is difficult to estimate the numbers of blue whales possibly killed and injured by fishing gear, because large whales that become entangled in fishing gear may often die later and drift far enough to not strand on land after such incidents. Vessel strikes are also a threat to all large whales, including blue whales, although reported vessel strikes are considered a minimum accounting of the total. The threat to blue whales due to underwater noise, pollutants, marine debris, and habitat degradation, are difficult to quantify. However, there is a growing concern that the increasing levels of anthropogenic noise in the ocean may be a habitat concern for whales, particularly for whales that use low frequency sound to communicate, such as baleen whales.

Off the U.S. west coast, blue whale distribution overlaps significantly with the transit routes of large commercial vessels, including cruise ships, large tug and barge transport vessels, and oil tankers in the proposed action area. Vessel strike mortality was estimated to be 18 blue whales per year in the U.S. West Coast Exclusive Economic Zone (EEZ), although this estimate includes only the period of July – November when whales are most likely to be present in the U.S. West Coast EEZ (Rockwood et al. 2017). Considering the effects of estimated vessel strikes, plus the effects of entanglements, human impacts may be exceeding the calculated PBR of 4.1 for this stock. While it is unknown if these same threats are occurring at similar levels throughout the global population of blue whales, the current levels of human impacts in the ENP are occurring at levels that may delay recovery of this stock of blue whales. Such a circumstance, especially if happening in concert with similar or larger impacts throughout their range, means that recovery of the entire species could be delayed altogether. The blue whale recovery plan (NMFS 2020b) describes recommended actions to determine the level of threat fishery entanglements, vessel strikes, and other potential threats pose to the likelihood of survival and recovery of the species.

Conservation: There are several international agreements in place to protect blue whales. For example, part of the IWC function is to set catch limits for commercial whaling, which have been set at zero since 1985. Even before then, blue whales have been nominally protected from commercial whaling since 1966 by the IWC. The ban on commercial whaling has likely been a key conservation measure that has allowed whales to recover and continue to increase in the North Pacific, although limited harvest of blue whales outside the IWC framework has occurred. Blue whales are currently listed as Appendix I under CITES, which is aimed at protecting species at risk from unregulated international trade. Appendix I includes species threatened with extinction which are or may be affected by trade; therefore, trade of Appendix I species is only allowed in exceptional circumstances. The IUCN Red List identifies and documents those species most in need of conservation if global extinction rates are to be reduced. The last assessment for blue whales was conducted in 2018; blue whales continued to be classified as "vulnerable" (Cooke 2018c).

The International Maritime Organization (IMO) is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships. One way that the IMO facilitates efficient and safe passage for ships is by establishing Traffic Separation Schemes (TSSs), which are voluntary routing measures aimed at separating opposing traffic streams and encouraging the flow of vessels in and out of port within designated traffic lanes. The IMO also designates regions as "Particularly Sensitive Sea Areas" and "Areas to be Avoided" for various ecological, economic or scientific reasons. The IMO was approached for the first time regarding conservation of an endangered whale species in 1998 for the North Atlantic right whale (*Eubalaena glacialis*), and since then they have been approached with nations' proposals to establish or amend routing measures in various locations to reduce the threat of vessel collision with endangered whales, including blue whales. The USCG is responsible for making recommendations to the IMO, and for establishing and modifying shipping lanes within U.S. waters. When considering changes, the USCG will initiate a Port Access Route Study (PARS), and recommendations for shifting or modifying shipping lanes are presented to the IMO for approval. IMO-endorsed modifications to TSSs have been established in areas off San Francisco/Oakland, off Santa Barbara and Los Angeles/Long Beach. As described above, the IMO recently adopted a U.S. proposal to increase protections for blue, fin and humpback whales off southern California, which took effect in the summer of 2023. The modifications include a 13 nautical mile extension of the existing TSS in the Santa Barbara Channel, resulting in vessels lining up in deeper waters where there are lower concentrations of whales, which should help reduce the risk from ship strikes. In addition, an area to be avoided by vessels (traffic exclusion zone) was expanded by more than 2,000 nm^2 and covers approximately 4,476 nm^2 of important foraging habitat off Point Conception and Point Arguello in Santa Barbara County, CA. Within the traffic separation scheme, which is near the Channel Islands National Marine Sanctuary, NOAA asks merchant ships to voluntarily slow down to 10 knots or less on all primary approaches to the port of Los Angeles/Long Beach from May to December.

2.2.4 East Pacific DPS Green Sea Turtle

In 2016, NMFS finalized new listings for 11 green sea turtle DPSs, including listing the East Pacific DPS as threatened (81 FR 20057). The East Pacific DPS (Figure 5) includes turtles that nest on the Pacific coast of Mexico, which were historically listed under the ESA as endangered. All of the green turtle DPSs were listed as threatened, with the exception of the Central South Pacific DPS, Central West Pacific DPS, and the Mediterranean DPS, which were listed as endangered (Seminoff et al. 2015). A recovery plan for East Pacific green turtles was completed in 1998 (NMFS and USFWS 1998).

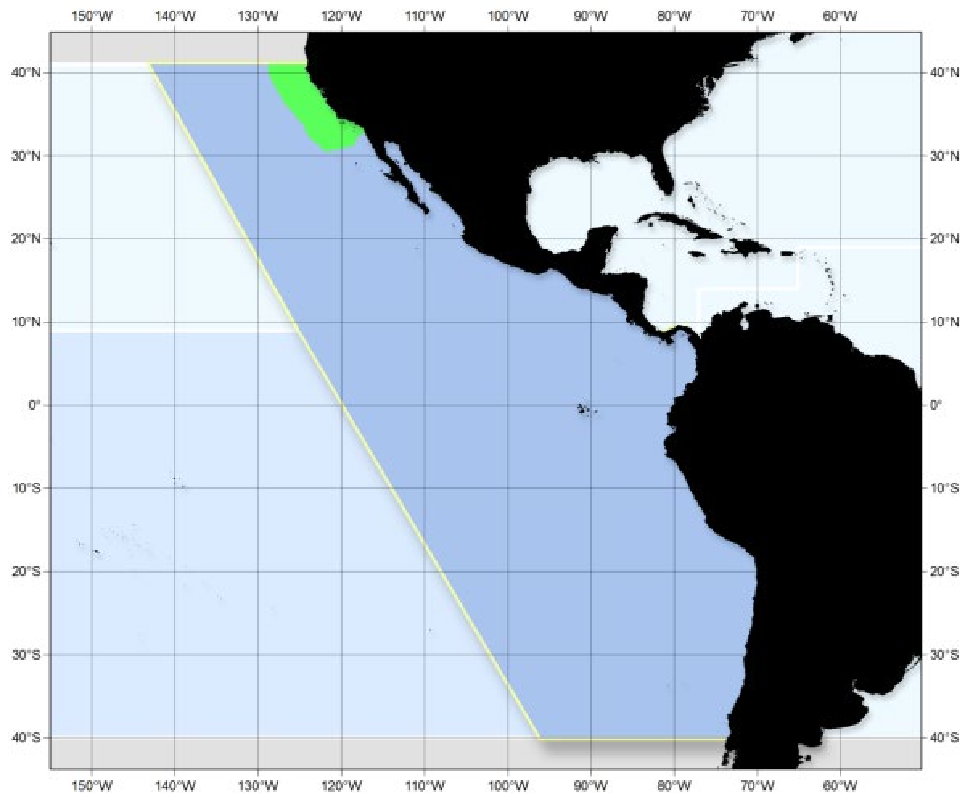

Figure 5. Range of the East Pacific DPS within U.S. jurisdiction. Blue indicates the defining boundaries of DPS; green indicates the range of the DPS within the U.S. EEZ.

On July 19, 2023, NMFS proposed designation of critical habitat in nearshore waters (from the mean high water line to 20 meters depth) off the coast of California and other states and territories (88 FR 46572). The designation also includes nearshore waters (from the mean high water line to 10 kilometers offshore) between San Diego Bay and Mexico (Figure 6). The proposed action occurs within the proposed green turtle critical habitat, and we analyze potential effects to designated East Pacific DPS critical habitat in section 2.7.4.1 of this Opinion. NMFS identified two features essential to the conservation of the East Pacific DPS for green turtles:

- Migratory: From the mean high water line to a particular depth or distance from shore (as dictated by the best available data for that DPS), sufficiently unobstructed corridors that allow for unrestricted transit of reproductive individuals between benthic foraging/resting and reproductive areas.
- Benthic foraging/resting: From the mean high water line to 20 m depth, underwater refugia and food resources (i.e., seagrasses, macroalgae, and/or invertebrates) of sufficient condition, distribution, diversity, abundance, and density necessary to support survival, development, growth, and/or reproduction.

Figure 6. Proposed critical habitat for the East Pacific DPS of green sea turtles. The lighter green shows the proposed designated critical areas containing the benthic foraging and resting features (including South and Central San Diego Bay, from Point Loma to Oceanside, from San Onofre to Santa Monica Bay, and Catalina Island). The darker green shows the migratory corridor from North San Diego Bay to the Mexico border in waters from the mean high water line offshore to 10 km.

Green turtles are found throughout the world, occurring primarily in tropical, and to a lesser extent, subtropical waters. In the eastern Pacific, greens forage coastally from southern California in the north to Mejillones, Chile in the South. Based on mtDNA analyses, green turtles found on foraging grounds along Chile's coast originate from the Galapagos nesting beaches, while those greens foraging in the Gulf of California originate primarily from the Michoacán nesting stock. Green turtles foraging in southern California and along the Pacific coast of Baja California originate primarily from rookeries of the Islas Revillagigedos (Dutton 2003).

Population Status and Trends: Green turtles that may be found within the action area likely originate from the eastern Pacific. Green turtles in the eastern Pacific were historically considered one of the most depleted populations of green turtles in the world. The primary green turtle nesting grounds in the eastern Pacific are located in Michoacán, Mexico, and the Galapagos Islands, Ecuador (NMFS and USFWS 1998). Here, green turtles were widespread and abundant prior to commercial exploitation and uncontrolled subsistence harvest of nesters and eggs. Sporadic nesting occurs on the Pacific coast of Costa Rica. Analysis using mtDNA sequences from three key nesting green turtle populations in the eastern Pacific indicates that they may be considered distinct management units: Michoacán, Mexico; Galapagos Islands, Ecuador, and Islas Revillagigedos, Mexico (Dutton 2003).

Information suggests steady increases in nesting at the primary nesting sites in Michoacan, Mexico, and in the Galapagos Islands since the 1990s (Delgado and Nichols 2005; Senko et al. 2011). Colola beach is the most important green turtle nesting area in the eastern Pacific; it accounts for 75% of total nesting in Michoacán and has the longest time series of monitoring data since 1981. Nesting trends at Colola have continued to increase since 2000 with the overall eastern Pacific green turtle population also increasing at other nesting beaches in the Galapagos and Costa Rica (NMFS and USFWS 2007; Wallace et al. 2010). Based on recent nesting beach monitoring efforts, through 2022/2023, the current adult female nester population for Colola, Michoacán is estimated to be 100,000 to 105,000 nesting females. At Maruata, a secondary nesting beach in Michoacán, researchers estimate there are between 4,000 and 6,000 nesting females (C. Delgado Trejo, Instituto de Investigaciones sobre los Recursos Nationale, personal communication, November, 2023).

Two foraging populations of green turtles are found in U.S. waters adjacent to the proposed action area. South San Diego Bay serves as an important habitat for a resident population of up to about 60 juvenile and adult green turtles in this area (Eguchi et al. 2010). However, this abundance estimate was based primarily on capture-mark-recapture data conducted between 1990 and 2009 (Eguchi et al. 2010). Since that time, NMFS' Southwest Fisheries Science Center (SWFSC) has conducted capture-mark-recapture sessions in San Diego Bay in 2017, 2019, and most recently in 2023 (following the COVID-19 pandemic) and the abundance estimate is likely to be much higher than the 2010 estimate. During the most recent (2023) surveys, the SWFSC captured 42 individual turtles, 22 of which had never been previously recorded in the Bay. Although the final mark-recapture analyses have yet to be completed, scientists note that it is very apparent that the green turtle population in San Diego Bay has increased substantially since capture efforts in 2019. The vast range of sizes of turtles captured (~45 centimeters (cm) to 101 cm straight carapace length) reflects a population that includes a demographic spectrum from small, recently recruited juvenile turtles to very large multi-year adult male and female turtles in the Bay (SWFSC, unpublished data).

There is also an aggregation of green sea turtles that is persistent further north in the San Gabriel River and surrounding coastal areas (e.g., Alamitos Bay) in the vicinity of Long Beach, California (Lawson et al. 2011; Crear et al. 2016) and in the Seal Beach National Wildlife Refuge (SBNWR or Refuge). Researchers began capturing and tagging these turtles in 2010 (San Gabriel River (2010-2014) and SBNWR (2012-present) in order to determine their abundance, behavior patterns, movement between or within foraging areas, etc. Over the last decade or more of study, NMFS researchers have identified at least 75 different sea turtles occurring in these two northernmost foraging areas (NMFS unpublished data) through research or strandings, although the duration of residence and/or transitory patterns of individuals in this area are the subject of ongoing research. Results from genetic sampling during monitoring programs or from strandings suggest that the lesser known Revillagigedo nesting population of green sea turtles is a significant source for southern California foraging animals (Crear et al. 2017).

Threats: A thorough discussion of threats to green turtles worldwide can be found in the most recent status review (Seminoff et al. 2015). Major threats include: coastal development and loss of nesting and foraging habitat; incidental capture by fisheries; and the harvest of eggs, sub-adults, and adults. Climate change is also emerging as a critical issue. Destruction, alteration, and/or degradation of nesting and near shore foraging habitat is occurring throughout the range of green turtles. These problems are particularly acute in areas with substantial or growing coastal development, beach armoring, beachfront lighting, and recreational use of beaches. In addition to damage to the nesting beaches, pollution and effects on foraging habitat is a concern. Pollution run-off can degrade seagrass beds that are the primary forage of green turtles. The majority of green turtles in coastal areas spend their time at depths less than 5 m below the surface (Schofield et al. 2007; Hazel et al. 2009), and hence are vulnerable to being struck by vessels. Collisions with vessels are known to cause significant numbers of deaths every year (NMFS and USFWS 2007; Seminoff et al. 2015). Marine debris is also a source of concern for green sea turtles especially given their presence in nearshore coastal and estuarine habitats.

The bycatch of green sea turtles, especially in coastal fisheries, is a serious problem because in the Pacific, many of the small-scale artisanal gillnet, setnet, and longline coastal fisheries are not well regulated. These are the fisheries that are active in areas with the highest densities of green turtles (NMFS and USFWS 2007). The meat and eggs of green turtles has long been favored throughout much of the world that has interacted with this species. As late as the mid-1970s, upwards of 80,000 eggs were harvested every night during the nesting season in Michoacán (Clifton et al. 1982). Although Mexico has implemented bans on the harvest of all turtle species in its waters and on the beaches, poaching of eggs, females on the beach, and animals in coastal waters continues. In some parts of Mexico and the eastern Pacific, consumption of green sea turtles remains a part of the cultural fabric and tradition (NMFS and USFWS 2007). Like other sea turtle species, increasing temperatures have the potential to skew sex ratios of hatchlings. Many rookeries are already showing a strong female bias as warmer temperatures in the nest chamber leads to more female hatchlings (Chan and Liew 1995; Kaska et al. 2006). Increased temperatures also lead to higher levels of embryonic mortality (Matsuzawa et al. 2002). An increase in typhoon frequency and severity, a predicted consequence of climate change (Webster et al. 2005), can cause erosion which leads to high nest failure (Van Houtan and Bass 2007). Climate change may also affect green sea turtle feeding. Seagrasses are a major food source for green sea turtles and may be affected by changing water temperature and salinity (Short and Neckles 1999; Duarte 2002).

Conservation: There have been important conservation initiatives and advances that have benefited East Pacific green turtles. There are indications that wildlife enforcement branches of local and national governments are stepping up their efforts to enforce existing laws, although successes in stemming sea turtle exploitation through legal channels are infrequent. In addition, there are a multitude of non-profit organizations and conservation networks whose efforts are raising awareness about sea turtle conservation. When assessing conservation efforts, we assumed that all conservation efforts would remain in place at their current levels or improve. Among the notable regional and/or multinational conservation groups and initiatives are the Central American Regional Network for the Conservation of Sea Turtles, Grupo Tortuguero de las Californias (GTC), Permanent Commission of the South Pacific (CPPS), and the Inter-American Convention for the Protection and Conservation of Sea Turtles (IAC). The Central

American Regional Network resulted in the creation of a national sea turtle network in each country of the Central American region, as well as the development of firsthand tools, such as a regional diagnosis, a 10-year strategic plan, a manual of best practices, and regional training and information workshops for people in the region. The GTC is a regional network in Mexico that brings together scientists, conservation practitioners, fishers, and local peoples to address sea turtle conservation issues. Perhaps the greatest achievement of this group was the large decrease in green turtle hunting and local consumption throughout Northwestern Mexico. CPPS is a regional body that includes Panama, Colombia, Ecuador, Peru and Chile, that has conducted many regional workshops on sea turtle conservation, but most importantly has developed a regional management plan for sea turtles. The IAC is the world's only binding international treaty for sea turtle conservation. Signatory nations in the Eastern Pacific include Chile, Peru, Ecuador, Panama, Costa Rica, Honduras, Guatemala, Mexico, and the United States. This treaty endeavors to reduce fisheries bycatch and habitat destruction through a series of binding conservation agreements across these nations. All three of these initiatives work under the principle that benefits and achievements from working in alliance are much higher than those from working alone.

Specific details regarding individual country's (i.e., Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Peru, and the U.S.) protective legislation with respect to the East Pacific DPS can be found in Seminoff et al. (2015) and IUCN (2021).

In southern California, NMFS has increased its outreach and education efforts to improve public awareness of the presence of green turtles and to reduce threats to foraging populations, particularly in San Diego Bay, the San Gabriel River and adjacent watershed, as well as estuaries such as Agua Hedionda and Mission Bay. Local threats to green turtles primarily include recreational fishing and vessel strikes, and NMFS has worked with partners to develop educational materials and signs to specifically address those threats.

2.2.5 Black Abalone

Black abalone were listed as endangered under the ESA in 2009 (74 FR 1937, 14 January 2009). NMFS identified five extinction risk factors for the species, including low abundance, low growth and productivity, compromised spatial structure and population connectivity, low genetic diversity, and continued manifestation and spread of withering syndrome. NMFS designated black abalone critical habitat on October 27, 2011 (76 FR 66806). The designation encompasses rocky intertidal and subtidal habitat (to a depth of 6 meters) within five segments of the California coastal areas: (1) Del Mar Landing Ecological Reserve (Sonoma County) to Point Bonita (Marin County); (2) south of San Francisco Bay to Natural Bridges State Beach (Santa Cruz County); (3) Pacific Grove (Monterey County) to Cayucos (San Luis Obispo County); (4) Montana de Oro State Park (San Luis Obispo County) to just south of Government Point (Santa Barbara County); and (5) Palos Verdes Peninsula extending from the Palos Verdes/Torrance border to Los Angeles Harbor. Coastal offshore areas include the Farallon Islands, Año Nuevo Island, San Miguel Island, Santa Rosa Island, Santa Cruz Island, Anacapa Island, Santa Barbara Island, and Santa Catalina Island. Essential habitat features include: rocky substrate (e.g., rocky benches formed from consolidated rock or large boulders that provide complex crevice habitat); food resources (e.g., bacterial and diatom films, crustose coralline algae, and detrital macroalgae); juvenile settlement habitat (rocky substrates with crustose coralline algae and crevices or cryptic biogenic structures); suitable water quality (e.g., temperature, salinity, pH) for normal survival, settlement, growth, and behavior; and suitable nearshore circulation patterns to support successful fertilization and larval settlement within appropriate habitat.

Black abalone are marine snails with one shell and a large muscular foot used for movement as well as to hold tightly onto hard substrates to avoid being dislodged by wave action (Cox 1960). Black abalone occupy rocky habitats from the upper intertidal to six meters depth. Historically, black abalone occurred from Crescent City (Del Norte County, California) to southern Baja California (Geiger 2004), but the current range is from Point Arena, California, to Bahía Tortugas, Mexico (74 FR 1937, 14 January 2009). Black abalone are most commonly observed in the middle and lower intertidal, in habitats with complex surfaces and deep crevices that provide shelter for juvenile recruitment and adult survival (VanBlaricom et al. 1993). They are able to withstand extreme variations in temperature, salinity, moisture, and wave action, and are usually strongly aggregated, with some individuals stacking two or three on top of each other (Cox 1960; Leighton 2005).

Abalone are broadcast spawners, meaning individuals release their gametes into the water column and rely on external fertilization. Thus, abalone must be in close enough proximity to one another to successfully reproduce. Abalone have a short planktonic larval stage (about 3-10 days) before settlement and metamorphosis (McShane 1992). Larval black abalone are believed to settle on rocky substrate with crustose coralline algae, which serves as a food source for post-metamorphic juveniles, along with microbial and diatom films. Black abalone reach reproductive maturity at a size of about 50 millimeter (mm) shell length in females and about 40 mm in males (Leighton 1959; Ault 1985). Spawning has not been observed in the wild, but likely occurs from spring to early autumn (Leighton 1959, 2005; Leighton and Boolotian 1963; Webber and Giese 1969) and may extend into winter months (VanBlaricom et al. 2009).

<u>Population Status and Trend</u>: Based on fisheries and long-term monitoring data since the 1970s, black abalone are believed to be naturally rare at the northern (north of San Francisco; Morris et al. 1980) and southern (south of Punta Eugenia; P. Raimondi, pers. comm., cited in VanBlaricom et al. 2009) extremes of the species' range. Areas of highest abundance occurred south of Monterey, particularly at the Channel Islands off southern California (Cox 1960; Karpov et al. 2000). Rogers-Bennett et al. (2002) estimated a baseline abundance of 3.54 million black abalone in California, based on landings data from the peak of the commercial and recreational fisheries (1972-1981). This estimate provides a historical perspective on patterns in abundance and a baseline against which to compare modern day trends. We note, however, that black abalone abundances in the 1970s to early 1980s had reached extraordinarily high levels, particularly at the Channel Islands, possibly in response to the elimination of subsistence harvests by indigenous peoples and large reductions in sea otter populations. Thus, our understanding of black abalone abundance and distribution for this time period may not accurately represent conditions prior to commercial and recreational harvest of black abalone in California.

Beginning in the mid-1980s through the 1990s, black abalone populations declined dramatically due to the spread of withering syndrome (Tissot 1995), a disease caused by a pathogen that affects the animal's digestion and causes starvation leading to foot muscle atrophy, lethargy, and death (Friedman and Finley 2003; Braid et al. 2005). Withering syndrome results in rapid (within a few weeks) and massive (reductions of over 80%) mortalities in affected populations (Neuman et al. 2010a). Overall, populations throughout southern California and as far north as Cayucos declined in abundance by more than 80%; populations south of Point Conception declined by more than 90% (Neuman et al. 2010a). Commercial and recreational harvest of black abalone contributed to some degree, but the primary cause of these declines was withering syndrome. The disease has also affected populations in Baja California, but little is known about the species' status in Mexico.

Populations north of Cayucos have not yet exhibited signs of the disease, but all are likely infected by the pathogen. Abalone may be exposed to and infected by the pathogen without showing symptoms; however, once symptoms develop, the animals rapidly succumb to death (Friedman et al. 1997a, 2000, 2002). The pathogen has been detected in all coastal marine waters off southern California to Sonoma County and at Southeast Farallon Island (Moore et al. 2002; Friedman and Finley 2003) (pers. comm. with Jim Moore, CDFW, November 2015; pers. comm. with Jim Moore, CDFW, cited in VanBlaricom et al. 2009).

Most populations affected by disease-related mass mortalities remain at low densities and are below the estimated levels needed to support successful reproduction and recruitment (e.g., 0.34 abalone per m^2) (Neuman et al. 2010b). Sites north of Cayucos have not yet experienced disease-related mass mortalities and have densities greater than this threshold value (1.1 to 10.5 abalone per m^2); whereas sites south of Cayucos that have experienced disease-related mass mortalities have densities below this threshold (0 to 0.5 abalone per m^2) (Neuman et al. 2010b).

Despite these low densities, researchers have observed evidence of recent recruitment and increases in abundance at several locations throughout southern California, including the Palos Verdes Peninsula, Laguna Beach, Santa Cruz Island, San Miguel Island, and San Nicolas Island (Richards and Whitaker 2012; Eckdahl 2015; Kenner 2021). These observations for black abalone, and similar observations for other California abalone species, indicate that additional factors need to be considered when assessing population viability. Recent studies also indicate the potential for disease resistance in wild black abalone populations. A bacteriophage has been discovered that infects the pathogen, reduces its lethal effects, and improves the survival of infected abalone (Crosson et al. 2012; Friedman and Crosson 2012; Friedman et al. 2014). Genetically-based disease resistance may also exist and is the subject of ongoing studies at the University of Washington (VanBlaricom et al. 2009).

<u>Threats</u>: Illegal harvest of black abalone is an ongoing threat, particularly because of the relative accessibility of black abalone compared to other abalone species, but the relative effect on the species' status and recovery is poorly understood and requires further evaluation. In 2020, CDFW and researchers throughout the California coast noted an increase in the number of people visiting the rocky intertidal and harvesting or temporarily removing invertebrates, most likely due to the economic and social effects of the COVID-19 pandemic (unpublished observations by John Ugoretz, CDFW, Multi-Agency Rocky Intertidal Network (MARINe) meeting, 3 October 2020). This increase in human use activities poses a direct threat to black abalone because of the potential increase in illegal harvest as well as trampling of intertidal

habitats. The increased harvest activities may also indirectly affect black abalone by altering the intertidal invertebrate community.

Elevated water temperatures resulting from local discharges, warm water events, and climate change could exacerbate disease effects on black abalone. Disease transmission and manifestation is intensified when local sea surface temperatures increase by as little as 2.5 ºC above ambient levels and remain elevated over a prolonged period of time (i.e., a few months or more) (Friedman et al. 1997b; Raimondi et al. 2002; Harley and Rogers-Bennett 2004; Vilchis et al. 2005). The disease appears to progress northward along the coast with increasing coastal warming and El Niño events (Tissot 1995; Altstatt et al. 1996; Raimondi et al. 2002), and poses a continued threat to the remaining healthy populations. In 2015-2016, researchers observed increased numbers of diseased individuals at the long-term monitoring sites, likely due to warmer water conditions (pers. comm. with Karah Ammann, UCSC, on 8 March 2016). It is not yet known how elevated water temperatures may affect the bacteriophage and genetic resistance.

Climate change and ocean acidification may also have range-wide effects on black abalone. In addition to increasing susceptibility to disease, warming ocean temperatures could reduce the growth of macroalgae (an important food source) and shift the distribution of black abalone if temperatures in the southern part of the range increase above the optimal range. Sea level rise could alter the distribution and availability of rocky intertidal habitat. Black abalone may be able to adapt to changes in their habitat conditions, depending on the timeframe over which these changes occur, but some populations and habitats may be lost.

Ocean acidification could hinder normal growth, development, and survival of black abalone by altering pH levels, carbonate availability, and the growth of crustose coralline algae (Crim et al. 2011). Studies on other abalone species indicate varying effects depending on the species, life stage, the degree to which pH levels decrease, and the presence of other stressors. Potential effects of ocean acidification on black abalone include reduced reproduction, abundance, and recruitment. Studies specific to black abalone are needed to evaluate effects on different life stages and under multiple stressors.

Sedimentation events have also emerged as an important threat to black abalone and their habitat, because they can result in direct burial and mortality. The 2017 Mud Creek landslide resulted in the burial of approximately 518 linear meters (1,700 linear feet) of shoreline and an estimated two acres of rocky intertidal habitat, as well as the loss of an unknown number of black abalone within that habitat. In August 2020, severe wildfires burned along the central California coast, followed by an atmospheric river rain event in January 2021, resulting in massive debris flows that buried large expanses of rocky intertidal habitat and black abalone. In response to both events, UCSC coordinated with NMFS, CDFW, and the Monterey Bay National Marine Sanctuary (MBNMS) to rescue and relocate black abalone within affected areas Researchers continue to evaluate the effects of these events on black abalone at the population and species level, as well as monitor how the affected populations recover. Climate change may increase the frequency, severity, and extent of wildfires and subsequent effects on nearshore habitats and communities, including black abalone and their habitat.

Oil spills and spill response activities also pose a threat to black abalone and their habitat. The severity of effects depends on the location, size, and scope of the spill. In the past ten years, two oil spills have occurred along the California coast: the 2015 Refugio Beach Oil Spill in Santa Barbara County (Refugio Beach Oil Spill Trustees 2021) and the October 2021 oil spill off Orange County (Southern California Spill Response 2021). Response efforts included deployment of booms and berms to protect sensitive habitats, surveys to assess impacts to shoreline and subtidal habitats, and clean-up activities. We discuss the effects of the Refugio Beach Oil Spill on black abalone and their habitat in Section 2.4 (*Environmental Baseline*). For the 2021 Orange County oil spill, assessments are ongoing and include evaluating effects on black abalone and their habitat within the affected areas.

Black abalone face high risk in each of four demographic risk criteria: abundance, growth and productivity, spatial structure and connectivity, and diversity (VanBlaricom et al. 2009). Although we know withering syndrome has affected populations in Baja California, little information exists regarding the species' status in that portion of the range. Long-term monitoring in California indicates that populations affected by disease-related mass mortalities remain at low abundance and density. The declines in abundance have potentially resulted in a loss of genetic diversity, though this remains to be evaluated. Some sites in southern California have shown evidence of recruitment; however, natural recovery of severely-reduced populations will likely be a slow process. Illegal harvest is a concern, particularly in areas with relatively easy public access. Withering syndrome and other diseases continue to pose a threat to the remaining healthy populations (Raimondi et al. 2002; NMFS 2020d). Elevated water temperatures and ocean acidification are range-wide threats that have the potential to exacerbate disease effects, reduce habitat quality and availability, and reduce the survival, growth, and development of black abalone. In addition, emergency events such as oil spills, landslides, and debris flows can affect large stretches of coast and result in the loss of populations.

Critical habitat areas north of Cayucos (where black abalone have not experienced disease-related mass mortalities) were generally identified as areas of high conservation value. These areas serve as a refuge from withering syndrome, support stable populations with evidence of recruitment in some areas, and contain habitat of good to excellent quality that is able to support larger numbers of black abalone. South of Cayucos (where black abalone have experienced disease-related mass mortalities), changes to critical habitat features have occurred. For example, at some sites once dominated by black abalone, the decline in numbers has resulted in a shift in the invertebrate and algal community. Increased growth of encrusting organisms like Phragmatopoma tube worms may reduce habitat suitability for adults (e.g., by filling in cracks and crevices) and for larval settlement (e.g., by reducing the surface area for crustose coralline algae to grow) (Toonen and Pawlik 1994; Miner et al. 2006; VanBlaricom et al. 2009; NMFS 2011). In general, however, these critical habitat areas continue to provide a high conservation value to the species, because they contain habitat of good to excellent quality that is able to support black abalone, with evidence of recruitment observed at a few sites (e.g., on San Nicolas Island and Santa Cruz Island) (VanBlaricom et al. 2009).

Climate change and ocean acidification may have range-wide effects on black abalone critical habitat. As discussed above, elevated water temperatures associated with climate change may reduce the quantity and quality of food resources (macroalgae) and shift water temperatures above the optimal range for black abalone, affecting the survival, health, and growth of abalone. Sea level rise could result in the loss of rocky intertidal habitat, shifting populations to subtidal conditions. Ocean acidification is predicted to reduce pH levels, affecting water quality to support normal growth and development of black abalone as well as the growth of crustose coralline algae to support juvenile settlement (Crim et al. 2011; O'Leary et al. 2017). Changes in pH levels at the local scale may vary and will be important for assessing the effects on black abalone and their critical habitat (Feely et al. 2004, 2008, 2009; Hauri et al. 2009).

Conservation: NMFS issued a final ESA recovery plan for black abalone (NMFS 2020d) to guide the implementation of priority recovery actions. Recovery actions identified in the plan include long-term monitoring, population and habitat preparation, disease research and management plans, emergency response planning, coordination with Mexico, and outreach and education. NMFS has appointed a recovery implementation team to coordinate and facilitate on-the-ground recovery efforts for black abalone. These actions are expected to enhance the propagation and survival of the affected species and will advance recovery for black abalone.

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). As described in the BA, the action area encompasses the Southern California Planning Area and the surrounding regions that could be affected by activities associated with continuation of O&G development, production, and decommissioning (Figure 7). The Bureaus' SCPA extends from the Monterey/San Luis Obispo County line southward to the U.S.-Mexico border, including waters 3-200 miles from shore. The action area's boundaries are drawn broadly to identify a general region in which activities and effects may occur. Not all areas within the boundaries of the action area will be affected. For example, the boundary includes areas potentially affected by a large oil spill; however, large spills are unlikely, and a large spill of the size estimated in the BA would not affect the entire action area. Similarly, vessel activities and potential impacts associated with the proposed action will not be distributed uniformly throughout the entire action area, as those activities are expected to occur along more specific routes between O&G platforms, infrastructure, and local ports.

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Figure 7. Action area (white outline) encompassing the Southern California Planning Area.

2.4 Environmental Baseline

The "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 consultations, 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).

As described above in Section 2.2 *Status of the Species* sections, the ESA-listed species that may be adversely affected by the proposed action that belong to the same species group (marine mammal, sea turtle, or abalone) are generally exposed to many similar threats throughout their range. Although the action area for this proposed action represents only a portion of relatively large ranges for the species that are highly mobile and migrate great distances, many of these same threats are present for animals when they do occur in the southern half of California where oil and gas activities production occurs. In this section, we review the available information regarding impacts to ESA-listed species by species group, with reference to individual species as necessary or appropriate based on the available information. Information provided in this section comes from a review of the NMFS marine mammal and sea turtle stranding databases, biological opinions, current scientific research permits, current SARs, and other material as cited below.

Globally averaged annual surface air temperatures have increased by about 1.0°C over the last 115 years (1901 to 2016). The earth's climate is now the warmest in the history of modern civilization. All of the relevant evidence points to human activities, particularly emissions of greenhouse gases since the mid-20th century, as the probable cause of this warming pattern (Wuebbles et al. 2017). Without major reductions in emissions, the increase in annual average global temperature relative to preindustrial times could reach 5°C or more by the end of this century. With significant reductions in emissions, the increase in annual average global temperature could be limited to 2°C or less. There is broad consensus that the further and faster the earth warms, the greater the risk of potentially large and irreversible negative impacts (Wuebbles et al. 2017).

Increases in atmospheric carbon and changes in air and sea surface temperatures can affect marine ecosystems in several ways including changes in ocean acidity, altered precipitation patterns, sea level rise, and changes in ocean currents. Global average sea level has risen by about seven to eight inches since 1900, with almost half of that rise occurring since 1993. It is very probable that human-caused climate change has made a substantial contribution to sea level rise, contributing to a rate of rise that is greater than during any preceding century in at least 2,800 years. Global average sea levels are expected to continue to rise by at least several inches in the next 15 years, and by one to four feet by 2100 (Wuebbles et al. 2017). Climate change can influence ocean circulation for major basin-wide currents including intensity and position of western boundary currents. These changes have potential for impact to the rest of the biological ecosystem in terms of nutrient availability as well as phytoplankton and zooplankton distribution (Gennip et al. 2017).

Effects of climate change on marine species include alterations in reproductive seasons and locations, shifts in migration patterns, reduced distribution and abundance of prey, and changes in the abundance of competitors or predators. Variations in sea surface temperature can affect an ecological community's composition and structure, alter migration and breeding patterns of fauna and flora and change the frequency and intensity of extreme weather events. For species that undergo long migrations (e.g., sea turtles, humpback whales), individual movements are usually associated with prey availability or habitat suitability. If either is disrupted, the timing of migration can change or negatively impact population sustainability (Simmonds and Eliott 2009). Over the long term, increases in sea surface temperature can also reduce the amount of nutrients supplied to surface waters from the deep sea leading to declines in fish populations, and therefore, declines in those species whose diets are dominated by fish.

Climate-related shifts in range and distribution have already been observed in some marine mammal populations. Specialized diets, restricted ranges, or reliance on specific foraging sites may make many marine mammal populations particularly vulnerable to climate change (Silber et al. 2017). MacLeod (2009) estimated that, based upon expected shifts in water temperature, 88% of cetaceans would be affected by climate change, 47% would be negatively affected, and 21% would be put at risk of extinction. Hazen et al. (2012) examined top predator distribution and diversity of top marine predators in the Pacific Ocean in light of rising sea surface temperatures using a database of electronic tags and output from a global climate model. The researchers predicted up to a 35% change in core habitat area for some key marine predators in the Pacific Ocean, with some species predicted to experience gains in available core habitat and some predicted to experience losses. Notably, leatherback sea turtles were predicted to gain core habitat, whereas loggerhead sea turtles (and blue whales) were predicted to lose core habitat area. Such range shifts could affect marine mammal and sea turtle foraging success as well as sea turtle reproductive periodicity (Kaschner et al. 2011).

Significant impacts to marine mammals and sea turtles from ocean acidification may be indirectly tied to foraging opportunities resulting from ecosystem changes. Nearshore waters off California have already shown a persistent drop in pH from the global ocean mean pH of 8.1 to as low as 7.43 (Chan et al. 2017). The distribution, abundance and migration of baleen whales reflects the distribution, abundance and movements of dense prey patches (e.g., copepods, euphausiids or krill, amphipods, and shrimp), which have in turn been linked to oceanographic features affected by climate change (Learmonth et al. 2006).

Sea turtles have temperature-dependent sex determination, and many populations already produce highly female-biased offspring sex ratios, a skew likely to increase further with global warming (Jensen et al 2018). Female-biased green sea turtle sex ratios have been reported for East Pacific green turtles at foraging locations in San Diego Bay, California (Allen et al. 2015). A fundamental shift in the demographics of species such as sea turtles may lead to increased instability of populations that are already at risk from several other threats. In addition to altering sex ratios, increased temperatures in sea turtle nests can result in reduced incubation times, reduced clutch size, and reduced nesting success due to exceeded thermal tolerances (Fuentes et al. 2011).

As mentioned in the *Status* section, climate change and ocean acidification may also have range-wide effects on black abalone, including in the action area, where black abalone have been compromised due to withering syndrome. In addition to increasing susceptibility to disease, warming ocean temperatures could reduce the growth of macroalgae and shift the distribution of black abalone if temperatures in the southern part of the range increase above the optimal range. Sea level rise could alter the distribution and availability of rocky intertidal habitat.

Environmental changes associated with climate change are occurring within the action area and are expected to continue into the future. Marine populations that are already at risk due to other threats are particularly vulnerable to the direct and indirect effects of climate change.

2.4.1 Marine Mammals

As described above in the status section, fin, humpback (both Mexico and Central America DPSs), and blue whales are all exposed to threats associated with fisheries bycatch, including with U.S. fisheries that occur in the action area. Other impacts to ESA-listed marine mammals that may occur while present along the U.S. west coast include vessel collisions, scientific research, and exposure to environmental changes or hazards. Although the whales considered in this Opinion are not listed as species that match up directly with stock definitions under the MMPA, we use information provided in the SARs for affected stocks of whales to understand what impacts are occurring the ESA-listed species of whales in the action area.

2.4.1.1 Fisheries Interactions

Most data on human-caused mortality and serious injury for this population is based on opportunistic stranding and at-sea sighting data that represents a minimum count of total impacts. However, more recent SARs have included records of entangled *unidentified whales* prorated to humpback whales based on location, depth, and time of the year, which at least provides a more conservative estimate of entanglements specific to humpback whales (and other large whale species).

From 1982 to 2017, there were 521 whale entanglements reported and 434 confirmed entanglements reported off the coast of California, Oregon, and Washington (Saez et al. 2021). Whale entanglement reports were confirmed using criteria that include reviewing photos/videos or through direct observation by NMFS staff. Between 1982 and 2013, there were an average of nine confirmed entangled large whales, while from 2014 to 2017, there were an average of 41 confirmed entangled large whales. There were multiple factors which may contribute to this increase in the number of reports, including an increase in public awareness and reporting, changes in the spatial distribution and abundance of whales, fishing effort, and ocean conditions. Humpback whales were the second-most frequently reported species, with 167 confirmed entanglements between 1982 and 2017. Overall, the majority of confirmed entanglements (all species) were reported from California (85%), with 7% from Washington, 6% from Oregon, and 1% from Mexico and Canada. The highest number of entanglements were reported in March and April, corresponding with the northern migration of gray whales as well as the early presence of foraging humpbacks. Many of the reports, and as reflected in recent SARs, included "unidentified gear" and could not be assigned to a particular fishery. For known fisheries, "netting" accounted for 34% of the reported gear and pot/traps accounted for 22% of the gear (Saez et al. 2021). More recent information specific to each ESA-listed species is described below.

<u>Fin Whales</u>: Information provided in the 2022 SAR indicated that three fin whales sighted at-sea along the U.S. west coast were determined to be seriously injured as a result of interactions with unknown fishing gear during 2015-2019 (Carretta et al. 2023). A review of entanglement records through 2022, including records that have not been evaluated in the most recent SARs, indicate that were two confirmed fin whale entanglements reported to NMFS in 2015, one reported in 2018, and one reported in 2022, in gear that could not be identified (NMFS Entanglement Response Program data, NMFS 2023b). The 2022 SAR also considered unidentified whale entanglements as potentially contributing to the fin whale fishery interactions totals. Carretta et al. (2023a) reported 16 additional unidentified whale entanglements from 2015-2019. Applying Carretta's (2018) method prorating 0.28 of these entanglements to fin whales, and prorating the unidentified gear entanglements to 0.75 serious injuries per entanglement case (0.28 x 0.75), results in approximately 0.21 additional fin whale serious injuries from these 16 unidentified

entangled whale cases. The total mean annual fishery-related serious injury and mortality including both observed and prorated cases is 0.64 fin whales (Carretta et al. 2023).

Humpback Whales: Off the U.S. West Coast, humpbacks have been documented injured and killed from numerous fisheries, vessel strikes, and entanglement in marine debris. Pot and trap fisheries are the most commonly documented source of mortality and serious injury of humpback whales in U.S. west coast waters (Carretta et al. 2023). From an overall perspective on threats to humpback whales off the U.S. West Coast, Carretta et al. (2022) provided a summary of humpback whale human-related injury and mortality sources, number of cases, and total mortality and serious injury for 2016 through 2020. The number of cases include non-serious injuries as well. We provide these as a snapshot but provide more information on the annual average estimates from the 2022 SAR (Carretta et al. 2023), specifically for known threats within the action area.

As shown in Table 4 and summarized more generally in the *Status of the Species* (section 2.2), of the documented 153 cases of human-related interactions with humpback whales over the most recent 5-year period (2016-2020), the majority of those are attributed to fisheries interactions, with most of them attributed to unidentified fisheries, followed by interactions with the California Dungeness crab pot fishery. Other pot/trap fisheries also contribute to the majority of fishery interactions with humpback whales and this reflects much of the historic entanglements dating back to the early 1980s. However, recent analyses indicate that since 2000, the proportion of whales (all species) entangled in pot/trap gear has increased, whereas net entanglements have decreased in prevalence (through 2017; Saez et al. 2021).

Table 4. Humpback whale human-related injury and mortality sources, number of cases, and total mortality and serious injury, 2016-2020, across California, Oregon, and Washington.

Source	Number of Cases	Mortality/Serious Injury Total (and Annual Average), 2016-2020
Unidentified Fishery Interaction (whales identified as humpbacks)	58	43.75 (8.75)
Dungeness Crab Pot Fishery (CA)	34	23.75 (4.75)
Vessel Strike	14	13.20 (2.64)
Unidentified Pot/Trap Fishery Entanglement	13	9.50 (1.9)
Dungeness Crab Pot Fishery (WA)	7	5.50 (1.1)
Gillnet Fishery	6	2.00 (0.4)
CA spot prawn trap fishery	5	3.25 (0.65)

Source	Number of Cases	Mortality/Serious Injury Total (and Annual Average), 2016-2020
Gillnet fishery, tribal	3	2.50 (0.5)
Dungeness crab pot fishery (commercial)	2	2.00 (0.4)
Dungeness crab pot fishery (OR)	2	1.75 (0.44)
Dungeness crab pot fishery (recreational)	2	1.00 (0.2)
WA/OR/CA sablefish pot fishery	2	1.50 (0.3)
Hook and line fishery	1	0.75 (0.15)
Marine debris	1	1.00 (0.2)
Pot fishery, tribal	1	1.00 (0.2)
Spot prawn trap/pot fishery (recreational)	1	0.00
WA/OR/CA sablefish pot fishery and CA coonstripe shrimp pot fishery	1	0.00
Total	153	112.45 (22.5/year)

Table 5 provides a summary of estimated mortality and serious injury associated with different sources of interactions attributed to different stocks of humpback whales in U.S. West Coast commercial fisheries for the period 2016-2020, unless otherwise noted (Carretta 2022; Carretta et al. 2023; Jannot et al. 2021). Records also include entanglements detected outside of U.S. waters confirmed to involve U.S. West Coast commercial fisheries. Most cases are derived from opportunistic strandings and at-sea sightings of entangled whales. Also included are records of entangled *unidentified whales* prorated to humpback whales based on location, depth, and time of year (Carretta 2018). Sources derived from systematic observer programs with statistical estimates of bycatch and uncertainty are shown with CVs. Totals in the first two numerical columns include whales from two stocks: the Central America / Southern Mexico – CA-OR-WA stock, and the Mainland Mexico – CA-OR-WA stock. As described earlier in the *Status of the Species* section 2.2.2, the totals are prorated to the Central America/Southern Mexico-CA/OR-WA stock (proration factor=0.42) and the Mainland Mexico-CA/OR/WA stock (proration factor=0.58), unless the interaction is known to have come from Washington waters where totals are prorated to the Central America/Southern Mexico-CA/OR-WA stock (proration factor=0.06) and the Mainland Mexico-CA/OR/WA stock (proration factor=0.25), and Hawai'i stock (proration factor=0.69; not represented in the table) (Wade 2021).

Table 5. Sources of serious injury and mortality of humpback whale stocks in U.S. West Coast commercial fisheries for the period 2016-2020, unless noted otherwise (Jannot et al. 2021; Carretta 2022; Carretta et al. 2023).

Fishery Source	Observed Interactions (% observer coverage if applicable)	∑ Total CA-OR-WA Mortality and Serious Injury (CV if applicable)	Mean Annual M/SI Central America / Southern Mexico – CA-OR-WA stock prorated totals (0.42)	Mean Annual M/SI Mainland Mexico-CA/OR/WA stock prorated totals (.58)
Unidentified fishery	58	43.75	**3.52**	**4.89**
Dungeness crab pot (California)	34	23.75	**2.01**	**2.74**
Unidentified pot/trap fishery	13	9.50	**0.62**	**0.94**
Dungeness crab pot (Washington)	7	5.50	**0.07**	**0.28**
Unidentified fishery interactions involving *unidentified whales* prorated to humpback whale	7	5.25	**0.44**	**0.61**
Unidentified gillnet fishery	6	2.00	**0.17**	**0.23**
California spot prawn fishery	5	3.25	**0.28**	**0.38**

Fishery Source	**Observed Interactions (% observer coverage if applicable)**	**∑ Total CA-OR-WA Mortality and Serious Injury (CV if applicable)**	**Mean Annual M/SI** **Central America / Southern Mexico – CA-OR-WA stock prorated totals (0.42)**	**Mean Annual M/SI** **Mainland Mexico-CA/OR/WA stock prorated totals** **(.58)**
Dungeness crab pot fishery (Oregon)	2	1.75	**0.15**	**0.20**
WA/OR/CA sablefish pot fishery (observer program) †*	1 (31% - 72%)	7.82	**0.66 (CV>0.8)**	**0.90 (CV>0.8)**
Dungeness crab pot fishery (commercial, state unknown)	2	2.00	**0.17**	**0.23**
CA swordfish and thresher shark drift gillnet fishery (observer program)**	0 (21%)	0.10	**0.01 (CV>4.7)**	**0.01 (CV>4.7)**
Totals CA-OR-WA waters	136	104.7	**8.1**	**11.4**

† At-sea sightings of entangled whales in the WA/OR/CA sablefish pot fisheries that were not recorded in observer programs during 2016-2020 (2) are included in mean annual mortality and serious injury totals because observer data are used to estimate total entanglements for two separate sablefish pot fisheries in this category (Jannot et al. 2021). These two records are not included in 'Observed Interactions.'

* Jannot et al. (2021) report one humpback entanglement in the limited entry sector in 2014, over an observation period spanning 2002 – 2019 where 13% - 72% of landings were observed. Jannot et al. (2021) report one humpback entanglement in the open access sector in 2016, over an observation period spanning 2002 – 2019 where 2% - 12% of landings were observed. This estimate is based on 2015-2019 data.

** There were no observed entanglements during 2016-2020[6], the model-based estimate of bycatch is based on pooling 1990-2020 data, resulting in a small positive estimate (Carretta 2022).

Non-commercial sources of anthropogenic mortality and serious injury, including tribal fisheries, recreational fisheries, and marine debris (including research buoys) are responsible for a small fraction of all reported cases annually (Carretta et al. 2023) (Table 6). As described earlier in the *Status of the Species* section 2.2.2, the totals are prorated to the Central America/Southern Mexico-CA/OR-WA stock (proration factor=0.42) and the Mainland Mexico-CA/OR/WA stock (proration factor=0.58), unless the interaction is known to have come from Washington waters where totals are prorated to the Central America/Southern Mexico-CA/OR-WA stock (proration factor=0.06) and the Mainland Mexico-CA/OR/WA stock (proration factor=0.25), and Hawai'i stock (proration factor=0.69); not represented in the table.

Table 6. Non-commercial fishery sources of anthropogenic mortality and serious injury observed and reported during 2016-2020 in U.S. West Coast waters (Carretta et al. 2023).

Source	Observed Interactions	Total Mortality and Serious Injury	Mean Annual M/SI Central America / Southern Mexico – CA-OR-WA stock prorated totals (0.42)	Mean Annual M/SI Mainland Mexico – CA/OR/WA stock prorated totals (0.58)
Gillnet fishery (tribal)	3	2.5	**0.03**	**0.13**
Dungeness crab pot fishery (recreational)	2	1	**0.09**	**0.12**
Hook and line fishery	1	0.75	**0.06**	**0.09**
Marine debris	1	1	**0.09**	**0.12**
Pot fishery (tribal)	1	1	**0.09**	**0.12**
Spot prawn trap/pot fishery (recreational)	1	0	**0**	**0**
Totals CA-OR-WA	**9**	**6.25**	**0.35**	**0.56**

[6] Carretta 2022 also includes estimates of mortality and serious injury in the DGN fishery through 2021.

Source	Observed Interactions	Total Mortality and Serious Injury	Mean Annual M/SI Central America / Southern Mexico – CA-OR-WA stock prorated totals (0.42)	Mean Annual M/SI Mainland Mexico – CA/OR/WA stock prorated totals (0.58)
waters				

Some limited humpback whale bycatch is expected and has been analyzed in other U.S. West Coast fisheries. Associated with the Pacific Coast Groundfish FMP, and specifically the sablefish pot fishery, NMFS estimated a maximum of 2.05 Mexico DPS humpback whales per year (1.44 maximum five-year running average) would be entangled by the fishery, while a maximum of 1.28 Central America DPS humpbacks per year (0.9 maximum five-year running average) would be entangled by the fishery. NMFS concluded that the Pacific Coast Groundfish fishery would not jeopardize ESA-listed DPSs of humpback whales (NMFS 2020e). As shown in Table 4 from the 2023 SAR (covering 2016-2020; Carretta et al. 2023), one humpback interaction was reported in the WA/OR/CA Limited Entry sablefish pot fishery sector (31% to 72% observer coverage). In addition, one humpback interaction was reported in the WA/OR/CA Open Access sablefish pot fishery sector (7% to 12% observer coverage). Given the mean annual mortality/serious injury attributed to these two fisheries using the most recent estimates available generated using observer data from 2015-2019 (7.8/5=1.6), and applying the proration factors yields estimates for the Central America/Southern Mexico-CA/OR/WA stock (and effectively the Central America DPS) of 0.7 humpbacks, and estimates for the Mainland Mexico-CA/OR/WA stock (effectively the Mexico DPS) of 0.9 humpbacks, seriously injured or killed each year (Table 4).

Preliminary information on humpback whale interactions which have been shared publicly, but have not undergone scientific review and serious injury determinations, include data from 2021 and 2022. In 2021, there were 17 confirmed humpback whale interactions, 11 from California, one from Oregon, two in Washington, and three from Mexico (that involved U.S. gear). Fisheries that were identified as attributing to the interactions include: five commercial Dungeness crab, two California large mesh drift gillnet, one California experimental box crab, one unidentified gillnet, one California commercial spiny lobster, one California commercial spot prawn, one recreational hook and line, and five attributed to unknown fishery interactions (NMFS 2022a). In 2022, there were 18 confirmed humpback whale interactions, with 16 reported in California and two in Mexico (that involved U.S. gear). Fisheries that were identified as attributing to the interactions include: seven commercial Dungeness crab, two unidentified gillnet, and nine in unknown gear (NMFS 2023b). In 2023, there were 15 confirmed humpback whale interactions, with 11 reported in California, two from Oregon, one from Washington, and one from Mexico that involved U.S. gear. Fisheries that were identified attributed to the interactions include six commercial Dungeness crab, one commercial spot prawn, one groundfish trawl, one with both halibut longline and sablefish pot gear, one unidentified gillnet, and five in unknown gear (NMFS 2024)

Blue Whales: Blue whales are occasionally documented entangled in pot/trap fisheries and other unidentified fishing gear along the U.S. west coast. As with fin whales and humpback whales, entanglements may originate outside of the action area and many interactions are with unidentified fisheries. Therefore, because the action overlaps with the species' range across the U.S. west coast, the information included in the *Environmental Baseline* may also apply to information contained in the Status section, but this section provides more details on commercial fisheries impacts to blue whales. As shown in Table 7, the annual entanglement rate of blue whales (observed) during 2015-2019 is the sum of observed annual entanglements (1.5/year), plus species probability assignments (Carretta 2018) from 16 unidentified whale entanglements (0.04/year), totaling 1.54 blue whales annually. Observed totals of serious injury/mortality are negatively biased for blue whales in the region because not all cases are detected and there is no correction factor available to account for undetected events (Carretta et al. 2023).

Table 7. Summary of available information on observed incidental serious incidental mortality and injury of ENP blue whales from commercial fisheries, 2015-2019 (Carretta et al. 2023).

Fishery	Observed mortality + serious injury	Estimated mortality and/or serious injury	Mean annual mortality and serious injury (CV)
CA Dungeness crab pot	0 + 2.75	n/a	≥0.55 (n/a)
Unidentified pot/trap	0 + 1	n/a	≥0.2 (n/a)
Unidentified fishery interactions involving identified blue whales	0 + 3.75	n/a	≥0.75 (n/a)
Unidentified fishery interactions involving *unidentified whales* prorated to blue whale	n/a	0.2	≥0.04
CA/OR thresher shark/swordfish drift gillnet fishery (21% observer coverage)	0	0	0 (n/a)
Total Annual Takes			≥1.54 (n/a)

2.4.1.2 Vessel Collisions

Unlike the methodology that has been developed to prorate unidentified whale species to fishery entanglements (Carretta 2018), the methods to prorate the number of unidentified whale vessel strikes to species are unavailable because observed sample sizes are small and identified cases are likely biased towards species that are large, easy to identify, and more likely to be detected, such as fin and blue whales (Carretta et al. 2023). Ship strikes were implicated in the deaths of seven fin whales along the U.S. west coast during 2015-2019, along with one additional serious injury to an unidentified large whale attributed to a ship strike (Carretta et al. 2023). Additional mortality from ship strikes probably goes unreported because the whales do not necessarily or typically strand, or if they do, they do not always have obvious signs of trauma. Fourteen humpback whales (13.2 deaths or serious injuries) were reported struck by vessels between 2016 and 2020 (Carretta et al. 2023). Between 2015-2019, four blue whales were observed with evidence of a vessel strike with an observed annual average of 0.8 vessel strike deaths. This most recent five-year period reflects a lower average than previous years, as more than 10 observed deaths/serious injuries occurred during 2007-2011, with 5 whales observed struck in a single year in 2007. Vessel strikes were implicated in the deaths of 7 fin whales from 2015-2019, and the average observed annual mortality and serious injury due to vessel strikes is 1.4 (Carretta et al. 2023).

Whale carcasses can sink and ships may not detect a whale strike, although this is more likely to be the case with large container vessels and tankers. As a result, most vessel strikes are likely undetected/unreported, and the true number of vessel collisions that occur is unknown. Vessel strike mortality has been estimated for several whale species (including humpback, fin, and blue whales) in the U.S. West Coast EEZ by Rockwood et al. (2017) using an encounter theory model (Martin et al. 2015) combining species distribution models of whale density (Becker et al. 2016), vessel traffic characteristics (size + speed + spatial use), and whale movement patterns obtained from satellite-tagged animals in the region to estimate whale/vessel interactions resulting in mortality. This model (assumed 55 percent avoidance dives by whales) estimated that the number of annual ship strike deaths along the U.S. West Coast in this study was 43 fin whale 22 humpback whales, and 18 blue whales, although these estimates includes only the period July – November when whales are most likely to be present in the California Current Ecosystem. We note that these estimates may not encompass all the potential risk of vessel collisions for humpback whales, since based on the last 5 years (2016-2020), five out of 14 (36%) reported vessel strikes occurred off or within Washington waters (e.g., Strait of Juan de Fuca, Puget Sound, where they are vulnerable to vessel traffic, including ferries). A comparison of average annual vessel strikes observed over recent historical time periods with these new estimates suggest that the detection rate for fin whale and humpback whale ship strikes could be 5% and 12%, respectively, whereas the detection rates for blue whales is approximately 4% (Carretta et al. 2023). Based on estimates of 22 annual deaths due to vessel strikes, the number attributed to the Central America / Southern Mexico - CA-OR-WA and Mainland Mexico-CA/OR/WA humpback whale stocks during 2016-2020 by Carretta et al. (2023a) are 6.45 and 10.15 humpback whales struck by vessels/year, respectively.

There is a large amount of uncertainty surrounding what the true number of ship collisions and mortalities are for these species. NMFS has determined that recent stock assessments of the blue, fin, and humpback whale stocks off the U.S. West Coast do not support an assertion that the current level of vessel strikes (whether reflected by the Rockwood et al. estimates or not) are impeding the recovery of these stocks (NMFS 2022b). Monnahan et al. (2015) assessed the impacts of vessel strikes on the population recovery of ENP blue whales and concluded that this stock was at 97% carrying capacity in 2013, even with 10 vessel strike deaths/year). In addition, we note that Rockwood et al. (2017) used a probability of avoidance of 55 percent based on existing data. However, other studies have shown a greater avoidance behavior by large whales (Lesage et al. 2017; Garrison et al. 2022), including humpbacks (Schuler et al. 2019), so the encounter rate may be lower than estimated in Rockwood et al. (2017). The populations of these species continue to show signs of recovery with increasing abundance on the U.S. West Coast despite the ongoing and persistent nature of this threat, although there have been actions in recent years that may be helping to reduce the number of vessel collisions that occur. There has been a long-term trend of decreasing vessel speeds across all U.S. West Coast waters (Moore et al. 2018), likely due to several factors that include response to increasing fuel costs and air pollution regulation. In addition, for over 10 years, NOAA has established seasonal voluntary Vessel Speed Reduction (VSR) zones off of California that have requested that all vessels 300 gross tons (GT) or larger decrease speeds to 10 knots or less to reduce the risk of vessel strikes on endangered whales. Cooperation rates with VSR have been increasing over this time, although they are still modest overall (Morten et al. 2022), and the potential changes (reductions) in risk associated with VSR have been explored (Rockwood et al. 2020, 2021).

The Port and Waterways Safety Act (PWSA) authorizes the Commandant of the Coast Guard to designate necessary fairways and traffic separations schemes (TSSs) to provide safe access routes for vessels proceeding to and from United States ports. The USCG completed Port Access Route Studies for the Santa Barbara Channel and the approaches to San Francisco and made recommendations to the IMO that the TSSs be modified, in part, to reduce the co-occurrence of large ships and whales. In February 2017, NMFS completed section 7 consultation on the U.S. Coast Guard's codification of the shipping lanes that vessels use to approach the ports of Los Angeles/Long Beach and San Francisco. Following formal consultation under ESA section 7, NMFS concluded that the proposed TSS lanes were not likely to adversely affect or jeopardize ESA-listed humpback, blue, and fin whales. On December 7, 2022 the United States District Court issued an order in *Center for Biological Diversity, et al. v. NOAA Fisheries, et al.,* Case No. 4:21-cv-00345-KAW (N.D. Cal.), vacating the biological opinion.

On June 5, 2023, the Coast Guard announced the availability of the study results of the Pacific Coast Port Access Route Study (88 FR 36607). This study evaluated safe access routes for the movement of vessel traffic proceeding to or from ports or places along the western seaboard of the United States. As a result of this study, the Coast Guard recommended establishing a number of voluntary vessel traffic fairways, including a coastwide fairway that follows existing vessel traffic patterns and connects with existing Traffic Separation Schemes (TSSs) (Strait of Juan de Fuca, San Francisco, Santa Barbara, and Los Angeles – Long Beach) and key ports. This study also recommends a number of fairways in specific areas, including a Point Mugu Fairway to direct traffic from LA/LB around the Channel Islands National Marine Sanctuary and to make accommodations for Department of Defense training and testing ranges (88 FR 36607). If these fairways are implemented by the Coast Guard in the future, there could be some impact on vessel traffic patterns in the action area, although to what extent is uncertain at this time.

2.4.1.3 Whale Watching Operations and Scientific Research

Whale watching boats and research activities directed toward whales may have direct or indirect impacts on fin, humpback, and blue whales as harassment may occur, preferred habitats may be abandoned, and fitness and survivability may be compromised if disturbance levels are too high.

Specifically, whale watching companies throughout the U.S West Coast, especially areas of Southern California and Monterey Bay, are the beneficiaries of the large amount of whale activity occurring in nearshore coastal waters. Individuals of all these whale species are known to visit the action on an annual basis during migrations. To date, there have been no indications or scientific studies suggesting that whale watching activities are significantly affecting any of these whale populations along the U.S. West Coast. A review of the NMFS Authorizations and Permits for Protected Species (APPS) database indicates that currently 20 scientific research projects that include directed research on fin, humpback, and/or blue whales off the U.S. West Coast. Most of these projects include some level of harassment for close approach, photography, acoustic monitoring, and/or sampling for biological data or deployment of tags. These activities are intended to be non-injurious, with only minimal short-term effects, although risks of more significant injuries or impacts do exist. A recent biological opinion (NMFS 2020f) analyzing the effects of NMFS' SWFSC research program concluded that activity was not likely to adversely affect ESA-listed large whales including species covered under this Opinion (blue, humpback, and fin whales).

2.4.2 Sea Turtles

As described above in the status section, East Pacific DPS green sea turtles are exposed to threats associated with fisheries bycatch, including U.S. fisheries that occur in the action area. Other impacts to ESA-listed sea turtles that may occur while present along the U.S. West Coast include vessel collisions, scientific research, ingestion or entanglement in plastics or marine debris, as well as changes in climate or oceanographic conditions. Historically, entrainment in coastal power plants was an issue, although this risk has been reduced through mitigation measures and changes in power plant operations over time.

2.4.2.1 Fisheries Interactions

Within the action area (which is primarily where green sea turtles are found), green sea turtles are occasionally reported and/or observed interacting with fishing gear, including gillnet gear and recreational hook and line gear. In the California large mesh drift gillnet fishery (DGN) only one green turtle has been documented interacting with the drift gillnet fishery (both in 1999; Carretta 2022). Based on stranding data from 1975 to mid-2016, only 14 green turtles were documented stranded with fishing gear, including unidentified gillnet gear (on occasion found in San Diego Bay) and recreational hook and line gear. Of 116 green turtles that stranded off California between 2017 and 2021, 15 animals were found hooked (including ingested hooks) or entangled (or ingested) in fishing gear, all of it appearing to be recreational fishing gear (NMFS WCR unpublished stranding data). All were found within bays and estuaries or in the nearshore coastal areas, which further suggest that the likely interactions were with hook and line (recreational) gear. Most (n=9) were found alive, and most were able to be released either following the removal of gear, or following rehabilitation.

There are two state gillnet fisheries in California that may interact with green sea turtles: the set gillnet fishery targeting halibut and white seabass; and the small mesh drift gillnet fishery targeting yellowtail, barracuda, and white seabass. No sea turtle interactions have been documented historically or recently, although observer coverage of these fisheries has been limited and irregular.

2.4.2.2 Entrainment in Power Plants

There are coastal power plants in California (non-nuclear and state-managed) where sea turtle entrainment has occurred (typically green sea turtles). Although these facilities have all been required to install large organism excluder devices by the State of California (California State Water Resources Control Board (CASWRB) 2010), occasional instances of green turtle entrainments (typically alive) continue to be reported. From 1975 through late-2016, 64 green turtles were entrained (most released alive). Since then, only four green turtles have been entrained in power plants, all released alive (2017-2023; NMFS-WCR unpublished stranding records).

2.4.2.3 Scientific Research

NMFS issues scientific research permits to allow research actions that involve take of sea turtles within the California Current. Currently there is one permit that allows directed research on green sea turtles, typically involving either targeted capture or sampling of individuals that may have stranded or incidentally taken in some other manner. These permits allow a suite of activities that include tagging, tracking, and collection of biological data and samples. These activities are intended to be non-injurious, with only minimal short-term effects; however, the risk of a sea turtle incurring an injury or mortality cannot be discounted as a result of directed research. The most recent biological opinion analyzed the effects of proposed SWFSC research surveys and estimated that one ESA-listed sea turtle found within the action area (any species of leatherback, North Pacific loggerhead, olive ridley and East Pacific green turtle) may be captured in CCE (California Current Ecosystem) trawl surveys and one ESA-listed sea turtle may be captured/entangled in longline surveys, with both released alive (NMFS 2020f).

2.4.2.4 Vessel Collisions

Vessel collisions are occasionally a source of injury and mortality to sea turtles along the west coast, and particularly in southern California. In southern California, green turtles are by far the most frequent species of sea turtles struck by vessels (including jet skis, small power boats, etc.). From 1975 through late 2016, 32 green turtles were suspected to be struck by vessels, with most resulting in mortality. In a review of the stranding records from 2017-2021, of 116 reported strandings of green turtles in California and Oregon, 29 of them were reported (suspected) struck by vessels, with almost all of them dead (28 animals; NMFS WCR unpublished stranding data). Most were in moderate to advanced decomposition, which often makes it difficult to determine a cause of death, although a cracked carapace or deep lacerations are usually a good indicator of blunt force trauma with a vessel's hull or propeller.

As described above, the PWSA authorizes the Commandant of the Coast Guard to TSSs to provide safe access routes for vessels proceeding to and from United States ports. In February 2017, NMFS completed section 7 consultation on the U.S. Coast Guard's codification of the shipping lanes that vessels use to approach the ports of Los Angeles/Long Beach and San

Francisco. Following formal consultation under ESA section 7, NMFS concluded that the proposed TSS lanes were not likely to adversely affect or jeopardize ESA-listed sea turtles, including green sea turtles. On December 7, 2022 the United States District Court issued an order in *Center for Biological Diversity, et al. v. NOAA Fisheries, et al.,* Case No. 4:21-cv-00345-KAW (N.D. Cal.), vacating the biological opinion.

On June 5, 2023, the Coast Guard announced the availability of the study results of the Pacific Coast Port Access Route Study (88 FR 36607). This study evaluated safe access routes for the movement of vessel traffic proceeding to or from ports or places along the western seaboard of the United States. As a result of this study, the Coast Guard recommended establishing a number of voluntary vessel traffic fairways, including a coastwide fairway that follows existing vessel traffic patterns and connects with existing Traffic Separation Schemes (TSSs) (Strait of Juan de Fuca, San Francisco, Santa Barbara, and Los Angeles – Long Beach) and key ports. This study also recommends a number of fairways in specific areas, including a Point Mugu Fairway to direct traffic from LA/LB around the Channel Islands National Marine Sanctuary and to make accommodations for Department of Defense training and testing ranges (88 FR 36607). If these fairways are implemented by the Coast Guard in the future, there could be some impact on vessel traffic patterns in the action area, although to what extent is uncertain at this time.

2.4.2.5 Contaminants

In southern California, green turtles forage in urbanized environments and therefore are more exposed to anthropogenic contaminants and pollutants. Sea turtles captured in Seal Beach and San Diego Bay in southern California were found to have higher trace metal concentrations (e.g., selenium and cadmium) than green turtles that inhabit non-urbanized areas (Barraza et al. 2019). A related study found that green sea turtles foraging in San Diego Bay had significantly higher total polychlorinated biphenyls (PCBs) than turtles in Seal Beach, and that these non-dioxin-like PCB congeners may be associated with neurotoxicity (Barraza et al. 2020).

2.4.2.6 El Niño/Changing Climate

El Niño events occur with irregularity off the U.S. West Coast and are associated with anomalously warm water incursions. Sea turtles may be affected by an El Niño event through a change in distribution or abundance of their preferred prey, which may result in a change in sea turtle distribution or behavior. These warm water events often bring more tropical marine species into normally temperate waters and therefore may affect the local ecosystem and normal predator-prey relationships. We considered the effect of climate change on sea turtles foraging in the action area and/or migrating to and from their nesting beaches or other areas of the Pacific Ocean. While climate change effects have been documented extensively on sea turtle nesting beaches, there is less information available on the effects of climate change on sea turtles specifically within the action area. Generally, we suspect that some sea turtle species may shift their distribution north as sea surface temperatures increase, which could bring them into more contact with human activities that occur off the U.S. West Coast.

Climate change is likely to affect the foraging essential features for the East Pacific DPS of green turtles. Increased temperatures and elevated sea level rise are likely to change the composition of seagrass beds as observed during El Nino events. For example, during the 1997-98 El Nino event, conditions became unsuitable for one seagrass species (*Zostera marina*) and favored another (*Ruppia maritima*) in Mission Bay and San Diego Bay (Johnson et al. 2003). Therefore, the distribution and abundance of invertebrate and algal communities in the action area are likely to change as a result of climate change.

2.4.2.7 Other Threats and Strandings

Strandings of sea turtles along the U.S. west coast reflect in part the nature of interactions between sea turtles and human activities, as many strandings are associated with human causes. Sea turtles have been documented stranded off California through their encounters with marine debris, either through ingesting debris or becoming entangled in the debris. Concentrations of plastic debris have been documented widely in the last decade, with the North Pacific Ocean showing similar patterns in other oceans, with plastics concentrating in the convergence zone of all five of the large subtropical gyres. Since the 1970s, the production of plastic has increased five-fold, with around 50% of it buoyant (summarized in Cozar et al. 2014). Studies documenting marine debris ingestion by sea turtles indicate impaired digestive capability, "floating syndrome," or reduced ability to swim, in addition to death (Casale et al. 2016). In addition, studies of marine debris ingestion in green turtles (Santos et al. 2015) indicated that the potential for death is likely underestimated, as is the magnitude of the threat worldwide, particularly for highly migratory species.

Many green turtles have reported stranded off California (and to a much lesser extent, Oregon) where the cause of injury/death cannot be determined, especially when some are found with moderate to advanced decomposition. From 2017-2021, 66 green sea turtles stranded alive, injured and/or dead off California and Oregon, with the cause of death undetermined. In most cases, NMFS experts could not determine whether human interaction played a factor in the stranding, either because of the lack of details or the moderate to advanced decomposition of the animal.

2.4.3 Black Abalone

Because the action area overlaps with a portion of the species' range and includes designated critical habitat, the description of the status of the species and critical habitat in Section 2.2 of this Opinion applies to the action area. In this environmental baseline, we discuss how specific factors and activities have affected black abalone and their critical habitat within the action area. These factors and activities include the effects of ongoing research, past rescue and relocation efforts, and the Refugio Beach Oil Spill.

2.4.3.1 Ongoing Research

Ongoing research activities include population monitoring conducted under Permit 18761-2R issued by NMFS to University of California at Santa Cruz (UCSC) and captive holding and propagation conducted under Permit 19571-2R issued by NMFS to the SWFSC La Jolla lab.

The Multi-Agency Rocky Intertidal Network (MARINe) and other abalone researchers have been monitoring black abalone throughout the California coast since the mid-1970s as part of long-term monitoring surveys, abalone habitat surveys, and surveys related to projects or unexpected events and circumstances. Prior to the ESA listing in 2009, no ESA permit was required. After the ESA listing, monitoring activities were conducted under Permit 14400 issued by NMFS to the Channel Islands National Park from 2010 to 2016, under Permit 18761 issued by NMFS to UCSC from 2016 to 2020, and under Permit 18761-2R issued by NMFS to UCSC from 2020 to the present.

Researchers monitor black abalone throughout the California coast to evaluate their abundance, density, size-frequency distribution, habitat, and health, using methods similar to those described in the proposed permits. These monitoring activities have resulted in little to no observable disturbance to black abalone and their critical habitat. At a few sites, researchers also tagged black abalone with visual tags and PIT tags attached to the shell with marine epoxy, to track the movements of individuals. Tagging caused minor, temporary stress to the abalone. Researchers have also deployed Abalone Recruitment Modules (ARMs) at a few sites at the Channel Islands, Point Reyes National Seashore, and Golden Gate National Recreation Area. Although few black abalone have been observed on the ARMs, these test deployments confirmed that the ARMs can withstand intertidal conditions. Researchers have also collected genetic samples using the swab method, noting minimal disturbance to black abalone, and have collected dead and obviously unhealthy black abalone for further analysis.

Currently, there are 51 black abalone at three captive holding facilities in California: the SWFSC La Jolla lab (21 black abalone), the CDFW Shellfish Health Laboratory (13 black abalone), and the Monterey Bay Aquarium (17 black abalone). Between January 2017 and December 2019, SWFSC researchers conducted several spawning attempts and were able to induce females to release eggs (SWFSC 2021). Researchers will continue to maintain the black abalone in captivity and evaluate methods to improve reproductive conditioning and induce spawning.

Overall, past and ongoing research activities have resulted in minor disturbance to black abalone and their critical habitat. These effects are greatly outweighed by the benefits of the research. Monitoring provides critical information to assess the status and trends of black abalone over time and the effects of different threats, such as disease, landslides, oil spills, and poaching. Captive holding and propagation studies are important to produce black abalone for future laboratory research and outplanting efforts. The final recovery plan (NMFS 2020d) highlights long-term monitoring and captive propagation studies as important recovery actions for the species.

2.4.3.2 Past Rescue and Location Efforts

Two recent rescue and relocation efforts were conducted for black abalone in response to the 2017 Mud Creek Landslide and the 2021 Big Sur debris flows. In both events, sediment had already buried segments of the coast, resulting in the loss of black abalone and their critical habitat, prompting an emergency response to minimize further losses of black abalone.
In May 2017, the Mud Creek landslide buried about 1,700 linear feet (518 linear meters) of rocky intertidal habitat along the Big Sur coastline in Monterey County, California (Caltrans

2021). Prior to the slide, the area was not accessible for monitoring. Thus, data are not available to estimate the number of black abalone lost due to burial by the landslide. Based on surveys of adjacent areas, the area buried by the landslide likely included good quality habitat that supported healthy black abalone populations. Following the initial landslide, wave action and nearshore ocean currents caused continued erosion and movement of slide materials, resulting in burial of adjacent habitats (Caltrans 2021). In November 2017, a team led by Caltrans and UCSC rescued 45 black abalone within an area at-risk of burial adjacent to the landslide (Caltrans 2021). The abalone were held overnight at The Abalone Farm in Cayucos, where they were measured, weighed, photographed, assessed for injuries, and genetically sampled by collecting an epipodial clip. Five were sacrificed and preserved for necropsy due to severely shrunken feet indicative of withering syndrome (n=2) or severe injuries sustained during collection (n=3). Nine were less severely injured and transported to the SWFSC La Jolla lab for rehabilitation and long-term holding. The remaining 31 abalone were tagged and released at the selected relocation site. Post-release monitoring through November 2019 recorded five confirmed mortalities based on collection of empty tagged shells (Bell and Raimondi 2020).

In August 2020, severe wildfires burned along the central California coast, followed by an atmospheric river rain event in January 2021, resulting in massive debris flows that buried large expanses of rocky intertidal habitat and black abalone populations. In response, UCSC coordinated with NMFS, CDFW, and the MBNMS to rescue about 200 black abalone within affected areas of the coast. The black abalone were held for several months at the CDFW-OSPR facility. Several died while in captivity, likely due to injuries sustained during the emergency event as well as during collection. In April and July 2021, all of the rescued black abalone (n=165) were released at selected relocation sites. Post-release monitoring is ongoing, as well as efforts to estimate the loss of black abalone and critical habitat due to the debris flow event.

2.4.3.3 Refugio Beach Oil Spill

In 2015, the Refugio Beach Oil Spill in Santa Barbara County impacted approximately 1,500 acres of shoreline habitat, including rocky intertidal and sandy beach habitat (Refugio Beach Oil Spill Trustees 2021). Three black abalone were found within the affected area (pers. comm. with Jack Engle, UCSB, and Pete Raimondi, UCSC, on June 5-6, 2015). The Damage Assessment and Restoration Plan includes support for transplantation efforts to restore black abalone populations and thus restore the rocky intertidal habitat within the impacted area (Refugio Beach Oil Spill Trustees 2021). This transplantation effort is the subject of the proposed Permit 26606.

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 (see 50 CFR 402.02). 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 the factors set forth in 50 CFR 402.17(a) and (b).

In some instances, this Opinion assesses effect pathways involving effects from an event that may have a low probability of occurring in any given year. However, this Opinion must consider the risk of such events occurring over the implementation of the entire action. As noted earlier, NMFS has determined that this action is expected to last at least the next 20 years. The likelihood of such an event over an action expected to last at least 20 years is considerably higher than the likelihood of that event occurring in a single year. Accordingly, an effect pathway that has a relatively low likelihood in a given year may be found to be reasonably certain to occur over a longer period.

For this consultation, we consider climate change where relevant to status of the species or environmental baseline, but do not consider any potential future impacts from climate change on listed species in the action area to be effects of the action. It is true that greenhouse gasses (GHGs) would be emitted when oil or gas produced under the proposed action is later used. However, we cannot show a causal connection between such emissions of GHGs and specific localized climate change as it impacts listed species or critical habitat with reasonable certainty for the following reasons

1. The ultimate fate of the oil or gas developed or produced is unknown. Depending on market conditions, crude oil could be refined into gasoline or diesel and burned in automobiles. Crude oil could be refined to produce motor oil or other lubricants. Or, it could be turned into asphalt or other consumer products including plastics. These products could be used anywhere in the world after production. Due to this high degree of uncertainty, we cannot identify any specific effect from the burning or processing of these fuels that is reasonably certain to occur.

2. We cannot make the requisite causal connections between the emissions of greenhouse gasses from the proposed action and specific localized climate change as it impacts the listed species or critical habitat.[7]

3. Additionally, even if we assume that all the oil and gas are burned to produce energy, and this is a step in a causal chain toward a change in temperature in the area where listed species occur, the magnitude of that effect pathway is likely to be too small to constitute an effect on the listed species or critical habitat. The amount of GHGs produced would be a small fraction of GHGs produced world-wide. Even if it were possible to make such an attribution, the global temperature change attributable to such emissions would be miniscule and we are unable to meaningfully analyze any resulting impacts on ESA-listed species and critical habitat.

2.5.1 Noise

The exposure of marine species to very loud noise can cause physical effects to individuals, including changes to sensory hairs in the auditory system (for marine mammals, sea turtles and

[7] Greenhouse gasses (e.g., CO^2 from fossil fuel burning) remain in the atmosphere long enough to become well mixed, meaning that the amount that is measured in the atmosphere is roughly the same all over the world, regardless of the source of the emissions (EPA 2024). While progress has been made in observing and attributing climate change at smaller scales as well as in attributing portions of large climatic events (e.g. droughts and severe storms) to climate change as a whole (IPCC 2023), it is currently beyond the scope of existing science to identify a specific source of CO^2 emissions and designate it as the cause of specific climate impacts at an exact location.

fish), which may temporarily or permanently impair hearing. Temporary threshold shift (TSS), which can last from minutes to days is a temporary change in hearing capability, and its severity is dependent upon the duration, frequency, sound pressure, and rise time of a sound (Finneran and Schlundt 2013). Full recovery is expected, and this condition is not considered a physical injury. At higher received levels, or for sound sources that are in frequency ranges where animals are more sensitive, permanent threshold shifts (PTS) in hearing can occur. The effect of noise exposure generally depends on a number of factors relating to the physical and spectral characteristics of the sound such as the intensity, peak pressure, frequency, duration, duty cycle, etc. as well as the species being exposed and their activity (e.g. sensitivity to sound pressure levels and frequencies, age, behavior, prior exposures, etc.).

In 2018, NMFS revised their comprehensive guidance on underwater sound pressure levels likely to cause injury to marine mammals through onset of PTS (harassment by injury (Level A)) or harassment as defined by the MMPA. Different thresholds and auditory weighting functions were provided for the different marine mammal hearing groups. The generalized hearing range for each hearing group and the PTS onset acoustic thresholds are presented in Table 8, using dual metrics of cumulative sound exposure level (LE) and peak sound level (PK) for impulsive sounds and LE for non-impulsive sounds. Because we have identified baleen whales that may be affected by underwater sound pressure levels associated with BOEM/BSEE proposed activities, we have only included information on the low-frequency cetaceans (i.e., fin, blue, and humpback whales).

Table 8. Marine mammal hearing ranges and threshold values underwater for onset of PTS (NMFS 2018a).

Hearing Group	Generalized Hearing Range	PTS Onset Acoustic Thresholds (Received Levels)	
		Impulsive	**Non-impulsive**
Low-frequency cetaceans (baleen whales)	7 Hz to 35 Hz	$L_{pk,flat}$*: 219 dB $L_{E,24h}$**: 183 dB	$L_{pk,flat}$*: 213 dB $L_{E,24h}$**: 168 dB

*Peak sound pressure (Lpk) has a reference value of 1 µPa. The µPa subscript "flat" is included here to indicate peak sound pressure should be flat weighted or unweighted within the generalized hearing range.
**Cumulative sound exposure level (LE) has a reference value of 1 μPa^2sec. The subscript associated with LE thresholds indicates the designated marine mammal auditory weighting function and that the recommended accumulation period is 24 hours.

Sea turtles may also be affected by exposure to underwater noise exposure and the thresholds are included in Table 9.

Table 9. Threshold for potential injurious underwater noise exposure for sea turtles.

Hearing Group	Generalized Hearing Range	PTS	TTS
Sea turtles	30 Hz – 2 kHz	LE: 204 dB	LE: 189 dB
		Lpk: 232 dB	Lpk: 226 dB

In addition to the physical effects of sound affecting marine mammals and sea turtles, marine species may change their behavior in response to underwater sound, which can be generally summarized as modifying or stopping current activities such as feeding or vocalizing, moving away from a sound source, masking, etc. The behavioral response of a marine mammal to an anthropogenic sound will depend on the frequency, duration, temporal pattern and amplitude of the sound as well as the animal's prior experience with sound or what the animal might be doing at the time of the exposure. The distance from the sound source and whether it is perceived as approaching or moving away can also affect the way an animal responds to a sound (Wartzok et al. 2003).

NMFS is in the process of developing updated guidance for behavioral disturbance to marine mammals. However, until such updates are available, we use the existing NMFS guidance following conservative thresholds of underwater sound pressure levels, expressed in dB re $1\mu Pa_{rms}$ from broadband sounds that cause behavioral disturbance, with root mean square (RMS) as the square root of the arithmetic average of the squared instantaneous pressure values.

- Marine mammals
    - Impulsive sound: 160 dB
    - Non-impulsive sound: 120 dB
- Sea turtles: 175 dB

All behavioral reactions are assumed to reflect stress and may result in "take" when they significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. Responses can overlap as well or be coupled with other behavioral reactions. Individuals of the same species may react differently to the same, or similar stressor depending on factors listed above, such as age, experience being exposed to the sound source, etc.

2.5.1.1 Sound from Drilling and Production

Production drilling may be conducted in the action area. Sound produced by production activities on platforms is relatively low, as a small surface area of a platform is in contact with the water and the machinery is placed on decks well above the water line. Gales (1982) measured noise from production activities on platforms offshore California. Sounds recorded from platforms were very low frequency sounds, approximately 4.5-38 Hz. The strongest received sounds were very low frequency, about 5 Hz, at 119-127 dB. The highest frequencies recorded were at about 1.2 kHz. NMFS (2020a) reported sound source levels for drilling from platforms up to 137 dB at 405 meters and estimated this to equal 185 dB at the source (167-192 dB_{peak}).

Other platform operations also generate noise; for example, noise generated during well stimulation operations, including hydraulic fracture and acidization, is predominantly associated with equipment operations on the platform. Airborne noise levels fluctuate according to the specific operations and presence of vessels. The highest value recorded by Blackwell and Greene (2006) was 62 dBA re 20 µPa, obtained 300 m from the source construction activities when boats were present. Ambient values were reached 1–4 km from the source. Some noise from on-platform equipment is carried downward through the water column, but underwater noise monitoring of platform operations has repeatedly identified drilling and vessel operations to be the primary activity generating the highest-level of noise (Kim and Richardson 2016; Quijano, et al. 2019).

Drilling noise is expected to be audible at low levels in all directions from the drilling location. Although drilling sound may contribute to a localized increase in ambient sound levels, it will not produce sound levels over great enough distances to cause disturbance. Due to the stationary and localized effects of platform-associated sounds, animals encountering platform sounds would be very brief as they swim by, and the potential effects of these sounds to disturb animals will be insignificant. Any ESA-listed species approaching the platform would be fully aware of its presence before approaching close enough to experience harassment. NMFS has found drilling noise unlikely to cause adverse effects to sea turtles and marine mammals, including humpback and fin whales (NMFS 2017, 2020a). As a result, we conclude that drilling and production noise from offshore platforms associated with the proposed action will be insignificant, and therefore not likely to adversely affect any ESA-listed species.

2.5.1.2 Sound from Well Conductor Removal (Mechanical Cutting)

In 2021, 55 well conductors were removed from three oil platforms located in the Point Aurguello Unit in Santa Barbara County off southern California. The conductors were cut 6 to 8 m (20 to 25 ft) below the mudline and the cutter revolutions per minute ranged from 60 to 72 rotations per minute (rpm). BOEM consulted with NMFS prior to project approval, focusing on sound as the primary potential impact. As described by BOEM, the only sound source that had the potential to cause adverse effects to listed species was a high-pressure abrasive grain cutting tool that would be lowered inside the conductor pipe to cut it below the mudline. BOEM estimated the sound pressure level of around 147 dB re 1µPa @ 1m. Assuming spherical spreading the sound should reduce to 120 dB, the current threshold for level B harassment of marine mammals at 22.3 meters. Based on the best available information and because of the mitigation and monitoring proposed for the Point Arguello Unit (and subsequently adopted by BOEM for the proposed action in December, 2023), NMFS concurred with the Bureau's finding that well conductor removal was not likely to adversely affect listed species given the small area of impact that will occur near the sea floor in 400 to 700 ft depth. In addition, large whales are not known to be benthic feeders, reducing the chance of the whales entering the 120 dB isopleth. Therefore, NMFS concluded that the potential for noise exposure would be extremely low and therefore discountable (NMFS 2020a, WCRO-2019-03765).

BOEM funded an independent study to collect empirical source level data during the cutting of a total of nine wellbores and 16 empty conductors (Fowler et al. 2022). The duration of the cuts was dependent on the number of casing strings that needed to be cut. Wellbores containing more casing strings took much longer to cut compared to the conductors that were empty. The broadband sound pressure levels (SPLs) generated by cutting either wellbore or empty conductors produced similar levels and, based on the spectrums observed, consisted of maximum broadband levels of approximately 150 dB re 1 μPa-m for frequencies of 500–1,000 Hz and 155 dB re 1 μPa-m for the band of 25–3,000 Hz. Since the cutting occurred below the mudline and the conductors themselves acted at least partially as sound radiators, transmission loss was complex, but an examination of the received levels from multiple receivers indicates that a 15 Log(range) approximation was reasonable. During the field survey ambient sound levels were typically found to be in the 110 to 122 dB_{RMS} SPL range for a broadband frequency band of approximately 25–3,000 Hz, with short periods (tens of minutes) where the ambient noise levels rose to 125 dB as local shipping passed near the survey. Thus, the distance to the marine mammal behavioral threshold for continuous sound of 120 dB is 205 m. However, marine mammals would have to remain in the ensonification zone (i.e., within 205 m of the structure) for a protracted period of time in order to hear and react to the cutting sound levels, while simultaneously being exposed to ambient noise which would likely be masking the cutting noise. This masking would effectively reduce the ensonified radius. The overall result is that it is highly unlikely that a marine mammal would remain within the Level B radius for long and that Level B impacts are not likely to occur.

Mechanical cutting activities associated with O&G platform conductor removal produces underwater sound pressure levels that contribute to the existing underwater ambient acoustic environment; however, sound pressure levels are well below the marine mammal onset for permanent threshold shift and generally lower for marine mammal temporary threshold shift onset (Fowler et al. 2022). With the mitigation and monitoring proposed by the Bureaus during well conductor removal activities, we conclude that the sound produced during well conductor removal will be insignificant, and therefore not likely to adversely affect any ESA-listed species.

2.5.1.3 Vessel Sound

The SCPA has near-constant shipping vessel traffic. The Santa Barbara Channel is a part of an international shipping route leading to and from the Ports of Los Angeles/Long Beach, one of the busiest port complexes in the world. Automatic Identification System (AIS) data compiled by the Benioff Ocean Science Laboratory (BOSL) (2022) data showed more shipping activity in 2021 as compared to 2020, with both an increase in the overall number of vessels and an increase in the total nautical miles traversed. Overall, there were 1,159 large vessels (> 300 tons) that transited a total of 714,749 nautical miles; representing a 23% increase in the number of ships transiting through this area, and a 12.6% increase in the overall number of nautical miles traveled within this zone from the previous year (2020). Given these trends, we can expect that vessel traffic and associated sound levels will continue to increase over time.

As summarized in Richardson et al. (1995), worldwide, vessels are the major contributors to overall background noise in the sea. Sound levels and frequency characteristics are roughly related to ship size and speed. The dominant sound source is propeller cavitation, although propeller “singing,” propulsion machinery, and other sources (auxiliary, flow noise, wake bubbles) also contribute to the total noise level produced.

Vessel noise is a combination of narrowband tones at specific frequencies and broadband noise and is determined by factors such as ship type, load, and speed, and ship hull and propeller design. Broadband components, caused primarily by propeller cavitation and flow noise, may extend up to 100 kHz, but they peak much lower, at 50-150 Hz. Richardson et al. (1995) give estimated source levels of 156 dB for a 16-m crew boat (with a 90-Hz dominant tone) and 159 dB for a 34-m twin diesel (630 Hz, 1/3 octave). Broadband source levels for small, supply boat-sized ships (55-85 m) are about 170-180 dB. Most of the sound energy produced by vessels of this size is at frequencies below 500 Hz. Many of the larger commercial fishing vessels that operate off southern California fall into this class.

Vessel speed restrictions may minimize collisions (and subsequent mortality) with marine mammals. While a slower speed reduces noise levels, that noise reduction is minimal in comparison to ambient noise in this high vessel traffic area. Changing vessel speeds would not affect impacts to mammals from noise. The Bureaus provided examples of noise (source levels and frequencies) generated by support vessels for O&G industry operations, depicted in Table 10. Seismic survey vessels and mobile offshore drilling units (drillships) were included in Table 6 of the BA, but because BOEM is not anticipating geological and geophysical surveys or exploratory well drilling, they are not included in Table 10 below.

Table 10. Examples of underwater sound pressure levels generated by O&G vessels.

Vessel Sound Source	Source Level (dB)	Frequency (Hz)
Service, crew and support vessels Tug (4 engine)	160-180 (rms); 187 (peak) 173-177 (rms); 188-191 (peak)	20-10,000 broadband
Semi-submersible pipeline barge	161 (rms); 171 (peak)	10-10,000
Pipe-laying vessel	170-182 (rms); 179-191 (peak)	Broadband

Acoustic monitoring shows that vessel traffic appears to increase background noise levels in the 71–224 Hz range by 10–13 dB (Hatch et al. 2012; McKenna et al. 2015; Rolland et al. 2012). McKenna et al. (2015) conducted long-term monitoring of underwater sound from ship traffic in the Santa Barbara Channel between 2007 and 2010 and concluded that a reduction of one ship transit per day resulted in 1.2 dB decrease in average noise. This study used AIS data to estimate the volume of ship traffic. AIS transponders are not required on ships less than 300 gross tons and therefore this study may not fully account for the contributions of smaller vessels.

Exposure and response to vessel noise and activities depend primarily on how close in proximity the vessel is to an individual animal. Close vicinity to a particularly loud vessel sound can result in acute noise exposure and disturbance. Long-term, chronic exposure to vessel sound may result in stress and masking of biologically important sounds (Hatch et al. 2012; Rolland et al. 2012). Behavioral changes specifically attributed to vessel noise have been reported to include disruption of normal behaviors such as foraging, habitat avoidance, and alterations of acoustic signaling behavior (Blair et al. 2006 [humpbacks]; Erbe et al. 2019 [marine mammals in general]; Silber et al. 2021 [gray whales]). Sound from vessels also has the potential to accumulate from multiple vessels and increase the ambient sound level (Hildebrand 2009).

Marine Mammals

Marine mammals' behavioral responses to vessel disturbance range from little to no observable change in behavior to momentary changes in swimming speed and orientation, diving, surface and foraging behavior, and respiratory patterns, as well as changes in vocalizations. For example, Watkins et al. (1981) found that both fin whales and humpback whales appeared to react when approached by small vessels by increasing swim speed, exhibiting a startle reaction and moving away from the vessel with strong fluke motions. Close approaches by small research vessels caused fin whales (n = 25) in the Ligurian Sea to stop feeding and swim away from the approaching vessel (Jahoda et al. 2003).

A number of factors may influence the type or severity of an animal's response. Changes in cetacean behavior can correspond to vessel speed, size, and distance from the animal, as well as the number and frequency of vessel approaches. Characteristics of the individual and/or the context of the approach, including age, sex, the presence of offspring, whether or not habituation to vessels has occurred, individual differences in reactions to stressors, and the behavioral state of the cetaceans can also influence the responses to close vessel approaches (Baker et al. 1988; Wursig et al. 1998; Gauthier and Sears 1999; Hooker et al. 2001; Lusseau 2004; Koehler 2006; Richter et al. 2006; Weilgart 2007). Observations of large cetaceans indicate that cow-calf pairs, smaller groups, and groups with calves appear to be more responsive to close vessel approaches (Hall 1982; Bauer 1986; Bauer and Herman 1986; Williamson et al. 2016). Cetaceans may become sensitized or habituated to vessels as the result of multiple approaches (Constantine 2001).

Chronic exposure to vessel sound may be a more significant source of stress than short-term exposures that occur during interactions with specific vessels. Chronic noise has been correlated with changes in stress hormones (Rolland et al. 2012) and long- and short-term changes in vocalizations (Parks et al. 2012). While masking due to vessel sound has shown to be more severe for North Atlantic right whales compared to other whales (Clark et al. 2009), masking of other baleen whale sounds still likely occurs, particularly given the low-frequency soundscape of vessels transiting an area.

The biological significance of the typical response to O&G vessel disturbance is low. Research suggests that cetaceans appear to resume typical behavior within minutes of vessels leaving the area (Watkins et al. 1981; Hall 1982; Baker et al. 1983; Malme et al. 1983; Richardson et al. 1985; Au and Green 2000; Baumgartner and Mate 2003; Jahoda et al. 2003; Koehler 2006; Scheidat et al. 2006; Isojunno and Miller 2015). Large whales are continuously exposed to vessel noise in the Santa Barbara Channel, but they occur there regularly (and most of the populations are increasing), using the area as a migration corridor and feeding area. O&G vessel traffic is only a fraction, albeit unknown, of the area's transit, recreational, and shipping vessel activities.

Sea Turtles

Underwater noise generated by vessels could cause behavioral changes or auditory masking to sea turtles. It is unclear whether masking resulting from vessel noise would have biologically significant impacts on sea turtles (CSA Ocean Sciences Inc. 2021). The behavioral responses to vessels could be attributed to both noise and vessel cues. Conservatively, it can be assumed that individual sea turtles disturbed by the vessels will undertake evasive maneuvers, such as diving or altering swimming direction and/or swimming speed to avoid the vessels. Sea turtles exposed to underwater noise greater than 175 dB may experience behavioral disturbance/modification (e.g., movements away from the noise source) (Moein et al. 1994). The noise levels typically produced by O&G vessels generate a small zone of harassment located very near the vessels, making disturbance of sea turtles unlikely.

BOEM expects that the O&G vessels will not substantially add to the local noise environment in their operating area due to the vessel size, propulsion, and other noise characteristics of typical support vessel machinery. The limited amount of project-related vessel traffic relative to existing vessel traffic in the Santa Barbara Channel area would contribute a negligible amount to the overall noise levels in the area. Therefore, vessel noise could result, at most, in a localized minor impact. Any contribution is likely small in the overall environment of regional ambient sound levels. A vessel's transit past an individual animal will be brief and is not likely to impact any individual's ability to feed, reproduce, or avoid predators. Brief interruptions in sheltering or communication via masking are possible, but unlikely given the ability of marine mammals, sea turtles, and fish to move away from vessel disturbances and to quickly resume normal behaviors. For all of these reasons, we conclude that vessel noise related to ongoing O&G activity in the POCSR is insignificant, and therefore unlikely to adversely affect any ESA-listed species.

2.5.1.4 Aircraft (Helicopters) Sound

Other than vessels, helicopters are an alternative means of crew transport on and off platforms in the POCSR. The rotors are the primary sources of sound from helicopters and the duration is variable, given that helicopters are moving rather quickly to/from their destination, although they do need to hover when landing on the platform. Helicopter noise has the potential to propagate underwater at levels that could be detected by marine mammals and sea turtles. Air-to-water transmission depends on the receiver depth, and the altitude, aspect, and strength of the source. The angle of incidence at the water surface, water depth, and bottom conditions also strongly influence the propagation and levels of underwater sound from passing aircraft; propagation is attenuated in shallow water, especially when the bottom is reflective. A Bell 212 helicopter presented an estimated source level of about 150 dB at altitudes of 150-600 m, with the dominant frequency a 22-Hz tone with harmonics. As an example of the variation in the duration of a helicopter's audibility, a Bell 214 was audible in air for 4 minutes before passing, for 38 seconds at 3-m (9-ft) depth, and for 11 seconds at 18 m (59 ft) (as summarized in Richardson et al. 1995).

Most of the information regarding the effects of aircraft on marine mammals focuses on fixed wing airplanes and not on helicopters. However, a study by Petel et al. (2006) evaluated helicopter and fixed-wing aircraft noise levels to determine potential effects to Weddell seals (*Leptonychotes weddellii*). They determined that in-water transmission of sound was greatest when aircraft landings and takeoffs took place on surface ice. Underwater transmission was otherwise inaudible or barely audible. Above the water's surface, airborne sound was more substantial and could be heard from aircraft traveling at altitudes up to 914 m (3,000 ft).

Marine mammals may also react to the visually observable presence of an aircraft; however, large whales spend the majority of their time foraging and traveling underwater and therefore should not be significantly affected by helicopter activity overhead. If they are disturbed, they are likely to dive but not in a way that would significantly affect their behavior.

Sea turtles may also respond to aircraft overflights. Based on sea turtle sensory biology (Ridgway et al. 1969; Lenhardt et al. 1994; Bartol et al. 1999; Ketten and Bartol 2005), sound from low flying aircraft could be heard by a sea turtle that is at or near the surface. Turtles might also detect low flying aircraft via visual cues such as the aircraft's shadow. Auditory response testing by Moein et al. (1993) showed sound-induced swimming and sound-induced head movements in most, but not all Atlantic Loggerhead test subjects. In a study of responses to unoccupied aerial systems (UASs or drones), Bevan et al. (2018) studied behaviors of three species of sea turtle, including green turtles, flatback turtles (*Natator depressus*), and hawksbill turtles (*Eretmochelys imbricata*), to a small commercially available (1.4 kg) multirotor drone. Juvenile green and hawksbill turtles foraging on shallow algae-covered reefs in nearshore waters off nesting beaches or in foraging habitats exhibited no evasive behaviors (e.g., rapid diving) in response to the drone at or above 20-30 m altitude, and at or above 10 m altitude, respectively.

Based on the available information, we do not expect that helicopter sounds will pose much of a risk to ESA-listed species. If there are any behavioral responses that might occur for some individuals exposed, at most those would likely constitute a short-term disturbance that would end in a matter of a seconds, and individuals would be expected to resume their behaviors and activities. As a result, we conclude that aircraft sound associated with the proposed project will be insignificant, and therefore not likely to adversely affect any ESA-listed species.

2.5.2 Liquid Waste Discharges

Effects to ESA-listed Species

Water discharges produced from offshore O&G development activities include discharges that may contain well stimulation treatment chemicals and may affect listed species through direct contact or ingestion of contaminated prey. The Bureaus prepared an environmental assessment of the occasional use of well stimulation treatments in the Pacific Region (ANL 2016).

The Environmental Protection Agency (EPA) regulates discharges from offshore O&G exploration, development, and production facilities in Federal waters off the southern California coast under an NPDES General Permit (issued in 2013). The General Permit issued by EPA regulates 22 identified discharges from O&G facilities, including drilling fluids and cuttings, produced water, well treatment, completion, and workover fluids, deck drainage, domestic and sanitary wastes, and miscellaneous routine discharges. The General Permit sets forth effluent limitations and monitoring and reporting requirements, including pollutant monitoring and toxicity testing of effluents. The point of compliance for effluents is the edge of the mixing zone, which extends laterally 100 m (328 ft) in all directions from the discharge point and vertically from the ocean surface to the seabed. Calculated concentrations of the constituents must meet the permit limits at the edge of the mixing zone, after accounting for dilution. The permit covers all 23 platforms (22 production and one processing) in the SCPA. All ocean discharges are tracked through quarterly discharge monitoring reports required by the NPDES permits (Kaplan et al. 2010). The General Permit does not apply to vessels supporting platform operations or pipeline maintenance or installation. Other discharges are regulated by the USCG or the State of California. The USCG regulates vessel discharges, and the State of California regulates ocean discharges into State waters. State waters extend to 3 nautical miles from the coast, as identified in the California Ocean Plan, first issued in 1972. This plan includes effluent limitations for 84 pollutants, which apply to any facility which discharges into State waters (Aspen Environmental Group 2005). Oil platforms in State waters do not discharge into the ocean.

As summarized in the BA, from drilling operations, POCSR oil platforms discharged 12,127 metric tons in 1996, 2,956 metric tons in 2000, and 2,314 metric tons in 2005, of drill cuttings. Drilling mud discharge volumes followed a similar pattern of declining discharge over recent decades. In 1996, platform operators drilled 31 new wells on the POCSR, but only 13 new wells in 2000. Platforms discharging drilling fluids and cuttings dropped from six in 2000, to four in 2005 (Lyon and Stein 2010). As of December 31, 2022, lessees have drilled a total of 370 exploration wells and 1,266 development wells, for a total of 1,636 wells in all, on the POCSR. Based on data from 1996, 2000, and 2005, the vast majority of drilling waste discharges in the selected years occurred in the Santa Barbara Basin where the majority of platforms lie (Table 8 in the BA).

Operators treat produced water to separate oil and other impurities prior to discharge under the NPDES permit or reinjection below the seafloor. Treatment methods include the use of heat, corrugated plate coalescers, electrostatic precipitation, bubbling, and chemical treatment. After treatment, the remaining produced water is mostly brine, but may include trace metals and dissolved hydrocarbons, including benzene, toluene, ethylbenzene, and xylene. Dissolved metals may include arsenic, barium, chromium, cadmium, copper, zinc, mercury, lead, and nickel. Inorganic constituents may include cyanides and sulfides (Kaplan et al. 2010). Table 8 in the BA provides a comparison of major platform discharges for 1996, 2000, and 2005, including the volume of produced water, drilling muds, drill cuttings, and cooling water for 23 platforms in the Santa Maria Basin, the Santa Barbara Channel Basin, and the San Pedro Bay Basin.

The regulation of discharges of potentially harmful substances from O&G operations in the POCSR mitigate the effects to ESA-listed species and critical habitats. The issuance of NPDES permits are subject to the requirements of the ESA. In 2013, EPA re-evaluated the potential effects of these discharges on ESA-listed species and critical habitat for BOEM’s active offshore lease blocks; they concluded that the discharges would have no effect on endangered or threatened species (EPA 2013a, 2013b).

Data from different oceans around the world show that heavy metal and PAH concentrations are present in marine mammal and sea turtle tissues and organs (see NMFS 2023c for a review). Elevated concentrations have also been detected in sea turtle eggs and hatchling sea turtles. Although these tissue levels provide strong evidence of exposures to these pollutants, we are not able to reliably estimate the contributions of specific activities to pollutant accumulations in marine species. This is because there are many known and unknown pollutant sources discharging into marine waters, and these species travel widely within and outside the Pacific Ocean over their lifetimes.

The feeding behaviors and habitat use patterns of our protected species influence their exposures and responses to the pollutant discharges that would occur under this action. We expect that some individuals from mobile species including ESA-listed marine mammals, sea turtles and fish will make numerous or possibly frequent and extended foraging and resting visits to the action area over the course of relatively long lifetimes that may include extensive migrations or residence around and within the action area. The duration of exposure could last up to many days, weeks, or even longer. As a result, the duration of exposure to the proposed action for individuals of all species may vary. However, these species are generally wide-ranging animals that feed on prey over great distances, so any prey consumed near oil and gas structures would be an insignificant portion of their diet, and are therefore expected to be an insignificant exposure to accumulated toxicants. Other ESA-listed invertebrate species are generally not located far enough offshore and/or near the discharge sources to be exposed to discharges from oil and gas activities.

The reinjection of drilling fluids, limited quantity of releases, application of mixing zone monitoring requirements and dilution by natural ocean currents reduce the concentrations of contaminants that ESA-listed species may be exposed to in the marine environment as a result of the proposed action to very low levels beyond 100 meters away from the point of discharge throughout the action area. As described, we generally anticipate that exposures to discharges will be limited, given the wide range of most ESA-listed species that are mobile, or the localized presence of invertebrate species like black abalone away from oil and gas activities offshore. Given the limited exposure anticipated for all ESA-listed species, we expect that any effects that may occur will be insignificant to the health of individuals. For these reasons, we conclude that discharges related to O&G operations will have insignificant effects and are not likely to adversely affect any ESA-listed species.

Effects on Critical Habitat

O&G activities generating non-point source pollution may affect the food resources, settlement habitat and water quality biological features of designated and proposed critical habitats for Central America DPS and Mexico DPS humpback whales, leatherback sea turtles, East Pacific DPS green sea turtles, and black abalone.

For example, intertidal communities near a sewage outfall pipe at San Clemente Island were characterized by lower species diversity, reduced numbers of large, canopy-forming intertidal macrophytes and an abundance of suspension-feeding animals (Murray and Littler 1974 in NMFS 2011). Altered algal diversity may affect the settlement habitat of abalone larvae and reduce food resources available for black abalone. Discharge that results in reduced ocean pH may reduce the growth of coralline algae (an important component of juvenile habitat) as well as reduced growth and survival of abalone, as has been observed in other marine gastropods (Shirayama and Thornton 2005 in NMFS 2011). Important prey features for humpback whale (krill and coastal pelagic fish species that include anchovy, sardines, and squid) and leatherback sea turtle (jellyfish) critical habitats could be negatively affected by these discharges, if exposed.

As described above, we anticipate that the discharge of waste is expected to have very limited impact on the environment and ESA-listed species outside of small areas surrounding those discharges. While prey features of humpback whale and leatherback sea turtle critical habitat may be exposed and negatively affected, the small area of impact and variable level of presence of foraging by ESA-listed species in such a small area lead us to conclude this effect will be insignificant to these designated critical habitats.

For black abalone critical habitat, and the proposed green sea turtle critical habitat, these nearshore critical habitats do not overlap the areas that could be affected by offshore waste discharges. Discharges from offshore oil and gas structures are expected to dissipate and/or sink to the bottom, and are extremely unlikely to reach nearshore waters. Therefore, we conclude that adverse effects to these critical habitats will be discountable.

2.5.3 Oil Spills and Oil Spill Response

Oil spills are well known to damage the environment and kill a range of animals that are directly and indirectly exposed to oil, including marine life. We note that some oil spill response activities that are included as plans prepared by offshore operators that are approved by the Bureaus involve the deployment of industry-owned oil spill response equipment such as oil spill booms, mechanical skimmers, response vessels, oil storage equipment, aircraft, and marker buoys. These responses help mitigate the effects of oil spills, when they occur. We note that the application of dispersants in the action areas as a remediation to disperse oil is not included as part of the proposed action, as the authorization and use of dispersants is managed by the USCG and EPA under the Oil Pollution Act (33 U.S.C. §2701 et seq.), and not the Bureaus. However, under the 2019 Region IX Dispersant Use Plan for California (USCG and EPA 2019), the use of dispersants may occur during an oil spill resulting from the proposed action in the action area. In addition, other remedies such as in situ burning, under the 2008 Region IX California In-Situ Burn Plan (USCG 2008), could occur. As a result, we consider the potential impacts and benefits of these response activities, as a consequence of the proposed action, as part of analysis of the potential effects of oil spills on ESA-listed species and critical habitats.

2.5.3.1 Causes and Estimated Occurrence of Future Oil Spills

In normal, day-to-day platform operations, accidental discharges of hydrocarbons may occur in the action area. Appendix A-1 of the Bureau's BA describes the risk of oil spills in the POCSR given historical spills dating back to 1963. Such accidents have typically been limited to discharges of quantities of less than one barrel (bbl) of oil. From 1963 to 2022, 1,451 oil spills were recorded in the POCSR. The total volume of oil spilled in the Pacific Region is dominated by the 1969 Santa Barbara Spill (80,900 bbl) which occurred soon after production began. During 1970–2022, there were 1,449 oil spills with an average volume of 1 bbl/spill and a total volume of 1,508 bbl, which represents less than 2% of the volume spilled in 1969. As summarized in the BA, the largest spill during 1970–2022 was the 588 bbl Beta Unit spill ("Huntington Beach" spill) in October 2021 from Amplify Energy Corporation's San Pedro pipeline P00547 (Table A-1). In a settlement agreement (Case No. 8:21-cv-01628-DOC-JDE, Document 476-4, U.S. District Court for the Central District of California, 2022), the corporate defendants asserted that the spill was a result of severe damage to pipeline P00547 from two container ships that repeatedly dragged their anchors across it. Without accepting responsibility, the shipping companies agreed to contribute funds to the remediation process.

The next six largest spills were (in descending order of size; Table A-1 in Appendix A-1): 164 bbl in 1997 due to a pipeline break in the flange metal in State waters due to welding flaws; 150 bbl in 1996 due to equipment failure and error allowing emulsion to flow through flare boom; 101 bbl in 1990 from mineral oil mud released due to incorrectly positioned standpipe and closed valves; 50 bbl in 1994 due to process upset resulting in overflow of oil/water emulsion from tanks into disposal tube; and 50 bbl in 1991 after a pipeline riser ruptured when snagged by grappling hook used by workboat to retrieve a lost anchor. The source of oil spilled in 2012 was primarily from Platform Houchin caused by a burst plate (35.78 bbl, per USCG).

According to BOEM, the current knowledge of the geology and understanding of reservoir characteristics in the SPCA is well advanced, and the SPCA has experienced significant changes in the status of the O&G fields being developed and produced compared to the beginning of production. Reservoir pressures have dropped to near zero in the majority of the fields now in production, and additional methods are needed to push and increase flow to the surface (BOEM 2023). As a result, BOEM concludes the risk of a loss of well control (a blowout) resulting in a spill is exceedingly small under these conditions.

The oil spill risk in the “50 to 1,000 bbl” range was estimated by BOEM for the POCSR using historic oil spill data (1963–2022) and cumulative production from the Pacific Region (BOEM 2023). The date of first production at these platforms varies, from the late 1960s (offshore Carpinteria) through the early 1990s. BOEM estimated the number of oil spills and the probability of one or more spills that could occur as a result of ongoing activities in the SCPA in the “50 to 1,000 bbl" size range using Pacific Region oil spill rates (Table 11). Oil spill rate is calculated as a function of the volume of oil handled or the amount of oil that could be exposed. Oil exposed is defined as the volume of oil produced or transported within a given area. Therefore, the total amount of oil that could be economically produced in the SCPA was used as this exposure variable. In the “50 to 1,000 bbl" size range, BOEM estimates there will be 1 spill, with a 63% probability of at least one oil spill occurring (based on oil production history spanning 60 years) (Table 11). According to BOEM, the probability of an oil spill occurring decreases with the decreasing amount of oil left to be produced, particularly because the POCSR fields are mature and the majority of reservoirs have low to no pressure and require artificial lift to access the oil (BOEM 2023). Note that BOEM did not include the 80,900 bbl 1969 oil spill in this calculation, since they concluded it does not fall within the “50 to 1,000” bbl size range for spill probability calculations. Ultimately, BOEM concludes that a spill of this size is an extreme event and not reasonably foreseeable, particularly since that spill occurred soon after production began, when oil reservoir pressures are highest. Since that spill, as mentioned, from 1970-2022, there were nearly 1,500 oil spills with an average volume of 1 bbl spill, which represents less than 2% of volume spilled in 1969 (BOEM 2023). Since only 2 spills over 1,000 bbl have occurred throughout the 60 year timespan analyzed in the POCSR dataset, BOEM states that a spill of this size would be an unlikely event, and they do not anticipate any oil spill greater than 1,000 bbl as a direct result of their O&G activities, because the majority of reservoirs have low to no pressure now due to the maturity of the oil fields.

A variety of factors contributed to the Bureaus' oil spill probability estimates and related conclusions, including their conclusion that they do not anticipate any larger oil spills in excess of 1,000 bbl. These factors include the oil spill history associated with POCSR, which reflects lower oil spill risks within this area as compared to other OCS areas under the Bureaus' authority. These conclusions are also supported by the long-established nature of this drilling program, which is currently producing oil and gas from mature fields with lower pressure that minimizes the risks of larger "blowout" spills. An additional factor supporting these conclusions is the lack of floating drilling rigs (which BOEM suggests are more at risk for oil spills); as well as the fact that no new platforms are being installed that could add new sources of potential spills. In addition, no oil is being transported via vessels, as it is in the Gulf of Mexico and other areas such as the Alaska North Slope, which present a different suite of oil spill risk factors (BOEM 2023).

Table 11. Estimated spill rate, mean number of oil spills, and spill occurrence probability in the POCSR for oil spills with volume greater than 50 but less than 1,000 bbl, and oil spills equal to or greater than 1,000 bbl.

Spill volume (bbl)	Dataset	Years	Structures	Spill rate (per Bbbl)	Estimated mean # spills	Probability ≥ 1 spill over proposed action
50-1,000	POCSR	1963-2022	Platforms & Pipelines	4.38	1	63%
50-1,000	U.S. OCS	1996-2010	Platforms & Pipelines	12.88	3	95%
≥ 1,000	U.S. OCS	1996-2010	Platforms	0.25	0.06	3%
≥ 1,000	U.S. OCS	1996-2010	Pipelines	0.88	0.20	4%
≥ 1,000	**U.S. OCS**	**1996-2010**	**Total**	**1.13**	**0.25**	**7%**

Source: Table A-2 in Appendix A of Bureau's BA

Thus, using POCSR data from 1963-2022, the estimated rate of spills greater than 50 bbl and less than 1,000 bbl is 4.38 spills per billions of barrels (Bbbl). Given the anticipated POCSR production of 0.226 Bbbl, the probability of one or more spills greater than 50 bbl and less than 1,000 bbl is 63%. Using data from the U.S. OCS from 1996-2010 (Anderson et al. 2012), including areas such as the Gulf of Mexico where the risk of oil spills is higher given their current level of production activity, estimated spill rate described in the BA was 12.88 spills per Bbbl, with the probability of one or more spills greater than 50 bbl and less than 1,000 bbl happening at 95%. However, those U.S. OCS data are from a shorter (14-year) time period, and inclusive of all OCS platforms and pipelines, which is less informative than the use of a longer (1963-2022) time series that is from the POCSR which encompasses the action area.

The BA describes the spill rate for an oil spill greater than or equal to 1,000 bbl as less for platforms (0.25 per Bbbl) than for pipelines (0.88 Bbbl), with a total spill rate equal to 1.13 per Bbbl. For both platforms and pipelines, the BA calculates the probability of a greater than 1,000 bbl oil spill during the lifetime of O&G production as 3% and 4%, respectively, for a total of 7%.

The slightly higher risk from an oil spill from pipelines is likely due to the fact that most of the oil produced in the SCPA is transported to shore via the vast pipeline infrastructure found offshore. Accidental pipeline breaks from underwater landslides, anchoring (including dragged anchor), storms, and an aging pipeline infrastructure are the causes of most pipeline spills, based on what has been documented in the Gulf of Mexico (NMFS 2020g; OPR-2017-9234).

As described in detail above, BOEM has calculated the future risk of oil spills in the POCSR based on historical oil spill data from the POCSR. During the consultation, NMFS raised questions to BOEM about the potential contribution of aging infrastructure to the risk of future oil spills in the POCSR. In response, BOEM explained how their oil spill risk assessment considers the potential impacts of aging infrastructure (February 9, 2024 email from Susan Zaleski, BOEM, sent to Dan Lawson, NMFS). BOEM states the regional data show that the number of oil spills greater than one barrel has decreased over time (Appendix A, Table A-1 *in* BOEM 2023), and the probability of an oil spill occurring decreased with the decreasing amount of oil left to produce (Appendix A-1: Oil Spill Risk Assessment and Methods; Table A-2 *in* BOEM 2023). As described in greater detail in the BA, there are four systems in place that contribute to the decreasing amounts of oil spills by protecting against aging infrastructure: a pipeline leak detection system (Section 7.1); pipeline internal inspections (Section 7.2); pipeline external inspections (Section 7.3), and structure inspections (Section 7.4). These requirements are described in more detail below.

Leak Detection

A leak detection system is required on all oil pipelines in the POCSR. The authority for the requirement is based on 30 CFR 250.1004(b)(5). The system consists of equipment at both the production end of the pipeline (the offshore platform) and at the onshore delivery point. The system uses instrumentation to compare the volume of material sent from the platform to the volume of material received onshore. If there is no difference in the two volumes, this indicates that there is no leak. Note that a leak detection system does not prevent a leak from occurring; but it plays a crucial role in limiting the impact of a leak. The system is required to include an alarm so that operators are notified when there is a discrepancy between the input and output volumes. The system is also required to have adequate sensitivity to detect variations between the input and output volumes. In lieu of the foregoing system description, the BSEE can approve an alternate method of a system capable of detecting leaks in the pipeline. Prior to a leak detection system's installation, a BSEE engineer reviews the system. The engineer is also notified at least 72 hours prior to the system's initial testing to allow BSEE the opportunity to witness the test.

Internal Pipeline Inspections

Permittees of pipelines are required to perform internal inspections in alternating years by a third party, within an interval not to exceed 13 months. Inspection plans must be submitted to BSEE for review a minimum of 30 days before the surveys are conducted. The survey results must be received by BSEE within 60 days after inspection completion. The internal surveys are done to identify corrosion and/or damage using methods approved by BSEE. BSEE reviews the inspection results for indications of characteristic "red flags" that would shut in a pipeline, i.e., wall loss of 80% or greater (ASME B 31G); dents over 6% or with a gouge, stress riser, or corrosion; or dents over 2% at girth or seam welds (ASME B 31.3 and 31.8). If a pipeline has a wall loss in the 70–79% range or a significant increase of wall loss from the prior internal inspection, BSEE will consider a verification inspection. If the inspection indicates that the pipeline does not provide safe and pollution-free transportation of fluids, the pipeline will be shut in.

External Pipeline Inspection

Permittees of pipelines are required to perform external inspections in alternating years by a third party, within an interval not to exceed 13 months. Inspection plans must be submitted to BSEE for review a minimum of 30 days before the surveys are conducted. The survey results must be received by BSEE within 60 days after inspection completion. External inspections are to be conducted by a remotely operated vehicle (ROV) with video and sonar, a high- or ultra-high resolution side scan sonar, or another method approved by BSEE. Inspection points include pipeline risers and riser clamps; any grout bags, spans, debris or other object which might constitute a pipeline safety concern or hazard to commercial fishermen or other users; identification of any weight or other coating damage; identification of third-party damage, such as anchor scars; observations of rectifiers and anodes; and visual inspection of the splash zone.

Structure Inspections

Title 30 CFR Part 250 Subpart I contains requirements for the maintenance, inspection, and assessment of platforms and related structures on the POCSR. Lessees and operators must ensure the structural integrity of all platforms and related structures on the POCSR for the safe conduct of drilling, workover, and production operations. Lessees and operators must implement a comprehensive in-service inspection plan for all POCSR platforms and structures. They must submit an inspection report to BSEE annually. The report must include:

1. A list of fixed and floating platforms inspected in the preceding 12 months;
2. The extent and area of inspection for both the above-water and underwater portions of the platform and the pertinent components of the mooring system for floating platforms;
3. The type of inspection employed (e.g., visual, magnetic particle, ultrasonic testing);
4. The overall structural condition of each platform, including a corrosion protection evaluation; and
5. A summary of the inspection results indicating what repairs, if any, were needed.

During platform visits, BSEE inspectors visually inspect platforms and the pipelines and conductors that descend from them for structure issues. BSEE inspectors also respond to accidents and other hazardous incidents that are reported by the lessee/operator.

BOEM asserts these systems help support the conclusion that the age of the infrastructure is not a major factor in oil spill risk. Further, BOEM asserts there is no indication that age of infrastructure has contributed to recent large oil spills in the region. BOEM highlights that the investigation into the 2021 Huntington Beach oil spill by the National Transportation Safety Board determined that the spill resulted not due to age of infrastructure, but from contact of cargo ship anchors with the underwater pipeline (https://data.ntsb.gov/Docket/?NTSBNumber=DCA22FM001).

Ultimately, we choose to rely upon BOEM with respect to how best to model and characterize oil spill risks, given their expertise, experience, and knowledge of the factors that influence oil spill risks, and their understanding of how O&G activities are anticipated to continue into the future, for at least the next 20 years. We are not in possession of any additional or contradictory information that suggests the risk of oil spills should be expected to be greater or lower than what BOEM has asserted is the best available information. Therefore, we rely on BOEM's oil spill risk analysis that uses of an anticipated spill rate of 4.38 per Bbbl, derived from historical POCSR data, to assume the chances of one or more spills occurring of a size that is greater than 50 bbl and less than 1,000 bbl over the expected remaining period of O&G activities (for at least the next 20 years) is 63%, and that a spill up to 1,000 bbl should be anticipated to occur. Given the historical spill information from the POCSR over the last 60 years, the monitoring and response program infrastructure established in place to prevent or respond to any oil spills that occur, and the relatively low level of production that is expected from oil reservoirs during the lifetime of operations, we accept BOEM's conclusion that a spill greater than 1,000 bbl is very unlikely as the best available information, and will not anticipate that such an event will occur during the remaining lifetime of O&G production.

2.5.3.1.1 Analysis of oil spill effects

In order to conduct our analysis, it is helpful to characterize spills from both sources (platforms and pipelines) collectively into spill size categories per area of risk within the SCPA. The primary assessment method to estimate oil impacts on marine life is to evaluate the likelihood of direct oil exposure, which is related to the size of the spill, but also to the location of a spill relative to areas of highest exposure risk for marine life within the action area. We note that BOEM has provided the probability of two sizes of oil spills that may occur over the future of O&G activities in California. This is based on historical spill rates in the area, noting that the largest oil spill occurred in 1969 (nearly 81,000 bbl), which occurred soon after production occurred. As mentioned above, for over the next 50 years, from 1970 through 2022, there were nearly 1,500 spills, with an average spill volume of less than 1 bbl and a total of ~1,500 bbl spilled during that time, which is ~2 percent of the 1969 spill. The largest spill during that time occurred in 2021, with 588 bbl spilled ("Huntington Beach" spill). This spill was detected on October 1, 2021 as a mystery sheen observed around three and a half miles off Huntington Beach, and as described earlier, was later determined to be a leak from a pipeline associated with the platform Elly (Beta Unit), with the pipeline possibly sustaining damage from a ship. Active response efforts concluded on February 2, 2022, and a natural resource damage assessment was initiated through the California Department of Fish and Wildlife (and is ongoing) (https://response.restoration.noaa.gov/oil-and-chemical-spills/significant-incidents/huntington-beach-oil-spill).

We can discern a lot about the potential effects of an oil spill from the 2015 Refugio oil spill, caused by a pipeline rupture along the 101 freeway and owned by Plains All American Pipeline. This rupture was not due to any activities managed or under the authority of BOEM/BSEE, so they were not involved in the prevention of this type of spill nor any of the response and restoration. On May 19, 2015, a 24-inch diameter buried pipeline ruptured in Santa Barbara County in the vicinity of Refugio State Beach. The pipeline, known as Line 901, transported heated crude oil extracted from deep subsea formations at several offshore platforms. As a result of the rupture, an estimated 2,934 bbl (123,228 gallons) of heavy crude oil were released from the pipeline. The shorelines from the release point, within Refugio State Beach to El Capitan State Beach, received the heaviest coastal oiling. Shorelines located further down the coast as far south as Long Beach, California were intermittently oiled with tarballs and subject to beach closures, with the level of oiling generally decreasing farther away from the release point. Subtidal habitats in the vicinity of the release point also experienced oil exposure. Thus, the trajectories of larger spills may impact oceanic and coastal habitats located far from the release point, which is why modeling such trajectories given varying scenarios within the action area are important in analyzing effects and response activities to listed species and critical habitat.

For analyses of potential oil spill trajectories, BOEM collaborated with NOAA's Office of Response & Restoration to create a model to determine the movement and fate of spilled oil within the SCPA. The Trajectory Analysis Planner (TAP: https://tap.orr.noaa.gov/#locations/south-california/impact_analysis), as described in Section A-4 of the BA, outputs modeling of realistic oil spill scenarios over a range of different regional oceanographic regimes, such as upwelling, relaxation, and eddy-driven flow. As described in Appendix A, we used the TAP to model oil spills from pipelines and platforms within areas of offshore O&G operations in southern California, using the parameters provided by BOEM in the BA describing the maximum spill scenario they anticipated. The scenario BOEM described involved modeling a maximum hypothetical spill of 1,000 bbl from each location using a spill rate of 200 bbl per day over 5 days, resulting in an accumulation of 5 bbl or more by 21 days since the maximum spill occurrence. We used the scenario provided by BOEM to help assess the potential impacts to important areas of interest (e.g., coastlines, islands, open ocean, critical habitats, etc.), depending on which ESA-listed species or critical habitat we were analyzing may be affected by such an oil spill. Within the TAP model, the level of concern is the specified threshold for a volume of oil that will make it to a specific location (defined by 2.3 km x 2.3 km cells throughout the action area in the TAP model) from an oil spill of a given size that is simulated. We used the level of concern set at 5 bbl per cell that BOEM used to support their BA in order to understand the percentage of 1,000-barrel spills for which at least 5 bbl of oil may reach any specific cells (i.e., locations) associated with areas of interest/concern over 21 days.

BOEM provided estimates of the likelihood of spills of different size categories occurring within the POCSR, and also provided information on possible spill trajectories based on an analysis of how spilled oil could move in the environment if it were released from hypothetical "launch points," i.e. potential spill locations such as platforms and pipelines. However, information is not available that would allow NMFS to predict the relative likelihood of a spill of a given size occurring at one location versus another. There is of course considerable uncertainty regarding spill locations, since, as BOEM notes, oil spills are inherently accidental events that are "neither authorized nor intended to occur." For the purposes of our assessment of potential effects from an oil spill, we consider the likelihood of a spill occurring at any one location to be effectively equally as likely as a spill at any other location. As a result, we simulate and evaluate the risks associated with oil spills across all locations throughout the action as if an anticipated spill was equally likely and expected to occur at each location. However, we acknowledge that we only expect any oil spill that occurs to happen at one location, as opposed to happening at all locations simultaneously.

Table A-3 in the BA includes a list of discharge scenarios that would be of greatest concern at each facility that were identified in oil spill response plans that have been submitted for each of the Federal platforms ("facilities"). That table includes information on the risk of oil spills given the number and orientation (e.g., pipeline to shore, pipelines between facilities) of pipelines at the various facilities, storage, and known drilling activity (bbl/day). While this was informative, we chose to focus our model scenarios using platforms and pipelines throughout the SCPA, and, by simulating oil spills, assessing the impact to known areas that might present risk to ESA-listed species and critical habitat. For example, for an oil spill originating from facilities/pipelines off Lompoc, Gaviota, or Santa Barbara, we can project how and where a 1,000 bbl oil spill would typically be transported and subsequently, how likely it would impact the northern Channel Islands, where we have important rocky intertidal habitat and designated critical habitat for black abalone. Similarly, for a spill originating from facilities within the Beta Unit Complex (offshore and southwest of Huntington Beach), we can project how and where a spill might typically be transported and whether it might be likely to impact proposed designated critical habitat for green sea turtles in the coastal areas of Bolsa Chica, north of Huntington Beach or offshore to Catalina Island. The results of our assessment of potential impacts to important areas of risk to ESA-listed species and critical habitats are presented and described as appropriate throughout this section, and are illustrated in Appendix A.

In assessing the potential impact of an oil spill up to 1,000 bbl, if it occurs, we considered the potential magnitude of impacts that could be associated with a spill of/up to this size. Generally speaking in other ESA consultations on oil and gas projects, BOEM and NMFS have characterized spills less than 1,000 bbl to be "small" spills (NMFS 2019b; AKRO-2019-00004), or have focused analyses of potential effects to ESA-listed species and designated critical habitats on spills larger than 1,000 for the purposes of identifying and describing any adverse effects that would be anticipated (NMFS 2020g; OPR-2017-9234). These consultations have generally considered that "small spills" pose less of a threat to ESA-listed species and designated critical habitat because the impact from these spills diminishes rather quickly due to natural processes such as weathering, and rapid spill dispersal, and exposure of species of most species that are mobile is expected to be minimal (NMFS 2019b). We also note that federal regulations regarding oil spill response activities define a "medium discharge" of oil as a "discharge of 10,000 to 100,000 gallons of oil to the coastal waters (40 CFR Appendix E to Part 300). For context, the oil spill that we anticipate to occur could be up to 42,000 gallons (1,000 bbl = 42,000 gallons), placing it firmly within the medium discharge category.

To a large extent, most of the adverse impacts from oil spills that have been documented have been generated as a result of study from large/very large oil spills, such as the Deepwater Horizon (DWH) and the Exxon Valdez, where ~134 million gallons (3.2 million bbl) and ~11 million gallons (262,000 bbl) of oil were spilled, respectively (NOAA Office of Restoration). NOAA recognizes that even relatively small spills can cause major harm, depending on the location, season, environmental sensitivity, and type of oil.[8] The extent of an oil spill that is

[8] https://response.restoration.noaa.gov/sites/default/files/2015_largest-oil-spills-us-waters_noaa.jpg

anticipated to occur as part of this proposed action would not be considered a large spill in the context of historical examples, and how BOEM and NOAA generally characterize the magnitude of spills. With a volume of no more than 1,000 bbl, such a spill would most likely be characterized as a small spill, leading in most cases to relatively minimal risks of extended exposure for many species, especially at any large distance away from the original source of the spill. As a relatively small spill (at most), we expect that the impacts of such a spill will generally diminish in a relatively short amount of time, due to natural processes such as weathering, and rapid spill dispersal, and that in most cases the exposure of most ESA-species that are mobile is expected to be minimal. This is also consistent with the fate of oil that has been described with local seeps in the action area, in the open ocean environment where an oil spill associated with this proposed action would occur.

However, we acknowledge that there are scenarios of oil spills that increase the potential for larger impacts to ESA-listed species and critical habitats, including spills where significant quantities of oil reach nearshore coastal areas. Some species and habitats in these areas may be more susceptible to impacts, given their "fixed" location and known vulnerability to oil spill impacts. As summarized in the BA, BOEM's expectation is that "a 1,000-bbl spill could oil several kilometers of coastline. The likely result would be patches of light to heavy tarring of the intertidal zone resulting in localized effects to contacted biological communities. The recovery time for these communities would depend on the environment. Within several months, natural processes will remove the oil from the rocks and beaches in these high energy rocky coasts, while low energy lagoons and soft-sediment embayments can retain stranded oil residue for several years."

Our analysis will consider the relative magnitude of the oil spill event and impact that is anticipated as described above, along with consideration of scenarios that may be more/less impactful based on specific conditions, as appropriate.

2.5.3.1.2 General Oil Spill Risk Assessment

The American Petroleum Institute (API) number is a unique number assigned to every oil and gas well, and is used by agencies to identify and track oil and gas wells. Oil in the SPCA ranges from very heavy (API 12) to very light (API 39). Crude oil contains different compounds of toxic aromatic chemicals that have at least one benzene ring. When crude oil is released, it immediately begins the degradation process, or weathering. Some oil compounds will weather by evaporation, dispersion into water, or bacterial degradation, while others will not, such as polycyclic aromatic hydrocarbons (PAHs). Different crude oils have different chemical compositions that are governed primarily by the geologic conditions under which they were formed, migrated, and accumulated. These conditions can result in oil from a given location or geologic formation having a unique chemical composition, including specific compounds that help experts distinguish one crude oil from another. The fate and transport of oil and gas after a spill differs. Oils may sink, become entrained in the water column, or surface. Light crude oils can lose up to 75% of their initial volume within a few days of a spill (NRC 2003), while heavy oil (API < 22) has a negligible evaporation rate and solubility in water. The moment oil reaches the surface, it begins to evaporate the aromatic compounds and the remaining heavier compounds react to other environmental conditions (i.e., sun, wind, waves, currents). Natural gas may remain submerged and be degraded by bacteria prior to reaching the surface, depending on the depth of the spill. The same bacteria produce mucus that may form with oil droplets and cause marine oil snow that then settles to the seafloor.

As summarized in Appendix A of the BA, depending on the type of oil spilled and the environmental conditions (i.e., sea state) at the time of the spill, 6 to 60% of oil during an oil spill would sink and be in the water column or on the seafloor in the vicinity of the spill (ADL 1984). Support for these statistics include a study of natural oil seeps at Coal Oil Point in the Santa Barbara Channel ranging in depth from around 20 to 70 meters and located a few kilometers offshore of Goleta, California (Leifer et al. 2006). This natural seep field is assumed to release around 80-100 bbl oil per day (Hornafius et al. 1999). Seeping hydrocarbons include tar, oil and gas, with oil slicks tens of kilometers long often visible, with tar washing up on southern California beaches. The amount of tar washing up adjacent to Coal Oil Point may be on the order of at least 100 times more than any other location. Oil seeped from this site are influenced by ocean currents, which follow the shoreline towards the northwest, convergence zones (which, when oil is continuously entering and being trapped, may subsequently weather and show up in thicker layers), and wind, which may influence the movement of any lighter oil and increase evaporation (Leifer et al. 2006). While these processes are for an oil slick from a natural seep, similar processes on the sea surface and within the water column are likely to occur for an oil/gas pipeline blowout.

Oil spills directly affect ESA-listed species through various pathways and often animals may be exposed in all pathways at the same time. Depending on the species, exposure pathways include external contact (through the skin and eyes), inhalation, aspiration, and oil ingestion (through oiled prey or accidental oil ingestion). Disruption of other essential behaviors, such as breeding, communication, and feeding may also occur. External contact with oil can cause irritation of the eyes, skin, and mucus membranes. In addition, oil present around a blowhole or in the mouth could lead to aspiration of oil. External contact can potentially transfer into the bloodstream; however, uptake through the skin has been considered unlikely in healthy cetacean skin in high salinity waters due to the tight intercellular bridges and thick epidermis (O'Hara and O'Shea 2001). The effects of long-term skin exposure that could occur result from large and long-lasting spills have not been determined for most species.

Hydrocarbon spills have varying levels of negative impacts on listed species and the marine environment depending on the size and location of a spill. Oil spills associated with the proposed action can occur for a number of reasons including equipment failure, human error, natural forces such as hurricanes, or a combination of causal factors. Sources of spills include drilling platforms, well-heads, vessels, pipelines, and oil barges. The volume of oil released can range from “droplet” leaks to millions of barrels. When spills do occur, the size of the spill depends on the volume (in a container or within the earth), the flow rate (a low-pressure/low-flow leak up to a high-pressure/high-flow event), and the capability of the responsible party or response agencies to contain and control the source of the spill and clean up the oil. An oil release will continue until either the reservoir is depleted or until the release is brought under control. Oil spills are accidental and unpredictable events, but are a direct consequence of oil and gas development and production from federally regulated oil and gas activities in the SCPA. Oil releases can occur at any number of points during the exploration, development, production, and transport of oil. Any discharge of hydrocarbons into the environment is prohibited under U.S. law. Consequently, there are stringent regulatory mechanisms, industry best practices, and BOEM/BSEE-required spill response plans in place to reduce the risks associated with oil spills. The following analysis will consider the risk of oil spill events and the consequences they could have on ESA-listed species and designated critical habitat.

2.5.3.2 Effects of Oil Spill Response Planning and Implementation in Avoiding or Minimizing Adverse Effects to ESA-Listed Species

In response to risks with oil spills, BOEM is required to develop spill response plans to minimize their effects according to BSEE regulations at 30 CFR Part 254. Spill response organizations help industry operators prevent, prepare for, and respond to spills. These plans are not subject to Federal approval and thus not included as part of this consultation (Alaska Wilderness League v. Jewell, 788 F.3d 1212, 1224-25; 9th Cir 2015) (as described in section A-3 of the BA). BSEE conducts regular inspections and spill response exercises (section 1.3.8 and 1.3.9, respectively). Spill response materials are stored and staged near potential sources. These conditions help reduce both the potential for and size of spills.

Oil spill response is generally seen as having overall beneficial effects in that it removes oil and thus lessens the effects discussed above. However, there are several aspects of response that introduce novel stressors. Oil spill response plans (OSRPs) are an important planning tool to enable a quick and effective response once oil spills occur. BSEE's preparedness standard operating procedure can be found at https://www.bsee.gov/sites/bsee.gov/files/bsee-sopapproved-2017-edition.pdf. We expect some response activities to have positive effects, but they can also introduce negative effects (as we discuss below). Given that both are expected and the complicated nature and lack of information on effects, we are unable to quantify them. As a result, we provide an overall discussion of potential impacts based on the best available information. Our exposure analysis is assumed to include all animals that would be affected by oil spills and/or by response activities.

The recovery of oil would vary, but planning for such responses is intended to ensure that adequate equipment and resources are available to be quickly deployed in the event a spill that warranted oil recovery occurred. Removing or directing oil away from sensitive areas as quickly as possible limits the exposure time and could reduce the severity of oiling of some listed species (e.g., black abalone) that come into contact with oil, or limit the amount of oil that is transported by wind and currents to locations where important listed species' habitats are found (i.e., black abalone critical habitat and proposed green sea turtle critical habitat). Oil recovery and removal is net beneficial to listed species and their habitats, although some negative impacts could occur.

The purpose of oil spill response, including the deployment of boom and skimmers, dispersants, or in situ burning, is to contain and/or divert oil to ensure the avoidance of fouling sensitive areas, including the nearshore environment. Containment boom deployments, and surface skimmer response operations may occur in the same areas as ESA-listed species and their designated critical habitats if an oil spill occurs. We consider the effects of mechanical removal operations to be minimal compared to other oil spill response methods (NMFS 2020g). The use of boom and skimmers can only recover 40 percent of an oil spill, at best (ORR 2018), meaning their use is often coupled with other cleanup methods. Vessels associated with oil spill response in the immediate vicinity of a spill are expected to be moving very slowly, so we would not expect response vessels in the vicinity of the spill to strike or adversely affect listed species. Offshore spills require activities that are most likely to affect sea turtles at the surface, particularly small juveniles that dwell in the upper water column. As such, skimmers that are used to remove oil can incidentally entrap and kill sea turtles at the surface or entrained in oil (DWH NRDA Trustees 2016). Unlike the Gulf of Mexico, where thousands of juvenile green and loggerhead turtles associate with *Sargassum* and may be affected by oil spill response activities, the likelihood that a sea turtle may become entrapped and killed by a skimmer during a relatively small oil spill along the southern California coast is extremely unlikely. While there may be some risk of displacement of some ESA-listed species, including marine mammals, sea turtles, and marine fish, due to the presence of response vessels, which would be slow-moving, and deployment of gear, these species are highly maneuverable and any impacts are likely to be temporary. Generally, most of those activities involve vessel-related operations at the surface, which are not likely to impact marine invertebrates, including black abalone. Therefore, we expect the effects of mechanical removal of oil on listed species to be extremely unlikely, or so minor that they cannot be meaningfully evaluated.

We note that clean-up activities such as the use of high pressure and/or high temperature water to flush out oil off the shoreline could negatively affect intertidal algal and invertebrate communities. The uncertainty associated with when, where, and how response efforts will occur in response to an oil spill anticipated under the proposed action does not allow for quantification of response effects of using high pressure and/or high temperature water to clean up shorelines. Generally, those effects would be localized and minimized through Area Contingency Plans (ACPs), which are discussed further in this section, where applicable.

The use of dispersant in response to oil spills in California, including within the proposed action area, is authorized and managed under the California Dispersant Plan (CDP). The potential effects of the CDP were evaluated by NMFS in a previous ESA consultation with the USCG and EPA (NMFS 2018b; WCR-2018-9670). In that consultation, NMFS concurred with USCG and EPA's determination that use of dispersants, as described and managed under the CDP, was not likely to adversely affect any ESA-listed species or designated critical habitats. In particular, NMFS pointed to the protective practices adopted by the action agencies in the CDP, including use of PSOs for monitoring, minimum buffers surrounding sensitive species or habitat, and vessel speed limits, among other things, as supporting the analysis that the use of dispersants under the CDP was not likely to adversely affect ESA-listed or critical habitats. In addition, it is not clear to what extent dispersants should be expected to be used in conjunction with the size oil spill that is anticipated under this proposed action (described in section 2.5.3.1), given that dispersants are generally associated as being helping control areas of large or very large spills (NMFS 2020g), which is not expected to occur as a result of the proposed action. Given this, we anticipate that the possible effects of the use of dispersants as a consequence of this proposed action will be extremely unlikely, or be so minor that they cannot be meaningfully evaluated.

The use of in situ burning in response to oil spills in California, including within the proposed action area, is authorized and managed under the California In-Situ Burn Plan. The effects of in situ burning of oil on ESA-listed species and critical habitats have not been well documented

(NMFS 2020g). Effects may result from inhalation of smoke and particulate matter in the air or inadvertent exposure of listed species to oil burning at the surface. A review of smoke inhalation cases in other animals shows that smoke can irritate or inflame airways, denude mucosal surfaces, and cause systemic toxicity which can lead to lung-induced morbidity and potentially mortality (Demling 2008). Most ESA-listed species that may occur in the action area are submerged a good portion of the time, but could be exposed to hazardous particulates and irritants during breathing periods at the surface.

It is not clear to what extent in situ burning of oil should be anticipated to occur in conjunction with the size oil spill that is anticipated under this proposed action (described in section 2.5.3.1). This activity is most likely to be associated where it is imperative to quickly remove large quantities of oil to protect on-water resources, and has only been pre-authorized outside of 35 nautical miles off the coast of California, although it may be authorized in other areas on a case-by-case basis (USCG 2008). As explained in section 2.5.3.1, a large spill is not expected to occur as a result of the proposed action. The uncertainty associated with when, where, and how response efforts will occur in response to an oil spill anticipated under the proposed action does not allow for quantification of response effects of in-situ burning. Generally, the impacts of burning should not extend to animals that reside under the water.

As described above, we expect the effects of oil spill response on ESA-listed species associated with the size oil spill that is anticipated under this proposed action to be so extremely unlikely, and therefore discountable, or so minor that they cannot be meaningfully evaluated, meaning they would be insignificant. Where there may be potential for more effects, the risks cannot be further evaluated with the available information.

2.5.3.3 Effects of Oil Spills on Marine Mammals

Large Whales

Exposure

O&G activities occur in known areas inhabited by large whales, and relatively large oil spills pose an increased likelihood of exposing these whales to oil, depending on the time of year, location and trajectory of the oil, and density of fin, humpback, and blue whales, the three species most likely to be found in the action area and subsequently may be affected by oil spills. The overlap of active oil and gas leases and pipelines with predicted densities of these whale species can help inform the risk of oil spills to individuals and populations, but this needs to put into context the anticipated production (0.226 Bbbl) in the POCSR from now until the future (i.e., continuing for at least the next 20 years).

Some species of ESA-listed whales have a very low probability of occurring in the action area at any time, and their presence in an area impacted by spilled oil during an event that may occur over the course of a 20-year or more period is extremely unlikely. Additional information about their exposure and/or response to effects considered in this biological opinion can be found in Section 2.12 *Not Likely to Adversely Affect Determinations*. North Pacific right whales are extremely rare in the action area, and only a few individuals have been seen off California since the early 1900s, so we consider the risk of overlap of this species with an accidental oil spill to be extremely unlikely to occur, and therefore exposure to any adverse effects from such an oil spill discountable. In addition, available information on the movements of Southern resident killer whales suggest that they have not been sighted or tracked south of Monterey Bay. Therefore, we consider the risk of overlap of Southern resident killer whales with an accidental oil spill to be extremely unlikely to occur, and therefore exposure to any adverse effects from such an oil spill discountable. Sei whales are rarely seen during NMFS ship-board surveys anywhere along the U.S. West Coast, and never within southern California, and there have been only a few strandings (ship strike) over the last 30 years (Carretta 2023a). Therefore, we consider the risk of overlap of this species with an accidental oil spill to be extremely unlikely to occur, and therefore exposure to any adverse effects from such an oil spill discountable. Sperm whales are typically found foraging in deep water, canyons and escarpments; and would rarely be found in the action area. Therefore, we consider the risk of overlap of this species with an accidental oil spill to be extremely unlikely to occur, and therefore exposure to any adverse effects from such an oil spill discountable. The endangered Western North Pacific gray whale forages primarily off northeastern Sakhalan Island (Russia) with a distribution extending primarily south along Japan, the Koreas, and China. Although in recent years a few whales from this population are known to have migrated along the eastern basin of the Pacific and south to the Mexican breeding grounds. Given the rarity of this endangered population in the area, we conclude that the risk of overlap of Western North Pacific gray whales with oil spills are extremely unlikely to occur, and therefore exposure to any adverse effects from such an oil spill discountable.

Other species of ESA-listed marine mammals are more commonly found in the action area, and may be exposed to an oil spill resulting from the proposed action, if one occurred. This includes fin whales, blue whales, Central America and Mexico DPS of humpback whales. As a result, we consider the potential effects of oil spills on these species next.

During and following the 2015 Refugio oil spill, no large whales stranded during the spill period, but several were observed (including a mother/calf pair) in the spill area both by local news agencies in the first days of the spill and during Natural Resource Damage Assessment (NRDA) marine mammal boat surveys (Refugio Beach Oil Spill Trustees 2021). During and following the 2021 Huntington Beach oil spill, no large whales were observed or recorded as being impacted by the oil spill,[9] although a final NRDA report and assessment of impacts has not yet been released. While some small cetaceans were determined to be affected by the Refugio oil spill and the Huntington Beach oil spill, large whales are less consistently distributed throughout specific coastal areas, and their presence varies greatly seasonally, as influenced by highly variable and dynamic concentrations of prey.

Blue whales are not evenly distributed along the U.S. West Coast, and they are found in aggregations, especially on the continental shelf edge, with greater tendency to aggregate off California compared to Oregon and Washington (Croll et al. 2005; Keiper et al. 2011). Shifts in blue whale distribution of blue whales have been recorded since the late 1990s, including documented movements from California north to areas off British Columbia and Alaska. These changes appear related to decadal oceanographic variations (i.e., Pacific Decadal Oscillation

[9] https://darrp.noaa.gov/oil-spills/pipeline-p00547-huntington-beach-oil-spill

(Calambokidis et al. 2009)). Calambokidis et al. (2015) identified nine biologically important areas for blue whales based on high concentration areas of feeding animals observed from small boat surveys, ship surveys, and opportunistic sources. Although the BIAs for blue whales represent relatively small portions of the overall West Coast EEZ, the areas encompass a large majority of the thousands of sightings documented and evaluated. Within the action area, the following BIAs for blue whales were identified: Point Conception/Arguello; the Santa Barbara Channel and San Miguel, Santa Monica Bay to Long Beach; and three others located farther offshore (i.e., San Nicolas Island and Tanner-Cortez Bank) or further south off San Diego. The Bight was identified as an area of high density for blue whales, particularly in the Santa Barbara Channel north of the Channel Islands. Recently, Calambokidis et al. (in press) updated the BIAs for blue whales, with data used to support the existence of "core" areas of use, or areas used notably more intensely, and identified these within a much larger "parent" areas. The revised BIA core area for blue whales was fairly consistent with the 2015 BIAs, extending contiguously within the action area and including Point Conception south to the Santa Barbara Channel and adjacent to the northern Channel Islands. Using the TAP model, a higher risk of co-occurrence of oil and relatively high densities of foraging blue whales in the Santa Barbara Channel from an accidental oil spill would occur from a leak at one of the three platforms in the Santa Ynez Unit. Given the broad distribution of blue whales that might be foraging in the area, a maximum 1,000 bbl oil spill would likely spread over a large area and dissipate rather quickly before reaching individual blue whales.

Fin whales satellite-tagged in the Bight use the region year-round, although they seasonally range to central California and Baja California, Mexico before returning to Southern California (Falcone and Schorr 2013). Additionally, acoustic data indicate that there may be a resident population in southern California waters. Recently, using long-term photo-ID data, Falcone et al. (2022) suggested the existence of two overlapping groups of fin whales off the U.S. West Coast, including a year-round resident group in the Bight that shifts inshore/offshore seasonally and a more transient group with broader seasonal movements ranging much farther north. Thus, in considering the exposure of fin whales to an accidental oil spill, this more year-round residential population may be more vulnerable than those transient whales exhibiting more offshore movements. Overall, similar to blue whales, fin whales occur in both the nearshore and pelagic waters, feeding on both krill and fish (Calambokidis et al. 2015). Recently, researchers updated the BIAs for several species identified in Calambokidis et al. (2015) and added BIAs for fin whales, using habitat density models, satellite tag data, and sightings of feeding behavior from non-systematic effort mostly associated with small boat surveys conducting photo identification work. The final parent BIA was the largest area of all of the BIA's identified in Calambokidis et al. (in press), which makes it more challenging to identify more precise and intensely used areas that might make fin whales more vulnerable to an accidental oil spill. Core BIAs for fin whales were identified further offshore than the core BIAs for blue whales. Using the TAP model to project oil spill scenarios, similar to blue whales, there is a higher risk of exposure of oil to higher densities of fin whales in the Santa Barbara Channel and northern Channel Islands from an accidental oil spill emanating from a leak at one of the Santa Inez Unit platforms, although a maximum 1,000 bbl oil spill would be spread over a large area with an widespread distribution of foraging fin whales.

Humpback whales are most abundant off the U.S. West Coast from spring through fall; however, sightings and passive acoustic detections in this area in the winter and spring indicate a portion of the population can be in northern waters in the wintertime. They are one of the most common and abundant large cetaceans in coastal waters off CA/OR/WA, and as described earlier, the endangered Central America DPS forages primarily off CA and OR, while the threatened Mexico DPS forages off the west coast but also forages off the Pacific coast of Canada and Alaska. Proportions of DPSs feeding shift with latitude. Humpback whale distribution on the feeding grounds is concentrated in coastal areas from the continental shelf to the shelf edge, making them more vulnerable to any accidental oil spills originating from a platform or pipeline associated with O&G activities. The BIAs identified by Calambokidis et al. (2015) and included in the action area, specifically where accidental oil spills may occur from platforms or pipelines, include an area south of Morro Bay to Point Sal (around Lompoc, CA) and the Santa Barbara Channel-San Miguel area, similar to the blue whale BIA. The core BIA identified most recently by Calambokidis et al. (in press) overlapped these two original BIAs to varying degrees. Given their preference to feed in more coastal areas, humpback whales may be vulnerable to an oil spill, particularly originating from the Point Pedernales Unit off Point Arguello, but also from the Santa Ynez Unit north of the Channel Islands. Given humpbacks' wide distribution throughout the area, the exposure of a maximum 1,000 bbl oil spill dissipated across a large range of ocean coming into contact with an individual humpback whale would be low.

Response

Despite a body of knowledge surrounding impacts to many marine mammal species from oil spills, comparatively little is known about the effects of oil on most cetaceans, including large whales in particular. There have been few oil exposure experiments, only a small number of reported observations of wild cetaceans in or near oil, and little published information from necropsies of carcasses of cetaceans known to have been exposed to oil (Helm et al. 2015). Based on the limited records of cetacean mortalities associated with oil spills from 1969 to 1989, including very large oil spills, it has been suggested that an oil spill may only affect small numbers of cetaceans, and the potentially low vulnerability of some species suggest they are able to detect oil (Helm et al. 2015).

Oil spills could directly affect ESA-listed whales through various and concurrent pathways. Exposure pathways include external contact (through the skin and eyes), inhalation, aspiration, and oil ingestion (through oiled prey or accidental oil ingestion). Disruption of other essential behaviors, such as breeding, communication, and feeding may also occur, including if prey resources are reduced. External contact with oil can cause irritation of the eyes, skin, and mucus membranes. In addition, oil present around a blowhole or in the mouth could lead to aspiration of oil. External contact can potentially transfer into the bloodstream; however, uptake through the skin has been considered unlikely in healthy cetacean skin in high salinity waters due to the tight intercellular bridges and thick epidermis (O'Hara and O'Shea 2001). The effects of long-term skin exposure that could occur during long duration spills have not been determined; however, oil was applied to the skin of a live, stranded sperm whale and skin lesions formed (DWH NRDA Trustees 2016). The effects of oil on cetacean eyes have not been determined; however, ringed seals (*Pusa hispida*) showed eye infections and breaking down of the cornea tissue after one day of exposure (Geraci and Smith 1976). Nevalainen et al. (2018) modeled oil spill exposures based on expert elicitation in the Arctic and found medium and heavy oiling to be the most dangerous oil types to seals and seabirds, and the type of oil has a greater effect on impact than does season that the spill occurred.

Crude oil can release volatile vapors, such as benzene, butane, N-hexane, isopentane, and pentane, when it comes into contact with the air. Whales may be at particular risk for inhalation exposure to PAHs within or downwind of a spill due to unique physiological and behavioral characteristics. Whales breathe at the air/water interface, exchange significantly more air and deeper inhalations than humans, and some deep-diving whales (e.g., sperm whales) have deep inhalations followed by a long breath hold on deep dives. Because deep breaths increase chemical inhalation injury to tissues deeper within the lungs, whales may be particularly susceptible when they are at the surface to breathe after a dive to exhale "bad" gasses and replenish "good" gasses to prepare for the next dive. Nursing calves spend a significant amount of time at the surface because they do not conduct feeding dives and wait at the surface for their mothers and, thus, may also be particularly susceptible to inhaled PAHs. Benzene is a known carcinogen in many animals and would likely have similar adverse effects on whales. Inhalation of crude oil vapors or smoke from *in situ* burning of oil could irritate or burn the respiratory system, and even small levels of benzene could cause cancers. A recent study found that in Barataria Bay, Louisiana, which experienced heavy and prolonged oiling during the DWH spill in 2010, bottlenose dolphins were five times more likely to have moderate to severe lung disease, which authors suggest may be related to inhalation exposure to PAHs (Schwacke et al. 2013). Lung injuries due to inhalation of PAHs in large whales would severely impact their survivorship since they must hold their breath to feed. The rapid dissipation of toxic fumes into the atmosphere from rapid aging of fresh oil and disturbance from response related sound and activity could limit the potential exposure of whales to prolonged inhalation of toxic fumes. The DWH oil spill significantly affected some large whales (e.g., Bryde's whales) that depended heavily on the affected habitat and ended up inhaling, ingesting, or absorbing petroleum compounds which may injure their respiratory and gastrointestinal tracts (NMFS 2020g).

Marine mammals are at a risk of oil ingestion due to the spreading of oil in the water and the potential for contact with prey. Whales that may feed at the surface (e.g., lunge-feeding humpbacks) may make them much more susceptible to oil ingestion for surface spills than whales that feed at depth and spend a significant amount of time below the surface. A few experimental studies have fed dolphins relatively low doses of oil for three to four months and showed no clinical, hematological, or biochemical alterations (Engelhardt 1983). Whales are unlikely to ingest oil for the majority of the numerous small spills in the SCPA, unless the oil is dispersed or spilled at depth in high amounts or is accumulated in ingested prey. Deep sea blowouts or subsurface spills could contaminate prey and the subsurface habitat as oil rises through the water column or becomes entrained where prey items are found. Subsurface spills could create tarballs or mats of oil that become entrained in the deep scattering layer where whales feed, that could be mistaken as prey items and accidentally ingested. Ulcers, internal bleeding, and other gastrointestinal disorders could result from ingested oil and oiled prey. Systemic PAH exposure could also result from PAH ingestion. Ingestion of oil may result in temporary and permanent damage to whale endocrine function and reproductive system function; and if sufficient amounts of oil are ingested, then mortality of individuals may also occur.

High levels of subsurface oil could have direct impacts on the prey community that could either lower the foraging success of whales, or cause the whales to move out of an area to a lesser quality foraging patch. A distribution shift may have impacts on survival and productivity of the populations. The impacts of oil spills on the prey of ESA-listed marine mammals are analyzed in the *Risk* section below, as well as section 2.5.3.9 *Effects of Oil Spills on Critical Habitat*.

Risk

While all of these potential health impacts may occur from exposure to oil spills, especially large spills, the evidence suggests these risks may not be high for some cetaceans, particularly large whales. Some of the mitigating factors may include: they lack hair or fur so oil does not compromise their insulation, their skin is nearly impermeable to the components of oil, they do not drink large volumes of sea water and would not ingest much oil, their foraging strategies likely do not include scavenging on oil-killed prey, and the toxic volatile components of oil can dissipate quickly so exposure to toxins through inhalation may be minimal (Helm et al. 2015).

We reviewed the recovery plans and most recent (or relevant) status reviews for large whale species that may be affected by an oil spill (and oil spill response activities) to help us determine the severity of the impact. In the recovery plan for blue whales, the stressor of contaminants and pollutants (such as constituents in oil) was found to potentially affect blue whale habitat, with sublethal health effects and potential mortality, although the severity of the impact was found to be low, with no evidence of population or species-level effect. Actual impacts depend on factors such as the extent and duration of contact and the characteristics of oil. However, the impact to blue whales is considered to be low. As described earlier, the exposure of blue whales to a relatively small (max 1,000 bbl) oil spill relative to their distribution within the action area is low. We described earlier the blue whale BIAs in the area where an oil spill may occur, that is, areas within a spill trajectory from an accidental oil spill from a platform or pipeline. As summarized in Calambokidis et al. (2015), the BIA located in the Santa Barbara Channel and San Miguel Island encompasses an area that is nearly 2,000 km2. Other nearby BIAs such as the area from Santa Monica to Long Beach encompass a nearly 1,200 km2 area. While blue whales will concentrate their foraging efforts in areas of high prey densities for a period of time, they are broadly distributed and wide-ranging, and the likelihood that up to a 1,000 bbl spill will impact individual blue whales is extremely unlikely.

Similar to the blue whale recovery plan, the 2010 fin whale recovery plan identified the threat of pollutants to be of low severity, with a medium level uncertainty likely due to their wide range and distribution (NMFS 2010). In addition, the most recent 5-year Status Review for fin whales concluded that further research is needed to understand the effects, if any, of contaminants on fin whale populations (NMFS 2019a). As described earlier, researchers recently identified BIAs for fin whales foraging off the U.S. West Coast (Calambokidis et al. in press). The parent BIA for fin whales represented 38% of the U.S. West Coast EEZ (315,000 km2) and encompassed 95% of small boat sightings of feeding whales, reflecting both coastal and extensive offshore use by fin whales. The core BIAs (within the parent area and representing high use densities) for fin whales were located further offshore than the blue and humpback whale BIAs, characterizing their affinity for a multitude of foraging habitats although the Santa Barbara Channel was included. Given the wide range and broad distribution of fin whales within the action area, and the known effects and response of large whales to oil spills, the likelihood that up to 1,000 bbl of oil impacting individual fin whales is extremely unlikely.

The 1991 humpback whale recovery plan, while dated, focused on populations in the North Atlantic and North Pacific and determined that recovery would be biologically successful when humpbacks occupy all of their former range in sufficient abundance to buffer against normal environmental variation or anthropogenic catastrophes, such as oil spills. The global status review for humpback whales (Bettridge et al. 2015) summarized the threat of oil spills due to oil exploration and development and, while acknowledging the little-known effects of oil on baleen whales, determined that barring a catastrophic event (i.e., large/very large oil spill), the risk posed by operational oil rigs is likely low. As described earlier, humpback whales are one of the most common and abundant large cetaceans in coastal waters of the U.S. West Coast. The BIAs identified in Calambokidis et al. (2015) reinforce the importance of high-use foraging areas within the SPCA where incidents (leaks, blowouts) from oil spill platforms and pipelines in the area may result in oil affecting individual humpback whales, either from the endangered Central America DPS or the threatened Mexico DPS. These populations are known to shift seasonally both up and down the coast as well as inshore and offshore. In addition, localized coastal boat-based surveys reveal a high degree of variation in some areas of humpback whale concentrations across years, while others appear to be used fairly consistently (Calambokidis et al. 2009). The revised parent BIA for humpbacks encompassed 140,000 km2, representing 20% of the U.S. West Coast EEZ. The core BIA represented 27% of the parent BIA but it encompassed 74% of the feeding sightings and was 50% larger than the original BIA. This indicates that, based on the most recently available data and using multiple sources (e.g., sightings, telemetry, models) humpback whales are using broad areas of foraging habitat and are wide ranging, also given their ability to switch prey, depending on availability and environmental conditions. Given this and the known effects and response of large whales to oil spills, the likelihood that up to 1,000 bbl of oil impacting individual humpback whales is extremely unlikely.

Areas north of and within the Santa Barbara Channel and northern Channel Islands, as well as areas off the coast of Los Angeles and Long Beach, are known to be important feeding areas for all three species of whales. The toxic physiological effects of oil spills to key forage species for these ESA-listed whales, including coastal pelagic species and krill, are well documented (see Grosell and Pasparakis 2021, NASEM 2022 for recent reviews). Certainly, if these prey are exposed to oil at high concentrations, there are significant risks of significant health effects, including mortality. However, it is noted that widespread mortalities of fish and crustacean that inhabit the marine water column occur infrequently, even after very large spills such as the Exxon Valdez or the DWH (NASEM 2022). Most often, finfish either are unaffected by oil or are affected only briefly because most oils float and routes of exposure to organisms living in the water column or on the ocean floor are typically very limited. However, these animals can be substantially affected in some circumstances, especially when oil spills into shallow or confined waters (NOAA Office of Restoration[10]). In a study on northern krill, various exposure treatments of low concentrations of crude oil proved not to be lethal (resulting in similar mortality rates across treatments) and did not impair krill basic functioning (Moodley et al. 2018). Although, it

[10] https://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/how-oil-spills-affect-fish-and-whales

is important to note that low mortality does not necessarily equate to high resiliency, as krill digestive gland tissue damage was significantly greater under oil exposure.

Fin whales, blue whales and Central America and Mexico DPS of humpback whales are highly migratory, wide ranging, and occupy a large area within the action area. As a result, their exposure is anticipated to be relatively brief in the event of a relatively small oil spill that is anticipated as part of the proposed action. We expect that the impacts of such a spill will generally diminish in a relatively short amount of time, due to natural processes such as weathering, and rapid spill dispersal, and that the exposure of ESA-listed whale species is expected to be minimal in the open ocean environment. While there are risks that some individuals of key prey species may experience some adverse health effects, including mortality, we do not expect any significant prey mortality events in the water column of the open ocean where these whales forage in association with the relatively small oil spill event that is anticipated to occur. Previous oil spills in the area have not been, including recent ones that are of similar magnitude, have not been documented to adversely affect any of these ESA-listed whale species.

Ultimately, given all these factors and considerations, we conclude the effects of oil spills to ESA-listed fin, blue, and humpback whales are expected to be extremely unlikely, and impacts to their prey will be insignificant.

Guadalupe Fur Seal

Oil spills could negatively impact Guadalupe fur seals. Guadalupe fur seals have a subcutaneous blubber layer and a thick pelage that thermally insulates these animals, and they can easily undergo thermoregulatory problems if they are externally exposed to oil. The dependence on their fur to maintain body temperature in the marine environment makes these animals more vulnerable to oil exposure than many pinnipeds. Northern fur seals (*Callorhinus ursinus*) are a similar species to Guadalupe fur seals. Kooyman et al. (1976) estimated that light oiling of 30 percent of the pelt surface results in a 1.5 fold increase in the metabolic rate of northern fur seals. Due to the similarities in these species, we expect similar effects are possible to Guadalupe fur seals. If their pelage comes into contact with oil, the health or survival of the seals could be impacted (Seagars 1984). For example, if the animal tries to clean itself, it may ingest the toxic petroleum product, which could cause health and reproductive problems. Due to the severity of the effects of oil spills, and the recognition that oil spills are a major threat for the population (Aurioles-Gamboa 2015), a catastrophic oil spill event could have detrimental or lethal impacts to Guadalupe fur seals.

Guadalupe fur seals are pelagic and spend a majority of their time in the open ocean, and almost exclusively come ashore at Guadalupe Island, 250 km offshore of the Baja California Peninsula. NMFS' marine mammal stranding network has responded to four oiled Guadalupe fur seals in the past 30+ years. All cases were in California and involved the animal having tar patches on their fur. It is unknown whether this tar came from natural seeps, which are common to the coast of southern California, or from anthropogenic sources. The risk of a Guadalupe fur seal getting oiled is relatively low (Norris 2017). Oil sources in southern California include shale gas basins and associated shale gas plays, oil and gas pipelines, wells, natural seeps, and spill incidents.

Norris (2017) compared Guadalupe fur seal distribution, based on satellite-tagged data from 20 juvenile seals, and oil sources in southern California. Juvenile Guadalupe fur seals spent the majority of their time in epipelagic waters, offshore of the continental shelf, whereas oil sources all occur within the continental shelf waters. There was little spatial overlap (<3%) between Guadalupe fur seal habitat use and areas of oil sources, allowing the authors to conclude that potential nearshore oil spill incidents that are restricted to continental-shelf waters pose minimal risk to Guadalupe fur seals off the California coast (Norris 2017). Ultimately, the extent of the risk is dependent on the location of the spill in relation to areas used for transit, foraging, breeding, and hauling out, which is an area of future research (T. Norris, TMMC, personal communication, 2019). Guadalupe fur seals have a larger offshore distribution compared to other pinnipeds, which may reduce their exposure to oil spills that occur closer to shore.

While considered rare, catastrophic oil spills have occurred. As described in the BA, in 1969, a platform offshore of Santa Barbara, California experienced a blowout and an estimated 80,000 barrels of oil were released into the ocean. After this incident, new safety requirements were developed for offshore operations. Since the oil spill off Santa Barbara, there was another oil spill off Refugio State Beach, California when a corroded on-land pipeline ruptured and over 3,400 barrels (over 100,000 gallons) of crude oil were spilled, much of which entered the ocean through storm drains and ravines (DARRP 2018). Refugio State Beach lies just 25 miles north of the California Channel Islands and is near Point Conception and some submarine canyons that are important upwelling centers in the southern California Current System. While no Guadalupe fur seals were encountered during spill response, wildlife experts responded to several pinniped (and small cetacean) species oiled, including California sea lions (52 dead, 42 live), northern elephant seals (8 live), and harbor seals (2 live). The Trustees noted that some injuries/deaths could not be accounted for since some animals may have died at sea and either sank, floated, or were scavenged before being observed and counted (DARRP 2018). In addition to potential oil spills, the California Channel Islands have a low level of chronic oil from natural oil seeps (Seagars 1984); however other areas within the Guadalupe fur seal's range have natural seeps, as well as oil in some shipwrecks (T. Norris, TMMC, personal communication, 2019). From a review of the stranding records over the last 30 years, there have been no reports of Guadalupe fur seals that have ingested oil or have an oiled pelage (NMFS, unpublished stranding records).

NMFS and other organizations have developed guidelines used to respond to oiled marine mammals, including Guadalupe fur seals. These guidelines include considerations for rescue and rehabilitation, capture and handling techniques, and dead seal considerations. The Marine Mammal Oil Spill Response Guidelines can be found online at https://www.fisheries.noaa.gov/resource/document/pinniped-and-cetacean-oil-spill-response-guidelines. Additional information about response to dead marine mammals during a spill can be found in the California State Oil Spill Contingency Plan (CDFW 2017).

As explained previously, we expect that the impacts of relatively small spill such as what is anticipated as part of this proposed action will generally diminish in a relatively short amount of time, due to natural processes such as weathering, and rapid spill dispersal, and that the exposure of mobile ESA-listed species is expected to be minimal in the open ocean environment. Given the relative rarity of Guadalupe fur seals in the action area, their preference for feeding in far offshore waters for extended periods of time, and the lack of evidence of any oil spills associated with stranded animals, we conclude that the risk of adverse effects to this species from an oil spill associated with the proposed action to be extremely low, and discountable.

2.5.3.4 Effects of Oil Spills on Green Sea Turtles

Exposure

Juvenile green turtles in particular demonstrate high levels of site fidelity to coastal foraging areas, often residing at the same site for years, growing to maturity (Broderick et al. 2007; Eguchi et al. 2010). Green turtle strandings in the action area are much more frequent than the other sea turtle species, with most of the strandings reported in San Diego County, primarily in bays and estuaries south of Los Angeles (NMFS unpublished stranding data). Sightings data confirm this, although since sightings (mainly from citizen scientists and ocean users) were initiated and reported (2015), there have been extensive sightings in Orange County (Hanna et al. 2021). To date, NMFS-SWFSC has received nearly 600 reported sightings of green turtles throughout California, showing that green turtles are present in highly urbanized environments such as marinas, harbors, and small drainage systems up to 5 miles inland of the coastline (LeRoux et al. unpublished). Multiple studies have been conducted on resident foraging populations in southern California, including the San Gabriel River (Long Beach), the Seal Beach National Wildlife Refuge (SBNWR), and San Diego Bay (Eguchi et al. 2010; Lawson et al. 2011; Crear et al. 2016; 2017). Green turtles are rarely seen offshore (see Hanna et al. 2021) in the action area, with only one green turtle captured in commercial fishing gear in southern California (1999 in the CA drift gillnet fishery). Given the extensive research that has been conducted in the northernmost foraging locations (Long Beach/Seal Beach) and the primary foraging area in the south (San Diego Bay), there have been few satellite telemetered turtles that have been documented traveling between these primary foraging areas, further underscoring the fact that green turtles are rarely found offshore unless they are traveling to/from their breeding areas in Mexico.

Although we know that green sea turtles primarily forage within estuaries and bays, we do have documented evidence from several satellite tagged animals that they have traveled in and out of the Seal Beach area into Anaheim Bay, foraging in the nearshore area (one traveled offshore) and returning to the SBNWR (NMFS-SWFSC unpublished data). From November 2018 through July 2020, 16 green sea turtles (straight carapace length = 60-90 cm, so large juveniles to adults) were equipped with satellite tags. Most of the turtles foraged within the inner portions of the Refuge, although four turtles transitioned into Anaheim Bay and of those four, two traveled offshore, one traveled north along the coast as far as Rancho Palos Verdes, while the other traveled south to Dana Point (Hanna et al. 2020). An adult female was also documented traveling from the Seal Beach area south to Mexican waters in early 2022, which was the first documentation of an animal from this northern foraging area to a breeding area south of the border.

In the POCSR, given what we know from strandings, sightings, in-water captures and telemetry studies in Los Angeles and Orange counties, especially in the well-researched study areas of the San Gabriel River (Long Beach) and the SBNWR, we used the TAP resource to simulate accidental oil spills from the nearest platforms and associated pipeline, which included four active offshore platform and associated pipelines within the Beta Unit. The Beta Unit is located southwest of Huntington Beach, in 161-700 feet of water, between 8.5 and 9.0 miles offshore. Pipelines carrying oil run to several points along shore.

Using the TAP resource, we simulated a maximum 1,000 bbl spill using the parameters provided by BOEM in order to understand the percentage of such spills in which at least 5 bbl of the oil would reach cells associated with our area of concern in Los Angeles and Orange counties (generally the nearshore areas, including estuaries and bays, most of which are proposed for designation of critical habitat). Because the nearshore areas surrounding Catalina Island (located southwest of Beta Unit) are proposed for critical habitat designation, we also considered the risk to green turtles there. We simulated spills originating from four platforms (Edith, Ellen, Elly and Eureka) and the main pipeline from platforms Edith/Ellen/Eureka. Modeled spill trajectories from all four platforms followed nearly identical patterns, radiating from the source and reaching the nearshore areas and shoreline from Long Beach south to Laguna Beach. The risk (i.e., percentage of spills where at least 5 bbl would reach locations within a given area) for coastal areas of concern decreases as the trajectory of the spill moves south of Newport Beach.

In the Long Beach/Seal Beach area, sea turtles congregate year-round in the San Gabriel River and in the SBNWR, where the two entrance points (Alamitos Bay and Anaheim Bay, respectively) are approximately 2 km apart from one another. Some turtles have been tracked venturing out to/from both the San Gabriel River and the SBNWR, and/or outside of the bay into nearshore waters (discussed in *Risk* section in more detail below). The modeled risk to sea turtles in these two concentrated areas from oil spilled from the four platforms under the scenarios evaluated was around 30% probability of at least 5 bbl of oil reaching those locations, depending on the location of the modeled spill. South of these areas, in Huntington Harbor and Bolsa Chica, also considered areas of high conservation value (NMFS draft biological report 2023) the modeled risk was still fairly high, but averaged around 20%. Further south (Bolsa Chica lowlands and Huntington Beach south to Newport Beach), the modeled risk gradually declined to below 15-20%. For areas south of San Onofre, the modeled risk decreased to near negligible levels (0-5%)

The modeled risk to sea turtles from an accidental break in the pipeline transporting oil from 3 of the platforms in the Beta Unit showed higher risk to the nearshore area of the San Gabriel River/SBNWR complex and associated bays (~40-60 percent chance of at least 5 bbl of oil contacting locations within sensitive areas after a 1,000-barrel spill), likely due to the proximity of the pipeline to the shoreline. The modeled risk to adjacent areas south (Huntington Harbor and Bolsa Chica) was also high, ranging between 60-70%. South of these areas, the modeled risk to sea turtles was still relatively high, from 40-50%. The modeled risk to sea turtles traveling further offshore (closer to the modeled source of an accidental pipeline rupture), was up to 80% closest to the source. Sea turtles also forage around Catalina Island, which is also proposed for designated critical habitat, which is located around 22 miles from the mainland. Using the TAP resource, the modeled risk to sea turtles foraging around Catalina Island from any accidental oil spills from platforms or the pipeline in the Beta Unit were near negligible (0-5%).

Given historical oil spills in the action area, the Bureaus estimate a 63% chance of at least one spill (50 bbl - 1,000 bbl), occurring in the action area during the proposed action, which is expected to last at least the next 20 years. Furthermore, given the modeled scenarios of a maximum 1,000 bbl accidental oil spill occurring from a platform and/or pipeline carrying oil to shore within the Beta Unit, there is a risk to sea turtles foraging in the nearshore areas and within bays/estuaries particularly in areas that are well studied. We also acknowledge there is some risk of exposure of green turtles from oil spills that may occur at other locations, as green sea turtles are occasionally found in other areas of the Bight, although such a scenario would likely involve a very small number of individuals, if it occurred at all, as no known high use areas are located in the vicinity of other O&G Units. While the risk of such a spill occurring in any given year may be relatively low, the risk becomes considerably higher over the duration of the action, which is expected to last at least 20 years. Therefore, we believe the exposure of green sea turtles to an oil spill in the area is anticipated to occur. As a result, we consider the likely response by green sea turtles subjected to an oil spill.

Response

Physical fouling by oil resulting from direct contact is the most frequently reported effect of oil exposure on sea turtles. Those sea turtles that spend a significant time in the neritic zone or within bays, estuaries and tidal creeks, such as the green sea turtles in southern California, may be exposed to petroleum through contact with their skin and by ingestion and inhalation. The effects of exposure to oil generally fall into two often interrelated categories: physical effects and chemical or toxicological effects (Wallace et al. 2020). Sea turtles that become mired in crude oil can be severely hindered by restricted movement, which may lead to physiological problems, such as exposure to harsh environmental conditions (e.g., extreme temperatures), vulnerability to predators and asphyxiation. Tar balls and other thick forms of oil can also obstruct the mouth or digestive tract, reducing sea turtles' ability to forage (Witherington et al. 2012). These effects are most acute and severe for surface-pelagic juveniles because of their small size and dependence on habitats where oil might accumulate.

If an oil spill persists into the marine environment where sea turtles may be foraging or resting, direct contact of oil may continue to occur as long as the slick persists, and physiological effects could continue for long periods once the slick dissipates. Direct oiling could impair swimming and block breathing passages. Oiling can cause thermal stress by acting as an insulator that interferes with thermoregulation. Sea turtles rapidly inhale a large volume of air, immediately at the air-water interface where hydrocarbon vapors and aerosolized oil concentrations would be the highest, before submerging. Repeated surfacing would result in repeated exposure to volatile hydrocarbon vapors and oil compounding the risk of lung injury and other adverse physiological effects (Shigenaka and Milton 2003). Any of these mechanisms, including impaired swimming, blocked airways, overheating, or physical or chemical damage to lung tissues, could result in mortality, if severe enough. Sublethal physiological injury is more likely with larger turtles and lower degrees of oil exposure and could impair a turtle's overall fitness so that it is less able to withstand other stressors; however, the long-term effects of oil exposure on reproduction and health are relatively unknown. Lutcavage et al. (1997) provided qualitative evidence that oil exposure disrupted lachrymal gland (salt gland) function, in which the glands physiologically did not function for several days. Their experiments on physiological and clinicopathological effects of oil on loggerhead sea turtles showed that the turtles' major physiological systems are adversely affected by both chronic exposure (96-hour exposure to a 0.05 centimeter layer of South Louisiana crude oil) and acute exposures (0.5 centimeter of oil for 48 hours). The skin of the exposed turtles, particularly the soft pliable areas of the neck and flippers, sloughed off in layers for up to two weeks, with recovery taking up to three weeks. Oil was also detected in the nares, eyes, upper esophagus, and feces, indicating that turtles were ingesting oil, though apparently not enough to cause intestinal bleeding and anemia. Internal effects of oil exposure also include significant changes in blood and blood chemistry. Hematocrits (red blood cell volume) decreased nearly 50 percent in oiled turtles and did not increase again during the recovery period. Immune responses were indicated by significant increases in white blood cells lasting more than a week in sea turtles exposed to oil. Although these effects may be sublethal in the near term, they could compromise a turtle sufficiently in the long-term to contribute to its ultimate death through predation, disease, or inability to forage.

In addition, there are also certain volatile hydrocarbons called volatile organic compounds (VOCs) which can cause cancer and neurologic and reproductive harm in aquatic organisms. Oil could impact both surface and benthic foraging habitats, oiling both the prey and habitats where prey could be located. Surface oil could aggregate along convergence areas (e.g., in association with large sargassum masses in the Atlantic/Gulf of Mexico) where turtles may spend prolonged periods feeding. Weathered oil that has consolidated with sediments and vegetation would sink and contaminate benthic environments where older turtles forage. Sea turtles could become oiled in these affected habitats and ingest contaminated prey. Larger volume spills could impact the entire foraging range of an individual.

Even if a sea turtle were not directly exposed to an oil slick, hydrocarbons can persist in marine environments for decades or longer. Tarballs are a byproduct of accidentally spilled oil, normal and accepted ship operations (e.g., bilge tank flushing), illegal discharges from tank washings, and natural oil seeps on the seafloor. They are found in every ocean and on every beach; oceanographic features such as convergence zones and upwelling can aggregate even widely dispersed tarballs into an area where sea turtles concentrate. Turtles indiscriminately eat anything that registers as being an appropriate size for food (Lutcavage et al. 1989), including tarballs and other materials. Non-food items ingested by sea turtles do not pass rapidly through its digestive tract and may be retained there for at least several days as they are being absorbed, metabolized, stored, or excreted (Valente et al. 2008). Protracted retention increases internal contact and the likelihood that toxic compounds will be absorbed. The risk of gut impaction also increases for turtles that have ingested oil. Tarballs ingested by any age class of sea turtle are likely to have a variety of effects, including starvation from gut blockage, decreased absorption efficiency, absorption of toxins, effects of general intestinal blockage (such as local necrosis or ulceration), interference with fat metabolism, and buoyancy problems caused by the buildup of fermentation gasses (floating prevents turtles from feeding and increases their vulnerability to predators and boats), among others. Through an examination of recent stranding records of green sea turtles in southern California, we found one turtle off Long Beach in 2018 that likely had been struck by a vessel (linear lacerations on its shell) and had black material in its stomach that resembled oil (NMFS-WCR unpublished stranding records). This reinforces the fact that sea turtles may be compromised by ingesting oil and may be more vulnerable to other natural or anthropogenic threats.

Oceanic juveniles (such as North Pacific loggerheads) that contact oil may exhibit a range of effects, from acute toxicity to impaired movement and normal bodily functions. There may be a large energetic cost since turtles may be unable to find adequate prey while seeking new habitat, as well as the increased cost of energy of moving through oiled waters or with oiled body surfaces. Oil spills that reach nearshore waters could impact juveniles and adult green sea turtles that spend considerably more time on the bottom foraging and resting. Oil remaining on the surface can oil sea turtles, but probably to a lesser extent than oil found near the source of a spill since the oil has dispersed and/or become weathered by the time it reaches nearshore areas. Weathered or dispersed oil may be present in the water column or sink to the bottom where it can interact with sea turtles or contaminate their prey.

There may also be indirect effects of oil on sea turtles, such as those from reduced prey availability or damage to nostrils and olfactory sensory organs. For example, a 1986 oil spill off Panama resulted in the destruction of seagrass and other invertebrates that sea turtles eat. The sense of smell plays an important role in navigation and orientation. Olfactory masking may not harm a turtle, but impairment of orientation for individuals could be as severe or worse to a population as direct effects (Shigenaka and Milton 2003). The chemical effects of oil exposure on sea turtles have not been understood as clearly as the physical effects. Petroleum and related compounds include various complex mixtures of chemicals, PAHs more widely studied. Studies of petroleum toxicity in turtles under both laboratory and natural studies have yielded mixed results. For example, juvenile loggerheads exposed to crude oil over two weeks had skin lesions, decreased salt gland function, and alteration of some blood cell parameters (Lutz and Lutcavage 1989). Camacho et al. (2013) examined stranded juvenile loggerheads that were oiled by undefined sources, but it was unclear whether any clinicopathological and histopathological abnormalities were caused by their exposure to petroleum. Loggerhead hatchlings were exposed to crude oil with and without dispersants for 1-4 days and they failed to gain weight as a result of both exposures, which was consistent with decreased seawater consumption and dehydration (Harms et al. 2014). Sea turtles exposed to crude oil during the DWH spill had non-specific blood abnormalities, including metabolic and physiological derangements consistent with stress, dehydration, and exertion attributed to oiling, but also could have been attributed to capture and transport, the relative contributions of which could not be discerned. Based on histology and blood analyses, there was no evidence of specific tissue toxicity, hemolytic anemia, or salt gland dysfunction (Stacy et al. 2017).

During the DWH spill in the Gulf of Mexico (2010), heavy fouling in oil was the most readily apparent and immediate harmful effect of the spill on sea turtles (Stacy 2012). Interestingly, during that spill, very few oiled neritic juvenile and adult turtles were observed, and only one heavily oiled turtle was encountered that was suspected to have been compromised (debilitated) by the oil. In contrast, hundreds of surface-pelagic juvenile turtles were observed to have been oiled during the incident. This is likely because larger sea turtles spend less time at the surface, actively transit greater distances underwater between breaths and may be more physically capable of overcoming restrictions in movement that may be created by fouling, compared to surface-pelagic juveniles (DWH NRDA Trustees 2016). As Wallace et al. (2020) conclude, larger turtles are less likely to be susceptible to the physical effects of oil than the smaller life stages.

We reviewed ACPs in the SCPA to determine whether green sea turtles were included as species/habitats that should be protected. The 2023 LA/Long Beach ACP (Volume I) revised

ACP 5-310 (Anaheim Bay (SBNWR)), changed their protection strategy by adding green sea turtles to its "resources at risk." Similarly, ACP-320 added green sea turtles for its resources at risk for Inner Bolsa Chica.

Risk to Green Sea Turtles in Action Area

Two of the most important northernmost feeding areas for the East Pacific DPS of green turtles include the San Gabriel River and the SBNWR, both of which have very different food resources that the species depend on. The urbanized San Gabriel River has rocky edges and no eelgrass, so turtles rely on invertebrates and algae and rely on manmade structures (e.g. areas near bridge pilings and runoff outflows) to rest (Crear et al. 2017). In contrast, the SBNWR reflects a more "natural" setting, composed of some restored habitat, including shallow saltwater basins and tidal channels. Here, sea turtles forage on eelgrass beds present throughout the SBNWR and along the nearshore areas of Anaheim Bay. As described earlier, we know that turtles venture in/out of the SBNWR, with two turtles traveling relatively long distances, both north (Rancho Palos Verdes) and south (Dana Point), and one adult female traveling south to Mexican waters (Hanna et al. 2021). We know that green turtle foraging populations are growing in the Long Beach and Seal Beach areas, particularly at the SBNWR where they are very protected and rarely subjected to anthropogenic threats.

Currently, the abundance of sea turtles within these two well-researched areas are unknown, but we believe there are at least 150 turtles within the two areas. In the San Gabriel River, analysis of photo-identification in the San Gabriel River from 2008-2015 estimated 77 individuals (Hashimoto et al. 2017). In the SBNWR, observers recorded sea turtle sightings at seven locations throughout the Refuge. From April 2021-September 2022 (349 sampling days), more than 100,000 surfacing events were recorded (Navy INRMP 2022). Many of the recorded sightings were in ponds north of the research area, so we believe there are at least twice as many turtles than those captured by researchers, particularly since research has not been conducted in the San Gabriel River since 2014. Since then, NMFS has seen more turtles in the northern reaches of the estuary (6+ miles north of Alamitos Bay), with 20-30 turtles seen in a relatively small area over a short period of time (NMFS unpublished data). From 2010-2014, researchers captured and tagged 20 individual turtles (with 4 recaptured) in the San Gabriel River, while from 2012 through August 2023, a total of 57 individual turtles (with 21 recaptured) were tagged/captured in the SBNWR.

Without the benefit of a model or some other way to quantitatively estimate the number of green turtles that may encounter and have direct contact with oil spilled offshore during the proposed action, expected to last at least the next 20 years, we can only provide a qualitative estimate based on the data we have. Given that there are sightings and strandings reported outside of these two well-researched areas, we conclude it is reasonable to assume that there may be at least 200 green turtles occurring within an area that could be exposed to direct contact with an accidental oil spill (in general, bays and estuaries and coastal and offshore areas within and off Los Angeles and Orange counties). Given the exponential growth of green turtles nesting on mainland Mexico beaches and the bays, estuaries, and nearshore providing adequate food resources and resting areas, we believe that the number of green sea turtles residing and foraging in Los

Angeles/Orange counties (particularly since many of these areas are proposed to be designated critical habitat) will only increase over time.

Based on information we have from the DWH spill, neritic juveniles and adults were rarely found oiled, whereas hundreds of pelagic juveniles were found oiled in the open ocean. Thus, we can infer that green sea turtles traveling offshore from resident foraging areas in Long Beach/Seal Beach and more southern coastlines, estuaries and bays, would be at most risk in the event of an oil spill.

We assume that there are at least 200 green sea turtles foraging in coastal areas including bays and estuaries in Los Angeles/Orange Counties. Of 16 sea turtles outfitted with satellite tags in the SBNWR, the majority of their time was spent within the Refuge. However, four turtles transitioned into Anaheim Bay while the tags were attached and functioning, with two of those moving offshore and thus into less protected areas, where they might be subjected to threats such as vessel strikes or, for our assessment, the risk of an accidental oil spill. Researchers have only captured/tagged sea turtles in this area from either the 7th Street Basin or the adjacent Capture Pond. However, there are five more areas within the Refuge where observers have regularly surveyed for sea turtles (2021-2022), where sightings at two of the ponds were greater than sightings at the 7th Street Basin (Navy INRMP 2022). Whether or not those turtles reside in those ponds for long periods of time or also venture out of Anaheim Bay to other coastal areas, is unknown. Furthermore, sea turtles tagged in the San Gabriel River occupy the river year-round (Crear et al. 2017) and have rarely been documented leaving the area (one rehabilitated and telemetered turtle released in the river in 2006 by the Aquarium of the Pacific was tracked to the San Onofre Power Plant (unpublished data)). Nevertheless, there are areas south of the San Gabriel River and the SBNWR that are not studied but we know from sightings and strandings (and are proposed for critical habitat designation), that they are important foraging/resting areas for this population.

Therefore, in the event of an accidental oil spill within the Beta Unit at up to 1,000 bbl, and given the increasing population of green turtles in southern California, we estimate that ~13 percent of this population could be at risk of direct contact with oil at any given time based on the tagging study where 2 out of 16 turtles left the coastal embayment and moved offshore. This suggests that approximately 26 green turtles may be adversely affected by direct contact with an oil spill occurring during the proposed action, expected to last at least the next 20 years. We also acknowledge there is some risk of exposure of green turtles from oil spills that may occur at other locations, although such a scenario would likely involve a very small number of individuals, if it occurred at all. Given that the Huntington Beach oil spill resulted in the distribution of tar balls onto southern California beaches, we consider that some green sea turtles may encounter heavier crude oil, and that barring rehabilitation and treatment, around half (~13) may die. Sea turtles that encounter oil but do not die may be compromised by sublethal effects that may affect their health, reproductive capacity, vulnerability to other natural or anthropogenic threats, etc.

Previously, we acknowledge the extent of an oil spill that is anticipated to occur would most likely be characterized as a small spill, leading to relatively minimal risks of extended exposure for many species, especially at any large distance away from the original source of the spill. As a relatively small spill (at most), we expect that the impacts of such a spill will generally diminish in a relatively short amount of time, due to natural processes such as weathering, and rapid spill dispersal, and that the exposure of most ESA-species that are mobile is expected to be minimal. This is also consistent with the fate of oil that has been described with local seeps in the action area, in the open ocean environment where an oil spill associated with this proposed action would occur. However, we acknowledge that there are scenarios of oil spills that increase the potential for larger impacts to ESA-listed species and critical habitats, including spills where significant quantities of oil reach nearshore coastal areas. Some species and habitats in these areas may be more susceptible to impacts, given their "fixed" location and known vulnerability to oil spill impacts. Although green sea turtles are mobile, they are also known for site fidelity and reliance upon nearshore areas, as well as vulnerability to oil spills. As a result, we conclude that even a relatively small oil spill expected to occur is anticipated to result in adverse effects if a spill occurs near areas of green sea turtle residence and high-frequency habitat use, even if the amount of oil that green sea turtles are exposed to is not of a high volume.

Effects of oil spills on proposed critical habitat for East Pacific DPS green sea turtles will be analyzed in section 2.5.3.9 *Effects of Oil Spills on Critical Habitat* below.

2.5.3.5 Effects of Oil Spills on Other Sea Turtles

The most common sea turtles that may be found in the action area are green turtles, which generally forage in the nearshore areas (bays and estuaries) off southern California, unless they are migrating to/from their breeding areas of Mexico. Based on what we know from stranding (2004-2023) and sighting (2015 to present) records and fishery observer program reports (1990-present), leatherbacks, loggerheads and olive ridleys are occasional, albeit rare, visitors to southern California.

Leatherback turtles lead a completely pelagic existence, foraging widely in temperate and tropical waters except during the nesting season, when gravid females return to tropical beaches to lay eggs. Leatherbacks are highly migratory, exploiting convergence zones and upwelling areas for foraging in the open ocean, along continental margins, and in archipelagic waters. Satellite tracking of post-nesting females and foraging males and females, as well as genetic analyses of leatherback turtles caught in U.S. Pacific fisheries or stranded on the U.S. West Coast indicate that leatherbacks found off the California are from the western Pacific nesting population (Benson et al. 2007, 2011), which is declining at an alarming rate (Talipatu et al. 2013). Leatherbacks rarely strand in southern California, although recently, a subadult leatherback stranded in Sunset Beach (October, 2017). Leatherbacks are also rarely captured in the California drift gillnet fishery in southern California, as their primary foraging grounds are found off central California and areas off the Pacific Northwest. Leatherback critical habitat was designated in 2012 and is located within the northern part of the action area, specifically from Point Arena to Point Arguello east of the 3,000 meter depth contour. The primary constituent element considered essential for the conservation of leatherbacks is "the occurrence of prey species, primarily scyphomedusae of the order Semaeostomeae (*Chrysaora*, *Aurelia*, *Phacellophora*, and *Cynea*, of sufficient condition, distribution, diversity, and density necessary to support individual as well as population growth, reproduction, and development of leatherbacks." Given the pelagic nature of the species, their widespread distribution off the U.S.

West Coast, but particularly off central California and Southern Oregon, and the highly migratory nature of leatherbacks, we believe the likelihood of an oil spill (< 1,000 bbl) affecting leatherback sea turtles to be extremely low, and discountable.

The endangered north Pacific loggerhead DPS documented off the U.S. west coast are primarily found south of Point Conception, California in the Bight, which is within the action area. These turtles originate from nesting beaches in Japan, where the number of females returning to deposit their nests have been increasing, although recent data are not available. Loggerheads have been captured in the California drift gillnet fishery (1990-present; NMFS observer program), although their presence appears to be closely correlated with anomalously warm sea surface temperatures, such as during El Niño conditions. In order to reduce loggerhead interactions with this fishery, NMFS implemented a time/area closure in 2003, which closed the Bight (east of 120ºW longitude) in the summer months during a forecast or declared El Niño. NMFS conducted aerial surveys of the Bight in 2015 (a year when the sea surface temperatures were anomalously warm, and an El Niño was occurring) and documented thousands of loggerheads throughout the area (Eguchi et al., 2018), likely feeding on pelagic red crabs and pyrosomes, their preferred prey. This study was compared to a similar aerial survey conducted during 2011, when environmental conditions (e.g., sea surface temperature, chlorophyll) were much more average, and no loggerheads were found. The disparity of these two surveys underscores the ephemeral nature of juvenile loggerheads, and when found in the southern California area are largely found further offshore. Three juvenile loggerheads that stranded and were monitored via satellite telemetry moved large distances in the study area (399-730 km) during their tracking durations (NMFS-SWFSC unpublished data). Given the known high motility of loggerheads, their ephemeral presence tied to environmental conditions, and their proclivity to feed offshore on free-floating tunicates such as pyrosomes, the likelihood of the threat of an oil spill (<1,000 bbl) to this species would be extremely low, and therefore discountable.

Like leatherback turtles, most olive ridley turtles lead a primarily pelagic existence, migrating throughout the Pacific, from their nesting grounds in Mexico and Central America to the deep waters of the Pacific that are used as foraging areas. The eastern Pacific population is thought to be increasing, while there is inadequate information to suggest trends for other populations. Since reduction or cessation of egg and turtle harvest in both Mexico and Central America in the early 1990s, annual nest totals have increased substantially. On the Mexican coast alone, at a major nesting beach alone (La Escobilla), a mean annual estimate of nesting females was over one million (*in* NMFS and USFWS 2014). Eguchi et al. (2007) analyzed sightings of olive ridleys at sea, leading to an estimate of 1,15 to 1.62 million turtles in the eastern tropical Pacific based on a weighted average of yearly estimates from 1992-2006. Olive ridleys rarely strand in southern California, and there has been only one documented interaction with the California drift gillnet fishery (in 1999) since 1990.

Ultimately, given the pelagic and highly migratory nature of the species, their widespread distribution throughout the Pacific Ocean, and their rarity off southern California we believe the likelihood of an oil spill (< 1,000 bbl) affecting olive ridley sea turtles to be extremely low, and discountable.

2.5.3.6 Effects of Oil Spills on Marine Invertebrates

Marine invertebrates and macrophytes are sensitive to the toxic effects of oil. Depending on the intensity, duration and circumstances of the exposure, they can suffer high levels of initial mortality combined with prolonged sublethal effects that can act at individual, population and community levels. Depending on the circumstances, recovery from these impacts can take years to decades, depending on the sensitivity of the taxa and any mitigating factors that can lessen the degree of exposure and response. Similar to previous descriptions, the exposure of invertebrates to oil spills is affected by a myriad of factors including: type of oil, extent of weathering, the persistence of exposure, response (e.g. application of dispersants or other clean-up measures), habitat type, temperature and depth, species presence and their stage of development or maturity, and processes of recolonization, particularly recruitment (Keesing et al. 2018).

Following a spill of 840,000 gallons of Bunker C oil in San Francisco Bay in 1971, Chan (1975) documented the death of marine organisms (mostly barnacles) in rocky intertidal reefs, primarily due to smothering by the oil. Most species experienced a significant decline in abundance within a few months of the spill, but reached or exceeded pre-oil levels within 1-3 years as the oil weathered away with wave action (Chan 1975). One exception was *Littorina planaxis* (grey periwinkle), which was already low in numbers before the spill and declined even more and remained at low numbers in the years following the spill (Chan 1975). This indicates that the initial status of the species at the affected site influences the species' ability to recover after experiencing declines due to an oil spill.

Three ESA-listed invertebrate species may be found in the action area and may be affected by oil spills/oil spill response: the endangered black abalone, the endangered white abalone, and the sunflower sea star (proposed for listing as threatened).

White abalone occur within the action area, off the U.S. West Coast along offshore islands and banks (particularly Santa Catalina and San Clemente Islands) and along the mainland coast from Point Conception, California, south to Punta Abreojos, Baja California, Mexico. NMFS published a final rule listing the white abalone as an endangered species on May 29, 2001 (66 FR 29046). In October 2008, NMFS published a final recovery plan for the white abalone (73 FR 62257), and, in 2016, identified white abalone as a Species in the Spotlight (NMFS 2016b). With this initiative NMFS has identified white abalone as one of 10 ESA-listed species for which immediate, targeted actions can stabilize the population and prevent their extinction. The Species in the Spotlight Priority Action Plan 2016-2020 does not mention oil spills as a threat to white abalone recovery.

Adults occupy open, low relief rocky reefs or boulder habitat surrounded by sand (Hobday and Tegner 2001). Because suitable habitat is patchy, the distribution of white abalone is also patchy. White abalone are the deepest living abalone species on the U.S. West Coast, occupying depths from 5-60 m (Cox 1960), although current remnant populations are most common between 30-60 m depth and recent surveys by Butler et al. (2006) and Stierhoff et al. (2012) found the highest densities at depths of 40-50 m. Low population densities resulting from historical overfishing has been identified as the primary threat to white abalone in California. Abundance estimates for the 1960s to 1970s ranged from about 600,000 to 1.7 million white abalone, whereas estimates for the 1990s were around 2,000 white abalone, or about 0.1% of estimated pre-exploitation abundance (Hobday et al. 2001). The current total population of white abalone in California is estimated to be in the thousands, and declining by an estimated 12% annually. A population viability analysis conducted 7 years ago, found white abalone to be at high risk of extinction, with a quasi-extinction of 1,000 individuals predicted to be met within 15 years (Catton et al. 2016). It is unknown exactly where white abalone may occur, but most of the areas where there are multiple individuals known to occur are south of areas where effects of oil spills may occur, including Tanner Banks and Point Loma. Palos Verdes is one area within the action area where a small number of white abalone are known to occur (NMFS unpublished abalone survey data).

White abalone are generally found in deep water (40-50 meters). Therefore, any oil spills up to 1,000 bbl will generally not affect these bottom dwellers. A review of the recovery plan for white abalone found no mention of oil spills as a potential threat, and the most recent status review had no mention of oil spills as a threat to white abalone (NMFS 2018c). We acknowledge that oil may sink and reach the sea floor, particularly during large oil spills. Of the 150 million gallons (equivalent to approximately 2.4 million bbl) of oil spilled as a result of the DWH oil spill, approximately 10 percent had settled to the sea floor, with much of the oil assumed to take weeks to months to settle in ocean waters approximately 1,500 m deep. Nevertheless, given the low densities of white abalone (identified as its primary threat in the listing decision) over its fairly large range, and that most of the areas where they are known to occur are outside of where oil spills are expected to impact, the likelihood of a fraction of spilled oil sinking to the sea floor and affecting white abalone is extremely low. Therefore, we conclude that the likelihood of an oil spill up to 1,000 bbl during the proposed action, expected to last at least the next 20 years, adversely affecting white abalone to be extremely unlikely, and therefore discountable.

The sunflower sea star was proposed to be listed as a threatened species in 2023 (88 FR 16212; March 16, 2023), noting that regional population declines have exceeded 95% in some areas from 2013-17 as a result of sea star wasting syndrome (SSWS). Signs of recovery have been patchy and slow to progress. The sunflower sea star occupies nearshore subtidal marine waters shallower than 450 m deep and is distributed as far north as Adak Island, Alaska to Bahia Asunción, Baja California Sur, Mexico. Sunflower sea stars prefer temperate waters, inhabiting kelp forests and rocky intertidal shoals (Hodin et al. 2021), but are regularly found in eelgrass meadows as well (Gravem et al. 2021). A number of environmental factors, including food availability, seawater temperature, photoperiod, salinity, and the lunar cycle may control seasonality of their reproductive cycles (Chia and Walker 1991). The species is a habitat generalist, consuming a wide variety of invertebrate prey, and also opportunistically scavenges on vertebrates. The diet of adult sea stars generally consists of benthic and mobile epibenthic invertebrates, including sea urchins, snails, crabs, etc. and this appears to be driven by prey availability (Shivji et al. 1983).

Because sunflower sea stars may be found from the nearshore down to 450 m deep, they may occupy areas within the action area, even though there are currently low densities overall along the U.S. West Coast. Prior to the 2013 through 2017 SSWS outbreak, the sunflower sea star was fairly common throughout its range, with localized variation linked to prey availability and various physiochemical variables. The pattern of decline mentioned above has been stark, particularly for populations spanning from Cape Flattery, Washington to Baja California, Mexico showing a 99.6 to 100 percent decline. Any action that disturbs relatively small amounts of sea star habitat are unlikely to adversely affect the species because the species is now so rare in southern California; and therefore, the chance of a sea star encountering oil from an oil spill anticipated as part of this proposed action is discountable.

2.5.3.6.1 Black Abalone

Given the abundance, densities, and distribution of the endangered black abalone (and its associated critical habitat) within the action area, the risk of an oil spill associated with the proposed action affecting this species may be substantial, depending largely on the proximity of platforms and pipelines to areas of high density and modeled trajectories of an oil spill. The 2011 biological report supporting the designation of critical habitat mentions oil spills and response as an activity that may require special management measures (NMFS 2011), and the most recent 5-year status review identifies oil spills and response activities as one of the threats of greatest concern (NMFS 2018c). Therefore, the following section will assess the effects of oil spills on black abalone and black abalone critical habitat.

Exposure

Black abalone occupy rocky intertidal and subtidal habitats from the upper intertidal to a depth of 6 meters. They are most commonly observed in the middle and lower intertidal, in habitats with complex surfaces and deep crevices, which provide shelter for juvenile recruitment and adult survival (NMFS 2020d). They feed preferentially on large drifting fragments of marine algae such as kelp. As identified in the black abalone recovery plan, contaminant spills, particularly oil spills and associated response activities pose a threat to black abalone and nearshore rocky habitat.

A few studies have evaluated the effects of natural or accidental oil exposure on subtidal abalone. Straughan (1977) evaluated the effects of natural chronic exposure to petroleum on red abalone (*Haliotis rufescens*), pink abalone (*H. corrugata*), and white abalone (*H. sorenseni*), analyzing individuals collected from Coal Oil Point (an area of natural oil seepage off Santa Barbara, California) and two control sites (Gull Island, which is off the coast of Santa Cruz Island, and Catalina Island); all except one abalone were collected from depths of 20 to 100 feet. Petroleum hydrocarbons were detected in the viscera of four out of 21 abalone from Coal Oil Point, but were not detected in the foot muscle tissues of any abalone from any of the three sites. Straughan (1977) found similar growth rates and seasonality of gonad development in abalone across all three sites; examination of gonads by histology and dissection did not identify any malformations in abalone from Coal Oil Point or the two control sites.

Edgara and Barrett (2000) evaluated effects on subtidal reef assemblages on Hebe Reef, Tasmania, following the grounding of the bulk carrier *Iron Baron* and subsequent release of oil. Within the area where the carrier ran aground, abundances of benthic invertebrates declined (including numbers of blacklip abalone, *Haliotis rubra*) and remained low during the first eleven months post-impact, followed by signs of recovery within two years (e.g., blacklip abalone numbers increased to half the levels found at reference sites; Edgara and Barrett 2000). In contrast, no detectable impact to biological communities was found in adjacent areas affected by oil only, potentially due to the relatively small size of the spill and short time over which oil was released (Edgara and Barrett 2000). Both Straughan (1977) and Edgara and Barrett (2000) focused on subtidal abalone populations; as noted by Edgara and Barrett (2000), effects of oiling in the rocky intertidal are different and potentially considerable. For example, Edgara (pers. obs. cited in Edgara and Barrett 2000) observed detrimental effects of oiling on intertidal plants and animals in the days following the *Iron Baron* grounding and spill, including localized mortalities of invertebrates.

Due to the persistent presence of black abalone and sensitivity to anthropogenic and natural threats, it is difficult to separate the effects of oil spills on abalone and populations from effects on their habitat, including critical habitat. Oil spills may have direct effects on black abalone (e.g., smothering, toxic effects) as well as affect critical habitat features such as complex rocky reef habitat with deep cracks and crevices, food resources (e.g., macroalgae), and juvenile settlement habitat (e.g., crustose coralline algae).

The 2020 black abalone recovery plan identified five geographic regions and their subregions in order to apply demographic recovery criteria. These areas account for variation in the historical and current status of the species along different segments of their range, and allow for differences in how the recovery criteria apply in each region/subregion. The University of California, Santa Cruz (UCSC; Raimondi Lab) has conducted abalone habitat assessment (AHA) surveys throughout the black abalone range, to assess species' abundance, size structure, and geographic distribution. In these AHA surveys, UCSC researchers survey segments of rocky intertidal habitat to determine the abundance of black abalone as well as the quality, extent, and spatial distribution of black abalone habitat. Useful information from these AHA surveys include the extent of rocky intertidal habitat surveyed in each subregion, the survey years, the overall total number of black abalone found within a particular subregion, including density estimates, as well as size range and percentage of size ranges (age class) within each area (i.e., abalone <50 mm, 50-100 mm and >200 mm) (unpublished data from Peter Raimondi and Nate Fletcher, UCSC, 2023).

In assessing the exposure of black abalone to oil spills and response activities within a particular subregion, we looked at the abundance estimates and densities of the species within each subregion and, using the platforms and pipelines within particular Units associated with O&G activities, assessed the risk of exposure for black abalone. To assess the exposure of black abalone critical habitat to oil spills and response activities, we identified the segments of coast designated as black abalone critical habitat within the particular Units associated with O&G activities and the platforms and pipelines within those Units.

In the POCSR, black abalone and their known rocky intertidal habitat, including designated critical habitat, may be exposed to oil due to oil spills within the Point Pedernales Unit, the Santa Ynez Unit, the Port Hueneme Unit, and the Beta Unit. Using the TAP resource, we simulated a maximum 1,000 bbl spill (200 bbl over 5 days, with our level of concern set at 5 bbl) in order to understand the percentage of spills where at least 5 bbl of spilled oil would reach locations within a particular area of concern; that is, coastal and offshore island shorelines that include rocky intertidal areas with known presence of black abalone from AHA surveys, as well as those areas that include designated critical habitat for black abalone.

Within the Point Pedernales Unit, platform “Irene” is the only facility currently operating, with one pipeline transporting oil to an oil and gas plant in Lompoc. We simulated an oil spill occurring from the platform and the majority of the oil traveled south, with the probability of a small volume of oil reaching the shore where black abalone are located of ~0-18% (and critical habitat, which has been designated from Montaña de Oro State Park to just south of Government Point). Should an incident occur at the pipeline, the risk of an oil spill reaching the shoreline in this area was higher, ranging from 0-21.5%. Based on AHA surveys conducted in 2007-2008, 2012, and 2014 in this area, there are low numbers and densities of black abalone in this area (119 total abalone surveyed over 558 meters of rocky intertidal habitat surveyed; overall density of 0.1408 abalone per linear meter of rocky shoreline; unpublished data from Raimondi and Fletcher, UCSC, 2023). A few sites within the areas of potential oil exposure have densities greater than one abalone per meter shoreline (unpublished data from Raimondi and Fletcher, UCSC, 2023). Therefore, there is potential exposure of black abalone and their critical habitat to oil from oil spills occurring from platform Irene, at least up to a 21.5% chance.

Focusing on black abalone occurring further south, in the northern Channel Islands (San Miguel Island, Santa Rosa Island, Santa Cruz Island, and Anacapa Island; all designated as black abalone critical habitat), the nearest O&G facilities are directly south of Gaviota, California, within the Santa Ynez Unit and include three platforms (“Heritage,” “Harmony” and “Hondo”). One main pipeline is used to transport oil to the Las Flores Canyon Plant. In our simulations of an oil spill event occurring at any one of the three platforms, the trajectory of the oil traveled southwest (similar in fact to the natural oil seep and subsequent studies at Coal Oil Point, also off Gaviota). The risk of oil reaching the mainland coast near Santa Barbara was from 0-9%, for all three platforms. The risk of oil reaching any of the northern Channel Islands ranged 0-6.5% from “Heritage” (Santa Cruz Island and Santa Rosa Island, with a 15% probability at a few locations on Santa Rosa Island); 0-7% from “Harmony” (Santa Cruz Island and Santa Rosa Island) and 0-9% from “Hondo” (Santa Cruz Island and Santa Rosa Island). The risk of oil from a pipeline incident in this Unit ranged 0-14.5% for the mainland coast near Santa Barbara, and 0-5% for Santa Cruz, Santa Rosa, and Anacapa Islands. While the numbers and densities of black abalone are relatively low on the mainland coast near Santa Barbara and on Anacapa Island, the numbers and densities of black abalone on Santa Cruz Island and Santa Rosa Island are relatively high. In AHA surveys conducted during 2015- 2016, researchers found a total of over 8,500 black abalone found over 6,000 meters of rocky intertidal habitat (overall mean densities of 0.72 and 2.61 abalone per linear meter of rocky shoreline on Santa Rosa Island and Santa Cruz Island; unpublished data from Raimondi and Fletcher, UCSC, 2023). Therefore, there is potential exposure of black abalone and their critical habitat on the northern Channel Islands to oil from oil spills occurring at the Santa Ynez platforms and pipeline, with the probability of 0-15%.

North of the northern Channel Islands and offshore of Carpinteria, there are several active facilities and pipelines within Dos Cuadras (field name). A review of an oil incident occurring at “A” “B” “C” and “Hillhouse” and their associated pipeline revealed oil projected to be transported both north and south along the coastline, but was not projected to reach areas offshore, including the northern Channel Islands (0-3%). This was similar for platforms “Habitat,” “Houchin,” and “Hogan,” in the same area, and for platforms Grace, Gilda, Gail, and Gina further south along the coast. The risk of oil from platforms Grace, Gilda, Gail, and Gina reaching Anacapa Island was slightly higher at 0-10.5%. In AHA surveys conducted on Anacapa Island in 2015, 122 black abalone were found over 627 meters of rocky intertidal habitat (overall mean density of 0.22 abalone per linear meter of rocky shoreline; unpublished data from Raimond and Fletcher, UCSC, 2023). Therefore, there is potential exposure to oil from oil spills for black abalone and their critical habitat on Anacapa Island, but the risk is less than other areas. The risk of oil from a platform or pipeline incident within Dos Cuadras reaching the mainland coast was higher (0-39.5%), with the greatest risk along the segment of coast from Goleta to Oxnard. Based on AHA surveys conducted in 2014-2016, 2018, and 2022 from Government Point to the Malibu Pier, numbers and densities of black abalone were low, with 26 total abalone found over 6,300 meters of rocky intertidal habitat (overall mean density of 0.0076 abalone per linear meter of rocky shoreline; unpublished data from Raimondi and Fletcher, UCSC, 2023). These surveys found one site located south of Oxnard with greater than one abalone per linear meter, but when we modeled a potential oil spill originating from the nearest platform (Platform "Gina" in the Point Hueneme Unit), the risk of at least 5 bbl of oil reaching the general area (noting that specific areas are kept from the public to reduce poaching risk) was from 0 to 3%, indicating a negligible risk of exposure to oil for an area with generally low densities of black abalone.

Southeast of the northern Channel Islands, black abalone habitat is located along the shore of Palos Verdes Peninsula (from the Palos Verdes/Torrance border to Los Angeles Harbor) and from Corona Del Mar State Beach to Dana Point, as well as offshore on Santa Catalina Island, Santa Barbara Island, San Nicolas Island, and San Clemente Island. The Palos Verdes Peninsula, Santa Catalina Island, and Santa Barbara Island are designated as black abalone critical habitat. Beta Unit contains several facilities located offshore of Huntington Beach: Platforms Edith, Ellen, Elly, and Eureka and the pipeline for Edith, Ellen, and Eureka. Model simulations of an oil incident occurring off the four platforms or at the pipeline showed lower risk to reaching rocky intertidal habitat associated with black abalone (0-12.5% only at the southern tip of the Palos Verdes peninsula; 0-13% for Corona Del Mar to Dana Point). Based on AHA surveys conducted in 2018, numbers and densities of black abalone were low along the Palos Verdes Peninsula (a total of 8 abalone found over about 1,500 meters of rocky intertidal habitat; overall mean density of 0.0107 abalone per linear meter of rocky shoreline) and from Corona Del Mar to Dana Point (a total of 3 abalone found over about 2,600 meters of rocky intertidal habitat; overall mean density of 0.0011 abalone per linear meter of rocky shoreline) (unpublished data from Raimondi and Fletcher, UCSC, 2023). Therefore, there is potential exposure of black abalone and their critical habitat (at Palos Verdes Peninsula) to oil from oil spills within the Beta Unit ranging from 0-13%. The pipeline bringing oil from the Beta Unit to shore presented more risk to the shoreline adjacent to the Unit from areas south of Long Beach to Newport Beach, but this area is not known to support black abalone. None of the model simulations for the Beta Unit presented any risk to black abalone on Santa Barbara Island, San Nicolas Island, or San Clemente Island (all 0%), which are located far offshore. Model simulations showed a negligible risk of oil reaching Santa Catalina Island (0-1.5%), which is designated as critical habitat, but no black abalone were observed on AHA surveys conducted in 2018.

Given the model simulations from TAP and available information on black abalone presence, numbers/density, and critical habitat, we conclude that there is risk of exposure of black abalone and black abalone critical habitat to oil from an oil spill occurring at the platforms and pipelines associated with O&G activities. The TAP model simulations show that should an oil spill of up to 1,000 bbl occur at one of the platforms and/or pipelines, the model found up to a 21.5% probability, depending on the modeled spill location, that over 5 bbl of oil would reach locations of rocky intertidal habitat that is designated as black abalone critical habitat and/or where black abalone are present.

The highest risk to black abalone and black abalone critical habitat is in the Point Pedernales Unit, where the modeling found up to a 21.5% probability of oil being transported to the shoreline where black abalone densities are greater than one abalone per square meter, and to rocky intertidal habitat designated as critical habitat (within the segment from Montaña de Oro State Park south to an area south of Government Point). Within the segment of coast from Government Point to Malibu (not designated as critical habitat), there is one area south of Oxnard where black abalone densities are greater than one abalone per square meter; here, the model found the probability of oil being transported to the shoreline is negligible (0-5%). The model found there is a 0-13% probability of oil being transported to other areas of the mainland coast where black abalone are present but at low numbers (i.e., at rocky intertidal habitat along the coast at Palos Verdes Peninsula and from Corona Del Mar to Dana Point).

For the Channel Islands, the model found there is a 0-15% probability of oil being transported to the shoreline where black abalone densities are greater than one abalone per square meter on Santa Cruz, Santa Rosa, and Anacapa islands (all designated as critical habitat). The model found the probability of oil being transported to the shoreline is negligble (0-1.5%) for Santa Catalina Island (where there are currently no known black abalone) and zero for San Miguel, Santa Barbara, San Nicolas, and San Clemente islands.

Overall, the risk of exposure is high enough that we conclude the exposure black abalone and black abalone critical habitat to oil from an oil spill is anticipated to occur. As a result, we consider the likely response of black abalone and black abalone critical habitat subjected to an oil spill.

Response

As noted in the initial status review of black abalone, oil spills from offshore drilling platforms were noted as an ongoing concern, particularly if black abalone and their associated habitat were oiled, causing significant mortalities on shorelines. In the threats assessment, oil spills could affect both juveniles and adults. The authors noted the overall threat of oil spills to be medium, with a medium severity (VanBlaricom et al. 2009). Gastropods, particularly herbivores such as black abalone, may experience high mortality due to oil spills, depending on the degree of exposure, which in turn is often associated with shore height in intertidal populations (Keesing et al. 2018). A large and persistent spill incident could cause widespread mortality of marine invertebrates and reduced densities that may persist for long periods of time. During a large oil spill in 1957 in Baja California, mortality of the abalone *Haliotis rufescens* was reported after a tanker was shipwrecked and spilled oil for eight to nine months (*in* Keesing et al. 2018). Exposure to heavy metals as a result of an oil spill can affect the growth of black abalone, either promoting or inhibiting growth, depending on the combination and concentrations of metals (Crowe et al. 2000; Keesing et al. 2018). Direct effects to black abalone that may be exposed to oil may be lethal, through smothering or suffocation, or through toxic effects of exposure to oil through ingestion of oiled food or direct uptake from the environment. Sublethal effects may include abnormal larval development, reduced growth (Crowe et al. 2000), reduced or altered reproductive development, and increased susceptibility to disease. As black abalone depend on rocky intertidal habitat, the alteration of their habitat as a result of exposure to oil may make areas unsuitable for black abalone to occupy (or remain) particularly if oil remains in cracks and crevices.

There are few studies examining the recovery of abalone following an oil spill, although there are several studies examining the recovery of gastropods, although much of recovery would depend on the extent and type of oil that may spill in rocky intertidal habitat and the exposure of the coastline to currents and wave action. For example, the Tampico Maru wreck in Baja California, Mexico partially blocked a cove and spilled oil for eight to nine months. Despite the incident, the intertidal gastropod *Littorina keenae* survived, but subtidal gastropods, including abalone (*Haliotis* spp.) were killed, with reduced numbers seven years later (summarized in Keesing et al. 2018).

ACPs provide guidelines and information to be used by responders during a spill response. The Los Angeles/Long Beach ACP contains information for four counties that address abalone sensitive areas within the action area (Los Angeles, Ventura, Santa Barbara, and San Luis Obispo, and including the northern Channel Islands). Our review found that the ACPs are or should be updated with information on black abalone critical habitat and strategies to protect habitat during spill response activities. However, they did identify specific areas where black abalone are present and at-risk. For example, the LA-LB ACP Vol II (Northern Channel Islands) included black abalone as a “resource at risk,” with year-round presence. The site summary for Prince Island, East Simonton Cove, Bay Point, the South Side at San Miguel Island identified black abalone as comprising an important intertidal resource. Similarly, the South West Beaches, the North Area beaches, and the South East beaches on Santa Rosa Island identified black abalone as comprising an important intertidal resource. On Santa Cruz Island, the ACP identified Forney Cove, Prisoners Harbor, Scorpion Harbor Area, Smuggler’s Cove, Punta Arena to Near Point as important rocky intertidal habitat for black abalone. Anacapa Island was also identified as an important sensitive habitat for black abalone. For Ventura County (Section 9813), Geographic Response Area 7, black abalone or their critical (i.e., sensitive) habitat are not mentioned in their plan to protect, should an oil spill occur. For Santa Barbara County, the Geographical Response Areas (4-6 in Section 9812) identified Point Sal, Lion’s Head to Purisma Point, Point Pedernales & Point Arguello, Point Conception to Government Point as containing extensive rocky intertidal resources, including black abalone occurring year-round. The section of the ACP that focuses on San Luis Obispo County (Sections 9810 and 9811) mentions abalone extensively and identifies areas with critical habitat and response strategies to protect particular sites due to sensitivities of abalone and rocky intertidal habitat (primarily non-invasive techniques such as booms).

Risk

We used the following information to estimate risk, in terms of the number of black abalone that may be exposed to and affected by oil from an oil spill at the platforms and/or pipelines associated with O&G activities:

- The amount of rocky intertidal habitat (linear km of shoreline) within each SubRegion;
- The proportion of shoreline within each SubRegion that has the potential to be exposed to oil, based on the TAP model simulations;
- The density of black abalone within each SubRegion, based on the AHA surveys.

Table 12 shows the estimated number of black abalone for each SubRegion, along with the associated data used to generate these estimates. If an oil spill results in oil reaching an area with high densities of black abalone (e.g., sites on Santa Cruz Island), large numbers may be affected (e.g., thousands of black abalone) by direct contact with oil. There is some possibility that all of the black abalone exposed to oil will die; although this is highly unlikely given that the size of oil spill expected is relatively small, and it is unlikely a high volume of oil would contact these areas such that such a large mortality event could occur. For individual areas, the estimated number of black abalone that could experience some level of adverse effect ranges from 12 black abalone in the segment of coast from Corona del Mar to Dana Point, to 30,344 black abalone at Santa Cruz Island (resulting from 12 km of shoreline at Santa Cruz Island being affected by oil).

We recognize that these estimates are likely overestimates, because they include all areas that may be affected by oil and assume that densities of black abalone are similar across all rocky intertidal shoreline within each SubRegion. Actual numbers of black abalone exposed to and affected by oil from oil spills will likely be lower, because of the following reasons:

- It is unlikely that all of the potential affected areas will actually be affected by oil over the duration of the proposed action.
- Black abalone distribution is not uniform across rocky intertidal habitat and oil may or may not affect areas with high densities or numbers of black abalone.
- The probability that oil will be transported to the shoreline is relatively low for spill scenarios (in the modeled scenarios, the probability of this was up to 22%) across the segments of coast where black abalone are known or likely to be present, based on the TAP model simulations and available data from AHA surveys.
- The implementation of spill response activities as described in ACPs, which are aimed at minimizing the exposure of rocky intertidal habitat to oil should an oil spill occur.

The actual numbers of black abalone affected by direct contact with oil from an oil spill would depend on the location, size, and duration of the spill, as well as spill response activities. For example, should a spill result in oil reaching an area with low densities of black abalone (e.g., segments of the mainland coast such as from south of Government Point to Malibu and from Corona del Mar to Dana Point), then few individual may be affected (e.g., less than 10 black abalone). Most likely, a portion of the individuals exposed will die, and some of the remaining portion that survive may experience stress and sub-lethal effects, such as reduced growth and altered reproductive development. Other individuals may experience no adverse effects. Oil may also affect habitat features that subsequently reduce habitat quality for black abalone, such as retention of oil in cracks and crevices and reductions in macroalgae (an important food resource for black abalone). Although the probability that oil will reach the rocky shoreline and affect black abalone is relatively low (up to 22%) across all areas, it is a potential consequence that is not extremely unlikely, especially for some key stretches of coast for black abalone and black abalone critical habitat, and therefore may occur.

Previously, we have concluded the extent of an oil spill that is anticipated to occur as part of this proposed action would most likely be characterized as a small spill, leading to relatively minimal risks of extended exposure for many species, especially at any large distance away from the original source of the spill. As a relatively small spill (at most), we expect that the impacts of such a spill will generally diminish in a relatively short amount of time, due to natural processes such as weathering, and rapid spill dispersal, and that the exposure of most ESA-species that are mobile is expected to be minimal.

However, there are scenarios of oil spills that increase the potential for larger impacts to ESA-listed species and critical habitats, including spills where significant quantities of oil reach nearshore coastal areas. Some species and habitats in these areas may be more susceptible to impacts, given their "fixed" location and known vulnerability to oil spill impacts. Black abalone are such a species that is essentially fixed to their location and vulnerable to effects from oil spills. Oil spills are expected in the action area, and although the risk of such a spill occurring in a site where black abalone will be impacted may be relatively low in any given year, the risk becomes considerably higher over duration of the proposed action, expected to last at least the next 20 years. As a result, we conclude that even a relatively small oil spill expected to occur is anticipated to result in adverse effects, even if the amount of oil that black abalone are exposed to is not of a high volume.

Effects of oil spills on designated critical habitat for black abalone will be analyzed in section 2.5.3.9 *Effects of Oil Spills on Critical Habitat* below.

Table 12: Summary table showing the estimated number of black abalone and rocky intertidal habitat that may be exposed to oil (km of shoreline) at individual locations, if a spill up to 1,000 bbl occurred at facilities near those locations, and the data used to generate these estimates (mean density of black abalone in abalone per meter shoreline; total amount of rocky intertidal shoreline in km; and proportion of shoreline exposed to oil) for each area (SubRegion) within the action area. Also shown are the Unit and O&G facilities (platforms and pipelines) in each area and the maximum probability that at least 5 bbl of oil would reach shoreline locations in each area (SubRegion) if any one of the listed facilities is the source of the oil spill.

SubRegion	# of black abalone exposed to oil	Rocky intertidal shoreline exposed to oil (km)	Mean Density (abalone/m shoreline)	Total rocky intertidal shoreline (km)	Portion (%) of shoreline exposed to oil	Unit	O&G facilities	Max modeled probability (%) oil reaches shoreline locations from a given spill
Montana de Oro to Government Point	4,549	32	0.1408	107.7	30	Point Pedernales Unit	Platform Irene Pipeline Irene	21.5
Government Point to Malibu Pier	344	45	0.0076	64.6	70	Santa Ynez Unit Port Hueneme Unit Dos Cuadras Area	Platforms Heritage, Harmony, and Hondo and pipeline Platforms A, B, C, and Hillhouse and pipeline Platforms Habitat, Houchin, Hogan, Grace, Gilda, Gail, and Gina	14.5 (Santa Barbara area - few to no black abalone) 39.5 (Goleta to Oxnard - few to no black abalone) 5 (one site with greater than one abalone per m shoreline south of Oxnard)
Palos Verdes Peninsula	279	26	0.0107	26.1	100	Beta Unit	Platforms Edith, Ellen, Elly, and Eureka and pipeline	12.5
Corona Del Mar to Dana Point	12	11	0.0011	11.2	100	Beta Unit	Platforms Edith, Ellen, Elly, and Eureka and pipeline	13.0
Cardiff State Beach to US-Mexico border	NA	NA	0	NA	NA	NA	NA	NA
San Miguel Island	0	0	1.5896	42.2	0.0	Santa Ynez Unit	Platforms Heritage, Harmony, and Hondo and pipeline	0.0
Santa Rosa Island	4,074	6	0.7249	56.2	10	Santa Ynez Unit	Platforms Heritage, Harmony, and	15.0

SubRegion	# of black abalone exposed to oil	Rocky intertidal shoreline exposed to oil (km)	Mean Density (abalone/m shoreline)	Total rocky intertidal shoreline (km)	Portion (%) of shoreline exposed to oil	Unit	O&G facilities	Max modeled probability (%) oil reaches shoreline locations from a given spill
							Hondo and pipeline	
Santa Cruz Island	30,344	12	2.6069	116.4	10	Santa Ynez Unit	Platforms Heritage, Harmony, and Hondo and pipeline	9.0
Anacapa Island	2,267	10	0.2184	34.6	30	Santa Ynez Unit Port Hueneme Unit Dos Cuadras Area	Platforms Heritage, Harmony, and Hondo and pipeline Platforms A, B, C, and Hillhouse and pipeline Platforms Habitat, Houchin, and Hogan Platforms Grace, Gilda, Gail, and Gina	10.5
Santa Barbara Island	0	0	NA	16.0	0.0	Beta Unit	Platforms Edith, Ellen, Elly, and Eureka and pipeline	0.0
San Nicolas Island	0	0	5.3154	27.8	0.0	Beta Unit	Platforms Edith, Ellen, Elly, and Eureka and pipeline	0.0
Santa Catalina Island	0	33	0	100.3	30	Beta Unit	Platforms Edith, Ellen, Elly, and Eureka and pipeline	1.5
San Clemente Island	0	0	0.0068	90.9	0.0	Beta Unit	Platforms Edith, Ellen, Elly, and Eureka and pipeline	0.0

2.5.3.7 Effects of Oil Spills on Marine Fish

The green sturgeon is an anadromous, long-lived, and bottom-oriented (demersal) fish species in the family Acipenseridae. NMFS listed the Southern DPS of green sturgeon as threatened under the ESA in 2006 (71 FR 17757, April 7, 2006). This DPS originates from coastal watersheds south of the Eel River, with spawning confirmed in the Sacramento River system. Critical habitat was designated in 2009 (74 FR 52299, October 9, 2009) and includes coastal marine areas (to a depth of 60 fathoms) and specified riverine, estuarine, and areas from Monterey Bay, California to the U.S.-Canadian border (outside of the SCPA). After migrating out of their natal rivers, subadult green sturgeon move between coastal waters and various estuaries along the U.S. West Coast. Relatively little is known about how green sturgeon use habitats in the coastal ocean and in estuaries, or the purpose of their episodic aggregations there at certain times (Lindley et al. 2011). While in the ocean, archival tagging indicates that green sturgeon occur between 0 and 200 m depths, but spend most of their time between 20–80 m in water temperatures of 9.5–16.0°C (Huff et al. 2011). They are generally demersal but make occasional forays to surface waters, perhaps to assist their migration (Kelly et al. 2007). Little is known of the southern DPS of green sturgeon's presence within the action area, but they are rarely found south of Monterey Bay, where incidental take of the southern DPS has been documented in bottom-set trawl fishery targeting halibut. Given their preference for deeper coastal habitat, and their rare documented presence in the action area, the likelihood that an oil spill would affect the southern DPS of green sturgeon is extremely low, and is therefore discountable.

The oceanic whitetip shark was listed as a threatened species on January 30, 2018 (83 FR 4153). Oceanic whitetip sharks inhabit circumtropical and subtropical regions across the world and are most abundant between 20°N to 20°S latitudes. In the eastern Pacific Ocean, the species occur from southern California to Peru, so they may be found within the action area. Oceanic whitetip sharks live offshore in deep water but spend the majority of their time in the upper part of the water column (<150 m) feeding on fish and squid. The oceanic whitetip shark is rarely observed off California (Love et al. 2021), and given that its distribution is strongly predicted by sea surface temperatures greater than 20°C, they may be more associated with warm water incursions associated with oceanographic anomalies such as El Niño. Given the rarity of this species and the fact that they are generally found offshore in the deeper waters, the likelihood that an oil spill would affect oceanic whitetip sharks is extremely low, and therefore is discountable.

The giant manta ray was listed as a threatened species on January 22, 2018 (83 FR 2916). The environmental variables that drive giant manta ray habitat use in the ocean are largely unknown, although temperature is a clear correlate (Jaine et al. 2014). Giant manta rays are found offshore in oceanic waters near productive coastlines, continental shelves, offshore pinnacles, seamounts and oceanic islands. Stewart et al. (2016) reported that giant manta rays off the Revillagigedo Archipelago, Mexico tend to occur near the upper limit of the pelagic thermocline where zooplankton aggregate, but also shift their activity from surface waters to 100-150 meters, likely targeting surface-associated zooplankton to vertical migrators. Burgess (2017) suggested that giant manta ray specifically feed on mesopelagic plankton, which would place them at depths as deep as 1,000 meters (also see Marshall et al. 2018). Giant manta rays have been observed as far north as Santa Barbara, California south to Peru, but it is rarely observed off southern California (Love et al. 2021), perhaps due to their patchy distribution. Prebranchial gill plates of manta species are highly valued in the international trade for their perceived medicinal value, which has increased fishing pressure. Given the rarity of this species within the action area as well as its patchy distribution, the likelihood that an oil spill would affect giant manta rays is extremely low, and discountable.

The Eastern Pacific DPS of the scalloped hammerhead shark was listed as an endangered species on July 3, 2014 (79 FR 38213) primarily due to significant declines in the population attributed in part to bycatch in commercial fishing and a lack of adequate regulatory measures, which still remain. The scalloped hammerhead shark is distributed as far north as the offshore waters of the southern California coast to South America (Ecuador and possibly Peru). This DPS rarely occurs in the action area and when it does, solitary individuals are observed (Love et al. 2021). In general, these semi-migratory sharks live offshore in deep water, but similar to oceanic whitetip sharks spend the majority of time in the upper part of the water column (<200 m). Squid are a preferred prey of the scalloped hammerheads, but they also feed on fishes and crustaceans. Given the semi-migratory nature of these sharks, their widespread distribution and rarity within the action area, the likelihood that an oil spill would affect Eastern Pacific DPS of the scalloped hammerhead shark is extremely low, and therefore is discountable.

The South-Central California Coast steelhead DPS is listed as threatened and is comprised of a suite of steelhead populations that inhabit coastal stream networks from the Pajaro River (within Monterey Bay) south to, but not including the Santa Maria River (within the northern extent of the SCPA (action area). Critical habitat designated for this steelhead DPS is located outside of the SPCA and therefore, we will not further consider any effects to critical habitat. NMFS conducted its most recent five-year status review for this DPS in 2023 (NMFS 2023d) and concluded that little had changed since the last status review in 2016, with declines attributed to an extended drought (with accompanying wildfires), agriculture, mining and urbanization activities that have resulted in the loss, degradation and fragmentation of riverine habitat. The lack of comprehensive monitoring has also limited the ability to fully assess the status of individual populations and the ESU as a whole. Little is known of the oceanic distribution of this ESU, although NMFS (2023d) noted that ocean harvest of steelhead is extremely rare (and prohibited by California Department of Fish and Wildlife, and is therefore likely an insignificant impact, although past exploitation rates likely contributed to its decline.

The Southern California steelhead DPS is listed as endangered, and comprises a suite of steelhead populations that inhabit coastal stream networks from the Santa Maria River system south to the U.S.-Mexico border. NMFS recently conducted a five-year status review for this DPS (NMFS 2023d) and concluded that little had changed since the last status review in 2016. As with most U.S. West Coast salmon and steelhead stocks, this DPS has declined substantially from their historic numbers. Multiple factors have contributed to the decline of individual populations, including the loss of freshwater and estuarine habitat, periodic poor ocean conditions, and a variety of land-use, flood control, and water management practices, which have impacted many watershed-wide processes. As with the South-Central California Coast steelhead DPS, little is known of threats to steelhead during their oceanic life stage.

There is no information within the 5-year status reviews on the risk of oil spills to the two DPSs that may be found within the action area. In addition, recovery plans for both DPSs (completed in 2012) do not mention oil spills or continuation of oil production and development as a risk to the South-Central California Coast DPS and the Southern California DPS. Furthermore, in past consultations with BOEM/BSEE regarding this threat, NMFS has concluded that the likelihood of oil spills contacting steelhead trout is extremely low, and discountable, particularly given the relatively low number of individuals within the action area. With both DPSs continuing to decline due to threats found primarily in their spawning/rearing habitat (outside the action area), we conclude that the risk of oil spills affecting these two steelhead DPSs to be extremely unlikely, and therefore discountable.

2.5.3.8 Summary of the Effects of Oil Spills on ESA-Listed Species

According to analyses above, we conclude that accidental oil spills are likely to adversely affect East Pacific DPS green sea turtles and black abalone. We have estimated that 26 East Pacific DPS green turtles may experience adverse effects, and up to half of them may die as a result of the exposure. For black abalone, we have estimated that the number of black abalone that could experience some level of adverse effect ranges from 12 black abalone in the segment of coast from Corona del Mar to Dana Point, to 30,344 black abalone at Santa Cruz Island. For the other ESA-listed species, we have concluded those species are not likely to be adversely affected. Effects to designated and proposed critical habitats will be addressed in Section 2.5.3.9 below.

2.5.3.9 Effects of Oil Spills on Critical Habitat

In this section we analyze the effects oil spills (and oil spill response) that occur as a result of the proposed action on the identified essential physical and biological features of designated critical habitat for the Central America DPS and Mexico DPS of humpback whales, leatherback sea turtles, black abalone, and on the proposed designated critical habitat of East Pacific DPS of green sea turtle.

2.5.3.9.1 Humpback Whale Critical Habitat

As summarized earlier, critical habitat was designated in 2021 (86 FR 21082; April 21, 2021) for the Central America DPS and Mexico DPS of humpbacks, both of which are found in the action area and affected by the proposed action. The essential feature defined for both DPSs is prey species, primarily euphausiids and small pelagic schooling fish of sufficient quality, abundance, and accessibility within humpback whale feeding areas. As described in the 2020 Biological Report supporting critical habitat (NMFS 2020h), the southern portion of Unit 17 (central California coast area) and Unit 18 (Channel Islands area) for both DPSs overlap with the action area and include biologically important areas identified in Calambokidis et al. (2015). The nearshore boundaries of Unit 17 and Unit 18 are the 30-m and 50-m depth contour, respectively, with the offshore boundaries defined as 3,700-m depth contour. High concentrations of krill are found in these areas supporting high density feeding aggregations of whales. Unit 19 (California South Coast Area) extending from Oxnard, CA and including waters off Los Angeles, Orange, and San Diego counties, does not contain a Biologically Important Area (BIA) and falls outside of the predicted high use area in the summer/fall months. This area does support higher densities of whales in the summer, which may stem from the fact that whales might be transiting through the area rather than using the area as a feeding destination (NMFS 2020h). Because of the documented use of two particular areas highlighted above, Units 17 and 18 were found to have very high conservation value for the Central America DPS and high conservation value for the Mexico DPS of humpback whales. Unit 19 was not designated as critical habitat due to its low conservation value for both DPSs.

During the summer/fall season, when humpback whales forage extensively to prepare for their migration south to the breeding areas, they depend on large concentrations of their prey for efficiency in accumulating sufficient fat reserves. Given that some large whale species may consume the equivalent of 3-4 percent of their weight per day, a 40-ton humpback whale may consume between a ton and a ton and a half of food per day (Clapham 2013).

Risk to humpback whale critical habitat may be due to accidental oil spills associated with the proposed action. As described earlier, depending on the type of oil that may accidentally spill due to O&G activities, oil may evaporate, sink, or follow a trajectory that depends on the environmental conditions, including sea state, currents, etc. Based on the two most recent significant spills occurring in the last decade (2015 Refugio spill and 2021 Huntington Beach spill), the trajectory of oil has been documented reaching areas adjacent to or along the shoreline, where impacts in the nearshore pelagic water column to coastal pelagic species such as anchovies and sardines may occur.

There is an overlap between designated critical habitat for Units 17 and 18 of humpback whales and various pipelines and oil platforms within the action area. As described, the nearshore boundaries of Unit 17 and Unit 18 are the 30-m and 50-m depth contour, respectively, with the offshore boundaries defined as 3,700-m depth contour. High concentrations of krill are found in these areas and therefore support high density feeding aggregations of whales. Because of the documented use of two particular areas highlighted above, Units 17 and 18 were found to have very high conservation value for the Central America DPS and high conservation value for the Mexico DPS of humpback whales. This area includes nearly all of the platforms and pipelines included in the action area, except for Edith, Elly, Ellen, and Eureka. The two areas (Unit 17 and 18) include nearly all of the platforms and pipelines included in the POCSR, except for Beta Unit, off Huntington Beach. As a result, we anticipate that the likelihood that oil from any oil spill associated with the proposed action will reach areas of designated critical habitat is essentially 100% under most scenarios without needing to confirm with any models. Instead of looking at the probability that oil may contact humpback whale critical habitat under different scenarios, we instead focus on characterizing the relative extent of the designated critical habitat within the action area that will be affected by a 1,000 bbl oil spill that is anticipated under the proposed action, which could occur at various locations throughout the action area.

Using the TAP resource, we simulated a maximum 1,000 bbl spill (200 bbl over 5 days, with our level of concern set at 5 bbl reaching a given area) in order to understand the percentage of such spills in which at least 5 bbl of oil would reach locations within designated critical habitat (offshore areas surrounding Santa Barbara and Ventura Counties) over 21 days. The modeled risks to humpback whales from an accidental break in platforms offshore from Point Conception to Santa Barbara County showed the probability of reaching feeding areas designated as critical habitat. Almost all pipelines and platforms within the action area, excluding those within the Beta group, have the potential to present oil spill risks to humpback whale critical habitat.

With respect to the extent of humpback whale critical habitat that might be affected by oil from an anticipated oil spill within the action area, the TAP model results suggest that roughly 10-25% of critical habitat within the confines of the action area could be affected by oil during an oil spill, especially if the spill originates from the Point Pedernales Unit. While that estimate is coarse, the model results do support the assertion that less area of critical habitat will be impacted by oil from an anticipated oil spill than the amount of critical habitat area that will remain unaffected.

The TAP provides us with a realistic simulation of an oil spill originating from pipelines and platforms within these feeding areas. Given the close proximity to designated critical habitat, and that there is a 63% chance that at least one 50-1,000 bbl oil spill could occur over the duration of O&G production, we assume that there would be high risk of the oil contacting areas of designated critical habitat for humpback whales, even if there are ACPs in place.

As described in section 2.5.3.3 *Effects of Oil Spills on Marine Mammals*, the toxic physiological effects of oil spills to key forage species for humpback whales are well documented (see Grosell and Pasparakis 2021, NASEM 2022 for recent reviews). Generally, widespread mortalities of fish and crustaceans that inhabit the marine water column are not expected to occur, especially during an oil spill event of the magnitude that is anticipated as part of this proposed action. Given the relatively small spill that is anticipated to occur, we expect that the impacts of such a spill will generally diminish in a relatively short amount of time, due to natural processes such as weathering, and rapid spill dispersal, and that the exposure of mobile prey in the water column in the open ocean environment within designated critical habitat is expected to be minimal. This is also consistent with the fate of oil that has been described with local seeps in the action area, in the open ocean environment where an oil spill associated with this proposed action would occur. While there are risks that some individuals of key prey species may experience some adverse health effects, including mortality, we do not expect any significant prey mortality events in the water column of the open ocean where these whales forage in association with a relatively small oil spill event that is anticipated to occur.

Additionally, we consider analysis of a previous oil spill that affected a large area within the designated critical habitat for humpback whales on the relative impacts to coastal pelagic fishery resources, including some species which constitute important foraging resources of humpback whales, completed by the SWFSC. The 1969 Santa Barbara Spill (80,900 bbl) was approximately 100 times larger than the magnitude of the oil spill that is anticipated to occur as a result of this proposed action. Using data collected from aerial surveys measuring apparent relative abundance of fish schools that were happening prior to the 1969 spill, analysis was conducted to look for any significant impacts in apparent abundance and distribution over three years following the spill. Ultimately, the study concluded that pelagic fish resources. with their capability of moving widely in their environment, did not suffer short-term debility from the 1969 spill (Squire 1992). Given the much lower magnitude of the spill that is anticipated, we conclude such a spill is unlikely to lead to any measurable changes in the available prey resources for humpback whales within the designated critical habitat area.

Humpback whales are susceptible to bioaccumulation of lipophilic contaminants, such as PAHs from oil, because they have long lifespans and large fat deposits in their tissues. Some contaminants may also be passed to young whales during gestation and lactation (Aguilar and Borrell 1994). Prey, such as schooling fishes and krill, are not primarily shown to display lethal effects in response (i.e, dying off) to toxic contaminants from oil, making them a fairly abundant and accessible food source. However, the consumption of prey that has ingested oil could decrease the overall quality of foraging resources within designated critical habitat, through bioaccumulation.

Humpback whales are generalists, taking a variety of prey while foraging and also switching between target prey depending on what is most abundant or accessible, or of highest quality in the system. Although we acknowledge that a wide area of critical habitat may be affected by an oil spill, consistent with our analyses above, we expect that the impacts of a relatively small spill will generally diminish in a relatively short amount of time, due to natural processes such as weathering, and rapid spill dispersal, and that the exposure of mobile prey in the water column in the open ocean environment within designated critical habitat is expected to be minimal. Generally, the exposure of fish and crustaceans in the water column in the open ocean environment is thought to be minimal, even when large oil spills occur. Even if a small amount of prey that may have ingested oil are consumed by humpback whales within the area, this is likely to constitute a very small fraction of their diet, over only a short period of time, as they switch back and forth with other prey resources within designated critical habitat that were not affected by a relatively small oil spill. As a result, any potential reduction in the quality of the prey feature associated with prey that may have ingested oil will be undetectable.

Given the limited effects to prey features within designated critical habitat that are expected, along with the extensive amount of other areas available to feeding humpbacks, the likelihood that an oil spill between 50 and 1,000 bbl (projected to be a rare occurence over the proposed action, expected to last at least the next 20 years) would have significant impacts on the quality, abundance and accessibility of prey within designated critical habitat for both humpback whale DPSs is considered to be extremely low and therefore discountable. Moreover, any such effects, if they occurred, would be undetectable and therefore insignificant.

2.5.3.9.2 Leatherback Critical Habitat

Leatherback critical habitat was designated in 2012 (77 FR 4170) and is located within the northern part of the action area, specifically starting at Point Arguello, and extending north to the end of the action area, east of the 3,000 meter depth contour. The primary constituent element considered essential for the conservation of leatherbacks is "the occurrence of prey species, primarily scyphomedusae of the order Semaeostomeae (Chrysaora, Aurelia, Phacellophora, and Cynea), of sufficient condition, distribution, diversity, and density necessary to support individual as well as population growth, reproduction, and development of leatherbacks." We do know that leatherbacks migrate to central California from across the Pacific Ocean to access very large plumes of jellyfish in the summer and fall months.

The leatherback critical habitat review team identified oil spills and oil spill response as an activity that may require special management considerations or protection. Some oil spill response activities such as the use of dispersants, or in-situ burning, are covered under a separate ESA consultation with the U.S. Coast Guard and EPA, and we did not consider these potential effects on leatherback prey further here. The effects of oil on jellyfish is largely unknown; in fact, a review of literature on anthropogenic effects (e.g., Purcell et al. 2007) on jellyfish yielded no information compared to impacts of fisheries, power plants, etc.

We expect that the impacts of such a spill will generally diminish in a relatively short amount of time, due to natural processes such as weathering, and rapid spill dispersal, and that the exposure of jellyfish is expected to be minimal in the open ocean environment, especially within the limited extent of overlap between the proposed action and leatherback critical habitat. While there are risks that some individual jellyfish may experience some adverse health effects, including mortality, we do not expect any significant prey mortality events in the water column of the open ocean where leatherback sea turtles forage in association with the relatively small oil spill event that is anticipated to occur.

Given the limited extent of overlap between the proposed action area and leatherback critical habitat, and the uncertain impact of oil spills on jellyfish, we assume that a 1,000 bbl spill, if it were to come in contact with their prey inside the designated critical habitat, would not significantly affect the availability of prey resources for leatherbacks. Therefore, we conclude that any effects of an anticipated oil spill would be insignificant to leatherback critical habitat.

2.5.3.9.3 East Pacific Green Turtle DPS Proposed Critical Habitat

As summarized in the proposed rule to designate critical habitat for the East Pacific green turtle DPS (88 FR 46572; July 19, 2023), NMFS identified essential resting and foraging features to include nearshore areas from the mean high water line to 20 m depth, underwater refugia and food resources (i.e., seagrasses, macroalgae, and/or invertebrates) of sufficient condition, distribution, diversity, abundance, and density necessary to support survival, development, growth and reproduction. Based on research conducted in southern California, in general, adults and benthic-foraging juveniles occupy small home ranges that include foraging resources and underwater refugia. Essential features for surface-pelagic juveniles were not identified in the proposed designation of critical habitat because NMFS did not have adequate data to identify such features off the coast of California, compared to areas of the Atlantic Ocean, where sargassum serves as an essential feature for juvenile green turtles. Proposed designated critical habitat areas extend from and include San Diego Bay to and including Santa Monica Bay (except for the area between Oceanside and San Onofre, where no data were available) and surrounding Catalina Island (Figure 6). As described in the draft Biological Report supporting green turtle critical habitat, these essential features may require special management considerations or protection against activities that reduce available food and shelter, such as oil spills. The draft ESA Section 4(b)(2) report summarizes the economic impacts of proposed designation of critical habitat for the East Pacific DPS of green sea turtles (NMFS 2023e). This report included O&G activities, including oil spills/oil spill clean-up as one of many categories of activities with a Federal nexus that may have the potential to affect essential features, and which can be expected to occur within specific critical habitat areas under consideration.

As summarized earlier, ACPs in the SCPA do consider green sea turtles and habitats that should be protected. The 2023 LA/Long Beach ACP (Volume I) revised ACP 5-310 for Anaheim Bay (including the SBNWR), changing their protection strategy by adding green sea turtles to its “resources at risk.” Similarly, ACP-320 added green sea turtles for its resources at risk for Inner Bolsa Chica.

Oil spills can affect the food resources that green sea turtles depend on, particularly seagrasses and macroalgae, but also invertebrates. Green turtles foraging in areas at risk to oil spills associated with the proposed action primarily include proposed critical habitat from Santa Monica Bay south to Santa Onofre. In San Diego Bay, Lemmons et al. (2011) found that green sea turtle diet consisted of primarily mobile invertebrates (38%) followed by seagrasses (26%) and sessile invertebrates (12%). Red and green algae were also identified as feasible prey species, although at reduced levels. Depending on the habitat identified in coastal and estuarine waters within Los Angeles and Orange counties, likely local seagrass pastures are of high value, serving as a major food resource and providing habitat for other green turtle prey.

Keesing et al. (2018) provides a comprehensive global summary of the impacts and environmental risks of oil spills on marine invertebrates, algae and seagrass, all of which are food resources considered as essential features for proposed green sea turtle critical habitat. As described in several sections within this Opinion, the extent of oil exposure to resting and foraging habitats considered important to green sea turtles may be affected by a myriad of factors including: type and amount of oil, the extent of weathering, persistence and exposure, habitat type, temperature and depth, species presence, and their stage of development or maturity, including life stage, which may affect recruitment. Depending on the intensity, duration and circumstances, foraging resources (i.e., invertebrates, macroalgae, and marine plants) can suffer high levels of initial mortality together with prolonged lethal effects, depending on the sensitivity of the taxa.

While many studies have examined the effects of oil on seagrasses, consensus on impacts to the overall health of seagrass is lacking due to a high degree of variability in oiling scenarios and potential response among seagrass species (Fonseca et al. 2017). In general, smothering, fouling and asphyxiation are some of the direct physical effects that have been documented from oil contamination in marine plants. Sublethal effects can cause a reduction in tolerance to other stress factors. The toxic components of oil are thought to be PAHs, which are lipophilic and tend to accumulate in the thylakoid membranes of chloroplasts (Keeling et al. 2018). Recent studies have suggested that when oil is in direct contact with seagrasses, it can lead to blade, if not shoot mortality, which may produce more immediate effects to the above-sediment vegetation than does fouling of the sediment surface (Fonseca et al. 2017). Direct contact with seagrass following oil exposure can result in morphological changes, where seagrass blades may become bleached, blackened, yellowed, or detached from the plant, while other direct effects may include a decrease in the density of vegetative and flowering shoots. As summarized in Keesing et al. (2018), there are many reported cases where hydrocarbon exposure has not led to any form of physical change in seagrasses. While some seagrass species appear to be more sensitive to oil exposure than others, the reasons for this remain unclear and are the results are difficult to compare from studies testing different oils on different species, as any one or a combination of variables could be responsible for varying results (Keesing et al. 2018). Phytotoxic effects of petroleum oil may lead to a range of sublethal responses, including reduced growth rates and stress, which can reduce the rate of photosynthesis, etc.

Similar to the effects of oil on seagrasses, exposure to oil has been shown to be phytotoxic to algae, depending on type and extent of oil exposure. For example, following the Exxon Valdez oil spill in 1989 (3.2 million bbl), exposure to the macroalga *Fucus distichus* resulted in lower biomass, lower percent cover, impaired reproductive capability and alterations to population structure, although the adverse effects may have been also been due to oil spill cleanup (Stekoll and Deysher 2000). Reported toxic effects to oil for macroalgae have included a variety of physiological changes to enzyme systems photosynthesis, respiration and nucleic acid synthesis (Keesing et al. 2018).

As a group, motile crustaceans are among the most vulnerable marine invertebrates to oil spills and may suffer high mortalities, behavioral disorders, and reduced recruitment. For example, with crabs being a highly conspicuous component of intertidal (and subtidal) assemblages, they may be among the first casualties to be reported following a spill. While not as conspicuous, amphipods and isopods may also be heavily impacted, with varying responses post-spill, depending on the extent and type of the oil and the species impacted. In a review of historical spills, some crustaceans exposed to large oil spills remained at low levels or absent ten years (e.g., amphipods exposed to the 1978 Amoco Cadiz spill), while other crustacean species may recover as quickly as one year (e.g., several shrimp and crab species exposed to the 2002 Prestige spill). Filter feeding invertebrates such as mussels and oysters can ingest toxic PAHs which readily bind to sediment, phytoplankton and other particulate organic matter. Bivalve molluscs in particular are effective at bioaccumulation of these toxicants and thus can suffer a range of sublethal effects.

Since benthic resting habitat, including underwater refugia (e.g., rocks, reefs, troughs, and human-related structures such as bridge pilings), has been identified as an essential feature of the proposed designated critical habitat for the East Pacific DPS of green turtles, we must also consider the effects of an oil spill and associated response on this habitat feature. Within lagoons and bays, including coastal inlets and estuaries, green turtles appear to use diverse habitats, while in coastal areas, they may forage in shallower areas and move to deeper resting areas for refugia. In southern California, sea turtles were found to rest adjacent to culverts (where tidal scouring creates a deeper resting habitat), bridge pilings, runoff outflows (Crear et al. 2017) and on the seafloor within the warm-water effluent of power plants (MacDonald et al. 2012; 2013). Since many of these features are fixed structures or generally permanent (e.g., areas with tidal scouring), oil spills are not likely to adversely affect this habitat feature, particularly when compared to foraging habitat. Oil spill response activities such as the use of boom in areas with underwater refugia known to be used by green turtles may temporarily reduce the ability of turtles to access the areas. However, individual sea turtles are agile and able to move around minor temporary structures without using excessive time or energy. While these temporary obstructions may impede their movement in narrow, coastal corridors or estuarine areas such as the San Gabriel River and the SBNWR, their access to underwater refugia is anticipated to be of minimal and temporary consequence to their ability to rest, as there are many other areas they are likely to use.

We reviewed the area maps proposed to be designated critical habitat for the East Pacific DPS of green sea turtles (88 FR 46572; July 19, 2023) in order to assess the risk of these areas to a maximum 1,000 bbl accidental oil spill, given the location of platforms and pipelines associated with O&G production. We concluded that areas from Oceanside, CA south to the U.S.-Mexico border are outside of the modeled oil trajectory and thus, effects would be negligible. As summarized in the proposed rule, NMFS concluded that the Seal Beach "Wetland and Nearshore Complex" (including San Pedro Bay, San Gabriel River, Alamitos Bay, Anaheim Bay, Huntington Harbor, Bolsa Chica (excluding lowlands), SBNWR, 7th Street Basin, and offshore waters (up to 20m depth) provide high conservation value because they support a high abundance of foraging/resting green turtles. The waters adjacent to San Onofre (where a decommissioned nuclear power plant once operated) provides high conservation value because the abundance of green turtles foraging and resting in these waters is relatively high. The following areas support a moderate abundance of foraging/resting green turtles and thus provide moderate conservation value to the DPS: San Onofre to Newport (including Newport Bay); Newport to Huntington Beach; Bolsa Chica lowlands; Los Angeles and Long Beach breakwater, Palos Verdes; Santa Monica Bay; and Catalina Island.

As described earlier, within the POCSR, the highest risk to proposed green sea turtle critical habitat may be due to accidental oil spills associated with the Beta Unit. Using the TAP resource, we simulated a maximum 1,000 bbl spill (200 bbl over 5 days, with our level of concern set at 5 bbl reaching a given area) in order to understand the probability of spills where over 5 bbl would reach proposed critical habitat (generally the nearshore areas from the mean high water line to 20m depth).

Modeled spill trajectories from all four platforms in the Beta followed nearly identical patterns, radiating from the source, with the oil primarily moving in a southeasterly direction. As expected, the risk (percentage of spills when at least 5 bbl would reach locations within proposed critical habitat) decreases further from the source. The modeled trajectory from oil spilled from either of the four platforms showed higher risk around San Gabriel/SBNWR south to Newport Beach, with probabilities around 30%. Because the TAP model offers coarse resolution (2.3 x 2.3 kilometer pixels), we assume these nearshore areas extend to the 20 m depth contour, noting that the proposed designated critical habitat extends to around 1 km from shore at its widest point (Figure 3a in the proposed rule). The risk of a maximum 1,000 bbl oil spill from any of the four platforms to proposed designated critical habitat around Santa Catalina Island was negligible, at zero percent. Because the modeled risk to green sea turtle proposed critical habitat is greater when simulated from an accidental leak from the Beta Unit pipeline, we considered those results to analyze our effects to proposed critical habitat.

The 2021 Huntington Beach oil spill occurred as a result of a leak from a pipeline associated with platform Elly, one of the four platforms within Beta Unit. As described earlier, the modeled risk to sea turtles from an accidental break in the pipeline transporting oil from three of the platforms in the Beta Unit (Edith, Ellen and Eureka) showed relatively high risk to the nearshore area of the San Gabriel River/SBNWR complex and associated bays (~40-60%), likely due to the proximity of the pipeline to the shoreline. The modeled risk to adjacent areas south (Huntington Harbor and Bolsa Chica) was also high, ranging between 60-70%. South of these areas, the modeled risk to sea turtles was slightly lower, from 40-50% off Huntington Beach, to around 20% south of Newport Bay (to around Emerald Bay). The modeled risk to critical habitat south of Emerald Bay to San Onofre (the southern extent of proposed critical within our area of concern, which is north of Camp Pendleton) was consistently above 5% (6-14.5%). Using the TAP resource, the modeled risk to proposed designation of critical habitat around Catalina Island from any accidental oil spill from the pipeline in the Beta Unit were negligible (0-5%).

The nearshore areas of Santa Monica Bay are proposed to be designated as critical habitat for green sea turtles, which are found in considerably lower numbers (occasional strandings and sightings) and are of moderate risk, as described above. Besides the Beta Unit, all other units and platforms are located further north, with the closest unit found off Point Hueneme. To determine whether any modeled oil spill trajectory as a result of an accidental oil spill would pose a risk to proposed designated critical habitat in Santa Monica Bay, we simulated an oil spill originating from platform Gina within the Point Hueneme Unit, and the trajectory models reflected negligible risk to the proposed critical habitat.

The 2021 Huntington Beach oil spill provides real-life context for an accidental oil spill that may occur during the proposed action, expected to last at least the next 20 years at the Beta Unit. Given that the spill was caused by a break in a pipeline from one of the platforms (Elly), we assume it is realistic that a pipeline associated with Edith/Ellen/Eureka could become compromised and leak due to an unexpected accident during the proposed action, expected to last at least the next 20 years. The TAP provides us with a realistic simulation of an oil spill originating from this pipeline. Given the pipeline's proximity to the coastline, and that there is a 63% chance that at least one 50-1,000 bbl oil spill could occur over the duration of O&G production, we assume that if a 1,000 bbl oil spill happened at this location, there would be high risk of the oil contacting areas proposed to be designated critical habitat for green sea turtles, even if there are ACPs in place. As described earlier, the TAP model offers a coarse assessment (i.e., each cell represents 2.3 km x 2.3 km) of where oil will contact proposed critical habitat for green turtles. In addition, because the cells are oriented in a north/south and east/west direction, small areas of a cell may actually reach the coastline or nearshore areas. Where the modeled risk is between 0-5%, we consider that risk to be negligible. Therefore, given the model simulation of up to 1,000 bbl of oil spilling from the pipeline associated with the Beta Unit, and using this assumption, this translates to an area from as far north as Alamitos Bay south to San Onofre, or around 45 miles (~72 km) of coastline. Proposed designated critical habitat in this area is, as described, from the mean high water line to 20 meters depth.

The extent of oil spill that is anticipated to occur would most likely be characterized as a small spill, leading to relatively minimal risks of extended exposure for many species/habitats, especially at any large distance away from the original source of the spill. As a relatively small spill (at most), we expect that the impacts of such a spill will generally diminish in a relatively short amount of time, due to natural processes such as weathering, and rapid spill dispersal. However, we acknowledge that there are scenarios of oil spills that increase the potential for larger impacts to ESA-listed species and critical habitats, including spills where significant quantities of oil reach nearshore coastal areas. Some species and habitats in these areas may be more susceptible to impacts, given their "fixed" location and known vulnerability to oil spill impacts. The foraging habitat features within the proposed critical habitat for green sea turtles are “fixed”, and located within shallow nearshore coastal areas. As a result, we conclude that even the relatively small oil spill that is expected to occur is anticipated to result in some adverse effects to foraging resources within the proposed critical habitat, even if the amount of oil that the area is exposed to is not of a high volume.

The available information on the potential effects of an oil spill on foraging resources within the proposed critical habitat suggest that effects could be variable, ranging from no discernable impact to seagrass and invertebrates, to minimal sub-lethal impacts that likely would not cause a significant change in foraging resources, to more severe impacts including mortality and reduction of some foraging resources. As a result, we conclude that at least some negative impacts to and reduction of foraging resources are expected to occur throughout a relatively large portion of the nearshore proposed critical habitat for East Pacific DPS in the action area, based on the possibility of an oil spill up to 1,000 bbl occurring in association with the Beta Unit.

2.5.3.9.4 Black Abalone Critical Habitat

Critical habitat features of black abalone that may be affected by oil spills and oil spill response include:

- Rocky substrate (oiling of substrate, reducing quality of the habit for black abalone), including filling in of cracks and crevices with oil and debris related to oil spill response.
- Crustose coralline algae (important component of juvenile habitat): may be affected by oiling
- Food resources: exposure to oil may affect growth of macroalgae, reducing this food source for black abalone.
- Water quality: reductions in water quality due to release of oil (contamination)

Rocky intertidal habitats and ecosystems are incredibly diverse, housing a suite of ecologically important seaweed and animals and thus are affected by numerous temporally and spatially variable abiotic conditions. As summarized in the black abalone critical habitat final rule, oil and chemical spills and response are activities that may affect the physical and biological features.

Black abalone critical habitat occurs throughout the SCPA, including coastal areas of California and several offshore islands, including the Farallon Islands, Año Nuevo Island, San Miguel Island, Santa Rosa Island, Santa Cruz Island, Anacapa Island, Santa Barbara Island, and Santa Catalina Island. Specifically, the geographical areas occupied by black abalone ranges from the Del Mar Landing Ecological Reserve (just south of Gualala, in Sonoma County) to Dana Point, in Orange County, California. The action area overlaps with region 2E (Government Point to Monaña de Oro State Park) and region 3 (coastal areas in southern California identified in the recovery plan) and region 4 (offshore Channel Islands) (Figure ES 1. *in* NMFS 2020d).

Following the Refugio Beach Oil Spill in 2015, surveys were conducted to assess the impacts of the spill on rocky intertidal habitats (Raimondi et al. 2019). These surveys evaluated changes in the abundance of rocky intertidal species, substrate, and condition (oil/tar presence, bleaching) at sites within the primary spill area. Changes were compared with natural variability measured at nearby long-term monitoring sites to determine whether they could be attributed to the effects of the spill. Raimondi et al. (2019) found that oiled sites differed from non-oiled sites; in particular, the surveys showed a reduced percent cover of long-lived species such as mussels, barnacles, Endocladia, and owl limpets in oiled sites vs non-oiled sites, as well as an increased proportion of sites with oiled substrate and species within the footprint of the spill vs outside of that footprint. The biological community differed between oiled and non-oiled sites, with most species being more common at sites that were not oiled vs those that were oiled (Raimondi et al. 2019). Overall, the Refugio Beach Oil Spill caused oiling of rocky intertidal habitat and species, resulting in changes to intertidal species abundance similar to those observed in other oil spills and persisting at least a year after the spill (Raimondi et al. 2019).

These survey results indicate that oil spills can alter rocky intertidal communities, particularly the abundance of long-lived species. Oiling of substrate and species can also persist long after the spill event, prolonging the effects on rocky intertidal habitat and communities. These findings are consistent with those for the Cosco Busan spill (1,275 bbl) in San Francisco. Following the Cosco Busan spill in 2007, Raimondi et al. (2009) conducted surveys at several sites throughout the spill footprint to compare impacts to rocky intertidal communities just after the spill event and about one year later (in 2009). At sites exposed to heavy oiling (Alcatraz and Point Isabel), species composition differed between the two periods (Raimondi et al. 2009). Further evaluation at one site (Alcatraz) indicated that these changes were not due to natural variability, but due to the effects of the spill itself, resulting in an increased abundance of rock and opportunistic or ephemeral species and a decreased abundance of long-lived species (e.g., Fucus, mussels) following the spill event (Raimondi et al. 2009).

We estimated the extent of critical habitat that may be exposed to and affected by oil from an oil spill at the platforms and/or pipelines associated with O&G facilities, using the following information:

- The amount of rocky intertidal habitat (linear km of shoreline) within each SubRegion;
- The proportion of shoreline within each SubRegion that has the potential to be exposed to oil, based on the TAP model simulations;

Table 12 shows the estimated amount of rocky intertidal habitat (in linear km of shoreline) that may be affected for each SubRegion. The total amount of critical habitat that may be exposed to and affected by oil across all areas is 119 km (Government Point to Malibu, Palos Verdes Peninsula, and San Miguel, Santa Rosa, Santa Cruz, Anacapa, Santa Barbara, and Santa Catalina Islands). However, any given oil spill will only affect one area. For individual areas, the amount of critical habitat that may be exposed to and affected by oil ranged from 6 km on Santa Rosa Island, to 12 km on Santa Cruz Island, to 33 km on Santa Catalina Island. The actual amount of critical habitat affected will likely be lower because:

- The probability that oil will be transported to shoreline locations of designated black abalone critical habitat depends on the location of a spill, and spilled oil reaching the critical habitat area from any given spill remains uncertain (see Appendix A, showing results of the TAP model simulations).
- The implementation of spill response activities as described in ACPs are aimed at minimizing the exposure of rocky intertidal habitat to oil should an oil spill occur.

Should an oil spill occur at one of the platforms or pipelines, there is the potential for large areas of critical habitat to be affected by oil, depending on the location, size, and duration of the spill, with effects as described above. Although it remains uncertain whether a given spill would reach any particular area designated as critical habitat for black abalone, exposure of critical habitat to spilled oil should be anticipated to occur.

The extent of oil spill that is anticipated to occur would most likely be characterized as a small spill, leading to relatively minimal risks of extended exposure for many species/habitats, especially at any large distance away from the original source of the spill. As a relatively small spill (at most), we expect that the impacts of such a spill will generally diminish in a relatively short amount of time, due to natural processes such as weathering, and rapid spill dispersal. However, we acknowledge that there are scenarios of oil spills that increase the potential for larger impacts to ESA-listed species and critical habitats, including spills where significant quantities of oil reach nearshore coastal areas. Some species and habitats in these areas may be more susceptible to impacts, given their "fixed" location and known vulnerability to oil spill impacts. All of the critical habitat features within designated critical habitat for black abalone turtles are "fixed", and located within shallow intertidal coastal areas, As a result, we conclude that even a relatively small oil spill that is expected to occur is anticipated to result in some adverse effects to these critical habitat features within designated critical habitat, even if the amount of oil that the area is exposed to is not of a high volume.

As a result, we conclude that at least some negative impacts to the quality and/or quantity of critical habitat features may occur throughout a relatively large portion of coastline that lies within designated critical habitat for black abalone, depending on exactly what location an oil spill of up to 1,000 bbl occurred. Consequently, we conclude that the designated critical habitat for black abalone will be adversely affected.

2.5.4 Vessel Strikes

2.5.4.1 Introduction to vessel strikes

Vessel strikes are considered a serious and widespread threat to ESA-listed species (especially large cetaceans) and are the most well-documented "marine road" interaction with large whales (Pirotta et al. 2019). This threat increases as commercial shipping lanes and other high traffic vessel areas overlap important breeding and feeding habitats, and as whale populations recover and populate new areas (Swingle et al. 1993; Wiley et al. 1995). As vessel traffic becomes more widespread, an increase in vessel interactions with cetaceans and other listed species is to be expected. The vast majority of commercial vessel strike mortalities of cetaceans are likely undocumented, as most may not be observed and/or reported. Most whales killed by vessel strike end up sinking rather than washing up on shore. Kraus et al. (2005) estimated that 17 percent of vessel strikes of North Atlantic right whales are actually detected. Of 11 species of cetaceans known to be threatened by vessel strikes, fin whales are the mostly commonly struck species worldwide (Laist et al. 2001; Vanderlaan and Taggart 2007). While any vessel has the potential to hit cetaceans, the severity of injuries typically depends on the size and speed of the vessel (Knowlton and Kraus 2001; Laist et al. 2001; Vanderlaan and Taggart 2007).

Vessel strikes are known to adversely affect ESA-listed sea turtles, fishes, and marine mammals (Brown and Murphy 2010; Laist et al. 2001; NMFS and USFWS 2008; Work et al. 2010). The probability of a vessel collision depends on the number, size, and speed of vessels, as well as the distribution, abundance, and behavior of the species (Conn and Silber 2013; Hazel et al. 2007; Jensen and Silber 2004; Laist et al. 2001; Vanderlaan and Taggart 2007). If an animal is struck by a vessel, it may experience no injuries, minor non-serious injuries, serious injuries, or death. In most cases, serious injuries are often assumed to result in death given the severity of the wounds and that animals are not adequately monitored to confirm they survived following such events (e.g. Vanderlaan and Taggart 2007). With respect to large whales, lethal or severe injuries are often caused by vessels 80 meters (262.5 feet) in length or greater, traveling 25.9 kilometers per hour (14 knots) or faster (Laist et al. 2001).

Vessel Collisions with Whales and Turtles in the Action Area

From the NMFS West Coast Region Marine Mammal Health and Stranding Response Program database (NMFS unpublished stranding data), the number of confirmed vessel collisions with whale and sea turtle species reported within the action area off the coast of Southern California from 2004-2023 is shown in Figures 8a-b and 8c, respectively. Data are broken down by species and year, and represent only the reported/known mortalities and injuries. Anywhere from 1-5 whale strikes, which include non-ESA-listed species (Eastern North Pacific gray whales; unidentified whales may or may not be ESA-listed), have been reported within the action area on an annual basis for the last 20 years. Fin whale collisions are consistently documented most every year, with more variable patterns for blue, gray, and humpback whales. In some instances, collisions have been reported with whales that could not be positively identified to a species.

Stranding data from the last two decades indicates that vessel collisions with whales are attributed to a wide range of vessel activity, with shipping vessels being the most common source identified, although most often the type of vessel involved is unknown (Figure 8a). Figure 8b also illustrates that a majority of whale strikes were found in Los Angeles County, where the Ports of Los Angeles and Long Beach are located. Stranding data provide a minimum estimate of animals killed (or injured) from vessel strikes, but they may under-represent the actual number of incidents occurring because many incidents go unreported or undetected.

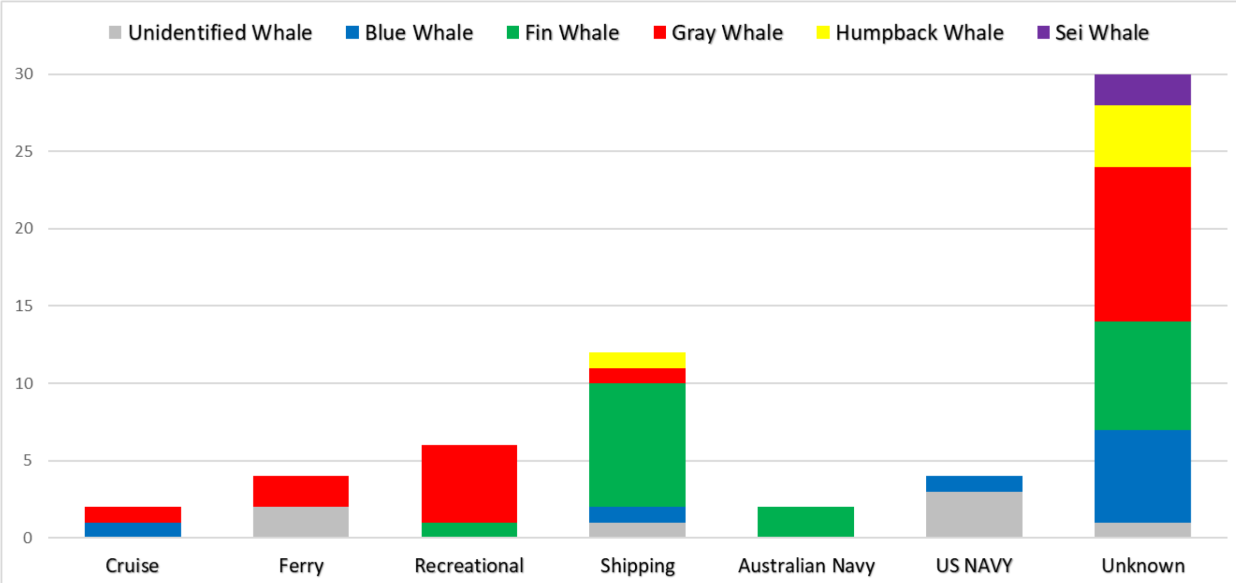

Figure 8a. Number of confirmed vessel collisions with whale species and associated vessel types in the action area from 2004-2023 (NMFS unpublished stranding data).[11]

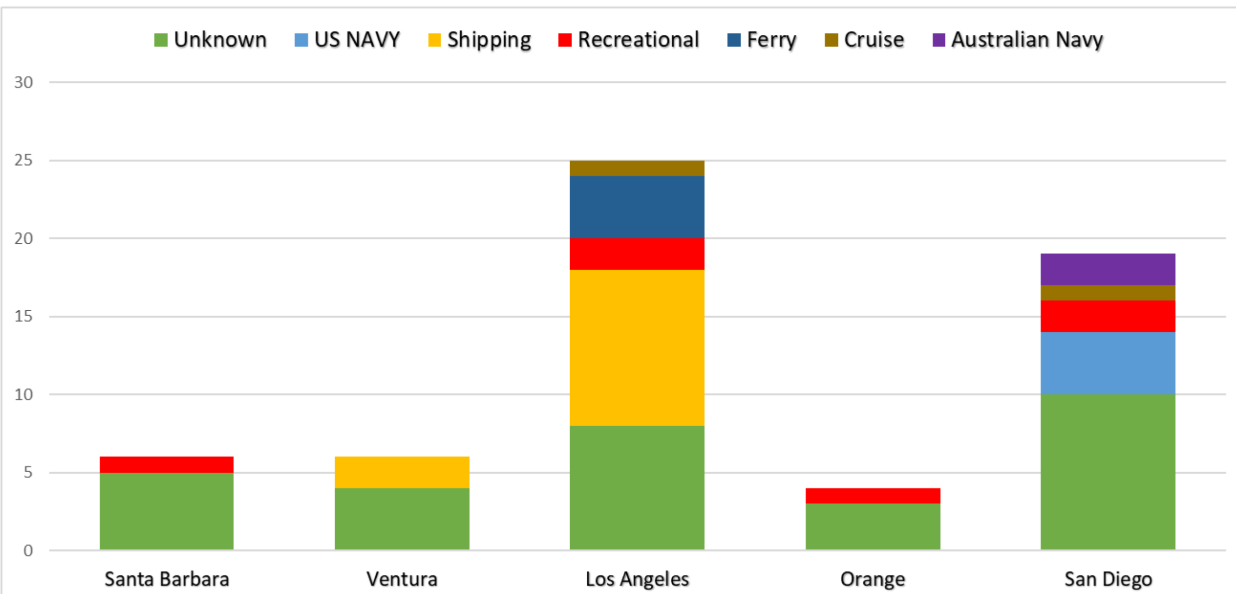

Figure 8b. Associated vessel types involved in whale collisions, by county, reported in the action area from 2004-2023. NMFS Stranding Data.

In the action area, green sea turtles are the primary species that have been documented involved in vessel collisions over the last 20 years, and the number of strikes reported has increased substantially during the last decade, with at least 8 or more recorded during 5 of the last 7 years (Figure 8c). Olive ridley sea turtles have been reported occasionally, and there have only been a few reported strikes of loggerhead and leatherback sea turtles in the area.

[11] Eastern North Pacific stock of gray whales are not a listed species, but the Western North Pacific DPS (endangered) occurs in the action area as well. Also, given the preponderance of collisions reported have involved ESA-listed whales, we can assume that at least some of the reported collisions associated with unidentified whales involve ESA-listed whale species.

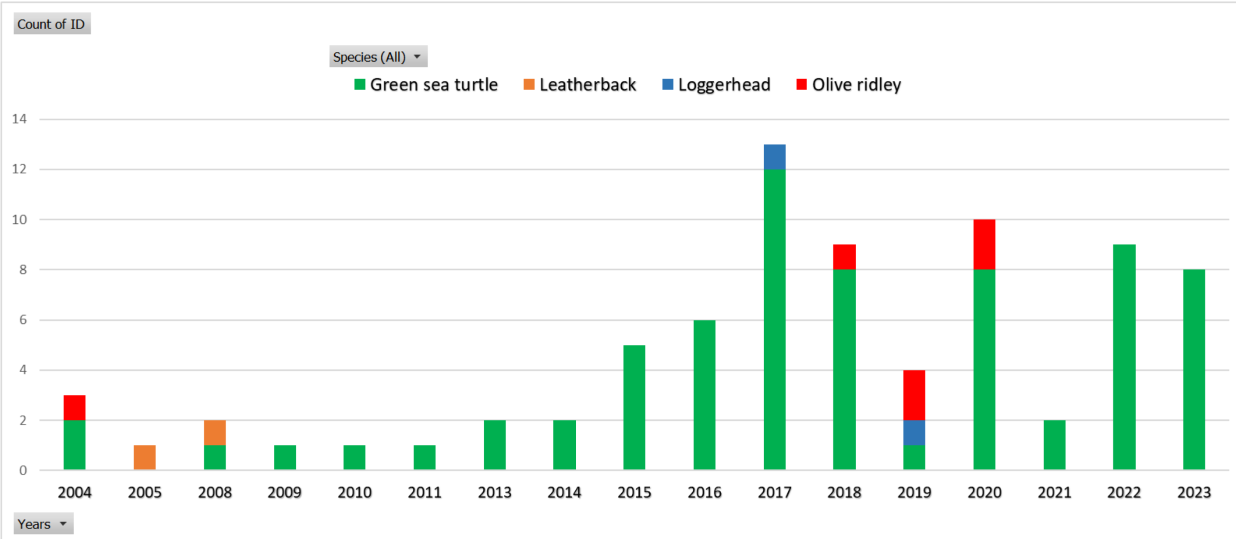

Figure 8c. Number of confirmed vessel collisions with ESA-listed sea turtles in the action area from 2004-2023, total = 79. NMFS Stranding Data.

Estimates of vessel collisions

In an effort to model vessel strike mortality for three baleen whale species off the coast of California, Rockwood et al. (2017) considered what might be the relative rate that vessel collisions that occur are observed/detected and reported, referred to as a "recovery rate". They used a recovery rate of 17 percent (representing a high estimate) based on North Atlantic right whales to produce "minimum" strike estimates, and a lower five percent recovery rate (the mean recovery rates estimated for gray, killer and sperm whales) as a best estimate, based on assumptions that rates for West Coast blue, fin, and humpback whales would be most similar to these species. The higher rate for North Atlantic right whales is likely based on their being a more buoyant species that is more easily detected (Rockwood et al. 2017). The results of those estimates across the U.S. West Coast are described above in section 2.4.1.2 *Vessel Collisions.* Notably, these estimates were only applicable for summer and fall months (July to December) when whale abundances are typically highest off the U.S. West Coast.

To look more closely at vessel collision risk in southern California outside the summer/fall season, using the model to predict whale mortality based on factors listed in Rockwood et al. (2017), Rockwood and Jahncke (2019) estimated that humpback whale mortality from January to April in southern California alone was 6.5 whales annually (1.63/month), based upon modeling using the most recent abundance estimates available for humpback whales off southern California. When added to the estimated mortality from July to December, the total estimated annual humpback mortality from vessel strikes in California alone was 23.4 deaths (16.9 + 6.5). This study did not include information for January to April for fin or blue whales, and did not estimate humpback mortality in central or northern California. In the model results, cargo vessels, especially container ships, accounted for more than half of the predicted mortality for all whale species in both northern and southern California, with oil tankers accounting for the second highest mortality.

To date, models attempting to estimate or predict vessel collisions with sea turtles have not been created, and there is no available information to characterize how many sea turtle collisions may not be detected. Given their relatively small size, it is likely that strandings of animals that remain in open waters are difficult to detect and often go unnoticed and unreported.

2.5.4.2 Analytical Approach to Estimate Vessel Strike Effects

The large extent and frequency of vessel operations associated with the proposed action has raised concerns regarding the potential for vessel strikes of ESA-listed species, especially over the relatively long time period (at least the next 20 years) associated with this activity. The approach for our evaluation of the risks and effects of vessel strikes from the proposed action is generally organized by species groups, based on varying levels of information available about their distributions that can be used for analysis, along with our knowledge and understanding of their potential vulnerability to vessel strikes within the action, and generally at large. In this section, we describe the level of vessel activity and other important characteristics of those vessels (e.g., size, speed, etc.) as they relate to the risk of vessel strike to ESA-listed species in the action area.

For several species of ESA-listed whales known to be vulnerable to vessel strikes in the action area, we have density models of species distribution compatible with a quantitative framework to explore the magnitude of vessel collision risk based on anticipated vessel activity, and predicted whale responses to strikes. We conducted the analyses for blue, humpback, and fin whales using density data from species distribution models from Becker et al. (2020a) and a framework estimating vessel strike risks informed by Rockwood et al. (2017). We do not have similar models of species density distribution available and a quantitative framework for other ESA-listed species that might be vulnerable to vessel strikes and there are other ESA-listed marine mammals and fish that are not known or thought to be especially vulnerable to vessel strikes in general or within the action area. For those species/groups, we rely on a qualitative assessment of vessel strike risk based on what we know about the extent and distribution of vessel traffic combined with information about species presence and distribution in the action area, along with characterization of their general vulnerability to vessel collision.

As part of our analysis for all ESA-listed species, we characterize and consider the general magnitude of vessel traffic associated with the proposed action and our quantitative model of vessel activity using information provided to us by the action agencies. To help evaluate the level of risk this general magnitude of vessel activity presents to ESA-listed species, we review available metrics of vessel activity and associated analyses produced for some other recent federal actions that have considered the risks associated with large scale vessel activities. We also consider known information about vessel strikes in the action area, including strandings data and reported occurrences of vessel injury in live animals, summarized in section 2.5.4.1 above.

Ultimately, we synthesize all of this information relating to vessel strike risks of ESA-listed species in the action area, within the context of the expected time horizon of the proposed action.

As described previously, we consider the potential that the proposed action is expected to continue over at least the next 20 years.

2.5.4.3 Description of Vessel Activity Associated with the Proposed Action

Daily offshore O&G development and production operations require routine personnel and equipment transfers. Two types of boats transport personnel and supplies to platforms: platform supply vessels and crew vessels. Crew and supply boats depart the coast approximately 30 times per day along predetermined routes from Seal Beach Pier in Orange County, Port of Los Angeles, Port Hueneme, Carpinteria Pier in Santa Barbara County, and Ellwood Pier in Santa Barbara County to nearby offshore platform groups. Support vessels for activities in the Santa Barbara Channel and Santa Maria Basin operate out of bases in the Santa Barbara Channel. Support vessels traveling to and from the four platforms in San Pedro Bay operate out of Long Beach. Support vessels in the Pacific Region, including both crew and supply boats, have averaged approximately 16 trips per week per platform (Bornholdt and Lear 1995, 1997).

Typical vessels used during support activities may include crew vessels, oil spill prevention and response vessels, platform supply vessels, anchor handling or tug supply vessels, diving support vessels, inspection maintenance and repair vessels, and vessels for remotely operated vehicle (ROV) support. Smaller vessels for spill prevention and response and crew transport may be 15 m (50 ft) in length and are capable of travel at speeds of 25 kn. Larger vessels are 100 m (328 ft) in length, and are powered by several thrusters, including powerful (~3000 kW) stern thrusters and smaller 800–1,000 kW thrusters for maneuvering. These vessels travel slower (10–16 kn).

Largely, our analysis will focus on information provided by BOEM about crew vessel and platform supply vessel activity associated with the proposed action, because information about the extent of other types of vessel activity was unavailable. However, given the very regular operation of crew and supply vessels on a near daily basis compared to these other vessel activities that we expect are far less frequent, we conclude that the vessel activity that we focus on does account for a very large percentage of the total vessel activity that occurs as part of the proposed action.

Vessel Trip Information

In this section we summarize information on the level of vessel traffic associated with the proposed action. BOEM provided vessel traffic data as vessel "trips," which are defined as a vessel leaving port and returning to port. Given this, these data provide a measure of vessel activity near ports. However, estimates of vessel trips are a rather coarse estimate of vessel traffic, especially as it relates to vessel traffic further offshore. For example, a vessel may leave a port, travel 1.5 km and return, while another may leave a port, travel 100 km and return. While both of these would be considered a single trip, clearly the latter vessel covered more ground and as such, may pose a greater risk to ESA-listed species in terms of vessel strikes. For any given trip, there could be a wide range of movements, with some being relatively short trips (both in time and distance) and others being much longer and further offshore. More specific consideration of the routes of vessel trips is associated with the quantitative modeling of vessel collision risks with whales in Appendix B *Vessel Collision Risk Modeling*.

In estimating vessel trips associated with the proposed action, BOEM identified two main categories of vessels. Platform supply vessels range in length from 160 to 330 ft (50 to 100 m) and provide logistic support and transportation of goods, tools, equipment, and personnel to and from offshore oil platforms and other offshore structures. Crew vessels are often 50 ft (15 m) in length and are capable of travel at speeds of 25 kn and ferry crew members to and from platforms (described in Section 3.3 of the BA). As described in the BA, vessel trips to each platform group occur almost daily, ranging from an estimated 26 roundtrips/mo (from the city of Goleta to Santa Ynez Unit platforms) to 134 roundtrips/mo (from Port of Los Angeles to Beta Unit platforms; Table 13).

Table 13. Estimated numbers of operator vessel trips per month to groups of platforms from Table 7 in the BA.

Platforms or groups of platforms visited	Departure location from shore	Estimated # trips per month
Heritage, Hondo, Harmony (Santa Ynez Unit)	Goleta	26
A, B, C, Hillhouse, Habitat, Henry	Santa Barbara	87
A, B, C, Hillhouse, Habitat, Henry	Port Hueneme	30
Gina, Gilda	Port Hueneme	87
Hogan, Houchin	Carpinteria	43
Gail, Grace	Carpinteria	43
Edith, Ellen, Elly (Beta Unit)	Port of Los Angles	134

Mitigation Measures

As described in the BA, the Bureaus conclude the risk of collisions is reduced through O&G industry use of established travel corridors. The Bureaus suggest the Santa Barbara Channel/Santa Maria Basin Oil Service Vessel Traffic Corridor Program is intended to minimize interactions between O&G operations and commercial fishing operations, as well as reduce potential for wildlife strikes (e.g., migrating gray whales). It was developed cooperatively by the two industries through the Joint Oil/Fisheries Liaison Office. In addition to providing transit corridors in and out of area ports, the program routes support traffic along the channel seaward of an outer boundary line. East of Gaviota, the outer boundary is defined by the 30-fathom line; west of Gaviota, and north of Point Conception as far as Pedernales Point, it follows the 50-fathom line. In the area west of Gaviota, the 50-fathom line is 4 km (2 nm) or more offshore.

BOEM and BSEE will implement protective measures, including vessel speed restrictions (10 kn) and protected species observers (PSOs) during vessel operations associated with well conductor removals. All project related crews are provided the approved OCS operations training program which includes information regarding marine mammal species present in the area. This information is intended to improve the awareness, detection, and avoidance of marine mammals during vessel operations associated with this activity. No additional protective measures for other vessel operations are proposed.

2.5.4.4 Whale Collision Risk Modeling

General Description of Modeling Approach

To explore the risk of a vessel collision occurring with ESA-listed large whale species (blue whale, humpback whale, and fin whale) from O&G vessel traffic within the SPCA of the POCSR, NMFS WCR adapted the vessel strike risk and mortality model for large whales presented in Rockwood et al. (2017). NMFS WCR adapts this model, while relying on the same literature and framework that Rockwood et al. (2017) established, to explore the risk of a vessel collision with several whale species along specific vessel routes that are expected to be used in the proposed action. The final output is an estimate of annual collisions and mortalities for the three focal large whale species across the relevant vessel routes. However, we don't directly apply these calculations of risk to generate absolute values of estimated strikes and mortalities, given the necessary assumptions in the model design that are described in this section, and the caveats and limitations of our quantitative approach (which are discussed in detail in the *Model Constraints, Caveats, and Considerations* and *Interpretation* portions in Appendix B; highlighted at the end of this section). In this Opinion, we rely upon these model results to inform the general magnitude of vessel collision risks associated with the extent and location of vessel activity associated with this proposed action in order assess the likelihood that vessel strikes may occur in O&G activities

A detailed explanation of the model and results are presented in Appendix B. In general, the WCR vessel collision risk model incorporates whale density data for humpback whales, blue whales, and fin whales in the action area from Becker et al. (2020a). The model also incorporates information provided by the Bureaus about key characteristics of the vessels used including vessel size, anticipated vessel speeds, and the number of transits for crew vessels and supply vessels. The model generally uses the framework outlined in Rockwood et al. (2017) to estimate encounter risks and the number of collisions that will occur, based on important characteristics of the vessels and species being analyzed, including assumed avoidance behaviors. Finally, the model estimates the probability of collisions resulting in mortalities.

We note the NMFS WCR vessel collision risk model only examines crew vessels and platform supply vessels associated with the proposed action, which may underestimate the total risk of a vessel collision. However, given the very regular operation of crew and supply vessels on a near daily basis compared to these other vessel activities that we expect are far less frequent, we conclude that the vessel activity that we have included in the modeling does account for a large majority of the total vessel activity that occurs as part of the proposed action.

Model Results, Caveats, and Limitations

The results of the model outputs are provided and described in detail in Appendix B, as are the important assumptions, caveats, and limitations. Based on information provided by the Bureaus about vessel activity, the model was run twice with all trips identified in Table 7 of the Bureau's

BA; once with all trips attributed to crew vessels in one run, and once with all trips attributed to supply vessels in a second run. The true vessel activity and associated risk would be somewhere between these two outputs. Although slower moving than crew vessels, the supply vessel scenario resulted in more than double the risk of collisions and mortalities than the crew vessel scenario. Fin whales appear to be at highest risk of collisions and mortalities in these scenarios, followed closely by humpback whales, with blue whales having the lowest estimated collisions and mortalities across scenarios. Looking at the average between the vessel type scenarios, the results would suggest that the risk for each of the species would amount to less than one vessel collision and 0.5 mortalities in any given year.

Although we used the best available information (i.e., parameter values, modeled relationships) based on the scientific literature, the modeling results should only be viewed in the context of real world responses and data limitations, and does not represent known or precisely anticipated levels of vessel collisions. There are a number of assumptions inherent in this modeling approach, many of which have significant influence on the results. Most importantly, as discussed in Appendix B, avoidance behaviors by large whales are not well understood. Garrison et al. (2022) incorporate a "reaction distance" at which a North Atlantic right whale initiates an avoidance response to an approaching vessel. A reaction distance is not readily available for blue, fin, and humpback whales. Additionally, we were not able to include stochastic behavioral responses for how fast and far away a whale would swim if an avoidance behavior was initiated in response to an approaching vessel. In addition, the model currently does not capture potential changes in speed throughout a transit, or evasive maneuvers that vessel captains may take to avoid collisions with whales, when whales are observed in the vicinity of vessels. Even subtle actions in course and/or speed change could have a large effect on potential outcomes, both in the model and in the real world. Because of these limitations, we conclude the WCR vessel collision risk model is likely underestimating the probability that a whale (or vessel) successfully avoids a collision. The model may also be overestimating the collision rate by using a generalized proportion of time that the large whales are within the strike depth. The model also did not adjust collision rates based on the behavior of large whales, such as foraging or traveling, at the time a vessel is approaching. It is possible that individuals may react differently to vessel approaches based on the behavior state that they are in.

We are cautious in our interpretation of the results from modeling vessel collision risk within the bounds of the uncertainties and limitations of the information and assumptions used to generate these calculations for O&G vessel activity, as discussed in detail in Appendix B. These factors all contribute to how and why these models could lead to biased results in terms of both underestimation and overestimation, using this modeling framework. Ultimately, on balance of all these factors, we conclude that it is likely the results are overestimating the probability of collisions to some degree, with the avoidance behavior relationship (both whale and vessel) the area of the largest uncertainty. This conclusion is further supported by inferences drawn from the information presented in the *Additional Perspective on Magnitude of Oil/Gas Vessel Activity* (section 2.5.4.6) below. As a result, we do not adopt these model results as our estimate of the number of collisions and mortalities expected to occur for these species each year during this proposed action, or for use in generating anticipated levels of take. But the model results do provide the basis for several key inferences and conclusions that help us understand the scope and likelihood of risks of vessel collisions from the proposed action.

The results from the models suggests that magnitude of vessel activity and extent of its overlap with high densities of several whale species for extended periods of time during a year creates a non-negligible risk of vessel collisions and resulting mortalities for those species. This level of risk is further extended in association with the long-term continuation of the proposed activities given the best available information on the vessels, their movements, and the species in the action area. This risk is going to be present annually for at least the next 20 years, while not necessarily at the same level or extent as vessel activity should decrease as operations move toward decommissioning stages.

Gauging the boundaries of the model results accordingly, we infer that the level of risk calculated does not predict that there are/would be strikes of each species every year, or that strikes of any species would necessarily occur each year, given the fractional values less than one represented within the boundaries of the model results and known sources of uncertainty. Ultimately, however, we do think the models support the assertion that some vessel collisions and mortalities for each of these species should be anticipated over the course of this proposed action, especially given the duration of continued project activities. Although mortality is not a certain outcome from all vessel collisions based on the information we have reviewed in this Opinion, we consider that mortality is a possible outcome from any collision involving O&G traffic.

Because of the uncertainty associated with our modeling results, we need to examine other lines of evidence to help translate our general understanding of the non-negligible risks of collisions with ESA-listed species, including the ESA-listed whales that we modeled, posed by O&G vessel activity throughout the action area, into a reasonable expectation for how many vessel collisions will occur as a result of the proposed action, which is expected to continue for at least the next 20 years. In order to do this, we will examine the level of vessel collisions that have been estimated to occur with other activities that are associated with large levels of vessel activity, along with the relative extent of vessel activity associated with those activities. We intend to gauge a realistic expectation for the level of vessel collisions that would be expected from O&G vessel activities using inferences from comparing the relative levels of vessel activities across these different actions. Our analysis and expectations for the extent of vessel collisions that we anticipate will be further described in section 2.5.4.7 *Summary of Vessel Collision Analysis* below.

2.5.4.5 Qualitative Assessment of Vessel Collision Risk for Other Species

Other ESA-listed Whales and Marine Mammal Species

As noted in the section on whale risk modeling, whale density data is only provided and analyzed for three species: blue, fin, and humpback whales. There is insufficient whale density data for the other ESA-listed whale species within the action area (North Pacific right whales, sei whales, sperm whales, and Western North Pacific gray whales). Additionally, the ship strike model can only be used for larger whales, as the scientific literature referenced above is specific to large whale behavior and lethality data.

O&G vessels transits in known areas inhabited by large whales, and relatively large vessels constantly traveling throughout the action area pose an increased likelihood of striking whales, depending on the time of year. North Pacific right whales are extremely rare in the action area, and only a few individuals have been seen off California since the early 1900s, so we do not anticipate any adverse effects from vessels to this species. Sei whales are rarely seen during NMFS ship-board surveys and there are few strandings (ship strike) over the last 30 years. Sperm whales are typically found foraging in deep water, canyons and escarpments and would therefore rarely be found in the action area. The endangered Western North Pacific gray whale forages primarily off northeastern Sakhalan Island (Russia) with a distribution extending primarily south along Japan, the Koreas, and China. Although in recent years, a few whales from this population have migrated along the eastern basin of the Pacific and south to the Mexican breeding grounds, there is still a rarity of this endangered population in the area. Therefore, due to the limited abundance of these species in the action area and low reported cases of vessel collisions to these species, we conclude that the likelihood that a vessel associated with the proposed action would strike a North Pacific right whale, sei whale, sperm whale, or Western North Pacific gray whale is extremely low.

While collisions with smaller marine mammal species have also been reported (Van Waerebeek et al. 2007), these species tend to be more agile swimmers and more capable of avoiding collisions with oncoming vessels. There have been very few documented vessel strikes with pinnipeds; however, as stranding data indicates over the last two decades, there are no reported cases of vessel collisions for Guadalupe fur seals. Therefore, due to lack of previous records of vessel strikes and the avoidance behavior of Guadalupe fur seals, we conclude that the likelihood of a vessel strike of an individual to be extremely low, and discountable.

Sea Turtles

All species of ESA-listed sea turtles within the action area are at risk of being struck by vessels associated with the proposed action. As described in the *Environmental Baseline* section 2.4.2.4, vessel strikes are a concern for sea turtles in the action area, especially green sea turtles, based on the level of reporting of strandings and high level of coastal development and human activity/vessel traffic in the area. Looking more closely at the available information on vessel strikes of sea turtles in the action area, Figure 9 below illustrates the reporting locations of various sea turtle vessel strikes within southern California, especially in Los Angeles and San Diego Counties. However, these reports are only opportunistic strandings with evidence of a collision, which usually cannot be identified with a specific vessel type. Based on behavioral observations of turtle avoidance of small vessels, green sea turtles may be susceptible to vessel strikes at speeds as low as two knots (Hazel et al. 2007). Lethal and nonlethal vessel-strike injuries observed include cracked and crushed carapaces, animals cut in half, missing limbs, propeller cuts, and scars (Foley et al. 2019). Although there have been thousands of vessel trips that have been made in support of offshore operations during the past 20 years, there have been no reports of oil and gas-related vessels having struck sea turtles. This is most likely because a strike with a turtle would probably go undetected by larger vessels and strikes are not reported.

Monitoring efforts and tracking data show that loggerheads, leatherbacks and olive ridleys are not present in high densities for extended periods of time throughout the action area, leading to an overall decreased risk of collisions. Loggerhead turtles generally do not frequent the action area, and only one loggerhead has been reported struck by a vessel in the Los Angeles/Long Beach port area where vessels originate as part of O&G activities in the last twenty years (2004-2023). As summarized in Eguchi et al. (2018) aerial surveys of loggerheads conducted in 2011 and 2015 determined that there were increased densities, abundance and distribution in the Bight when anomalous warming of the North Pacific and El Nino co-occurred. Thus, there is some increased risk when these conditions are present; however, as depicted in Figure 1 of Eguchi et al. (2018), loggerheads were not seen in the coastal areas off the Los Angeles/Long Beach port, and were found further offshore of Catalina Island. Therefore, we do not anticipate vessel transits associated with the proposed action to adversely affect loggerhead sea turtles. From 2004-2023, only six olive ridleys and two leatherbacks have been reported struck by vessels in the action area. Leatherbacks are infrequently seen south of Pt. Conception.

Given their highly migratory nature, widespread distribution throughout the Pacific Ocean, behavioral avoidance of large vessels, and the lack of evidence of any confirmed O&G vessel collisions, we conclude that the likelihood that a loggerhead, olive ridley or leatherback sea turtle may be struck by a vessel is extremely low, and discountable.

The only potential sea turtle species likely to be present with any consistency is green sea turtles, residing in the Bight, especially in estuaries and coastal areas near Long Beach and Seal Beach. As described earlier in section 2.5.3.4 *Effects of Oil Spills on Green Sea Turtles*, sea turtles congregate year-round in the San Gabriel River and in the SBNWR. Some turtles have been tracked venturing out to/from both the San Gabriel River and the SBNWR, and/or outside of the bay into nearshore waters. They are also at least occasionally present in numerous other surrounding coastal estuarine areas. Based on the available information, we assume that there are at least 200 green turtles or more occurring within an area that could be exposed to vessel traffic and risk of collisions associated with O&G activities, especially off Los Angeles and Orange Counties. Given the exponential growth of green turtles nesting on mainland Mexico beaches and the bays, estuaries, and nearshore providing adequate food resources and resting areas, we believe that the number of green sea turtles residing and foraging in Los Angeles/Orange Counties will only increase over time.

As shown in Figure 9, over the last twenty years (2004-2023), fourteen green turtles have been reported struck by vessels in Los Angeles County, and nine have been reported struck by vessels in Orange County. In the Long Beach area, many of these turtle strikes, typically determined through examination of a stranded animal, have been detected and reported from within coastal embayments such as Alamitos Bay, which suggests that at least some were more likely struck by private recreational watercraft that are more commonly operated in these areas. However, the location of where many strikes may have occurred is uncertain, and could include the nearshore coastal areas even if the subsequent stranding is later reported near or within coastal estuarine areas.

The information provided in Table 13 in section 2.5.4.3 above on vessel traffic illustrates that the highest amount of vessel activity associated with any one platform group occurs in associated with Beta Unit, in the vicinity of known areas of high concentrations of green sea turtles, by a sizeable margin (over 50% more trips than any other platform). However, we acknowledge the majority of O&G traffic overall occurs away from these areas, where green sea turtles may also occur, but far less frequently, and in lower concentrations.

Given the number of vessel trips currently estimated to occur out of Los Angeles/Long Beach Harbor traveling to/from the Beta Unit, and the apparent vulnerability of green sea turtles to vessel strikes in this area, we cannot conclude the possibility of a green turtle being struck by O&G vessels transiting for at least the next 20 years is extremely unlikely. Although mortality is not a certain outcome from all vessel collisions with sea turtles, we consider that mortality is a likely outcome from any collision involving O&G traffic based on the fact that the known record of sea turtle collisions comes from a stranding record dominated by dead sea turtles with evidence of a vessel collision. Our analysis and expectations for the extent of vessel collisions that we anticipate will be further described in section 2.5.4.7 Summary of Vessel Collision Analysis below.

Figures 9. Sea turtle vessel strikes within the action area, from Santa Barbara County to San Diego County (2004-2023).

Effects of Vessel Strikes on Marine Fish and Steelhead

Section 2.12 provided a general overview of the status, distribution, basic biology, including migration, feeding habits, thermal preferences, and threats of the ESA-listed marine fish and salmonids that may be found within the action area, so we will not repeat that here.

With regard to marine fish, the southern DPS of green sturgeon, like most *Acipenseridae*, are generally demersal and they are rarely found south of Monterey Bay. Given their preference for deeper coastal habitat, and their rare documented presence in the action area, the likelihood that the southern DPS of green sturgeon may be struck by a vessel is extremely low, and discountable. The oceanic whitetip shark is rarely found off California, is found primarily in offshore waters, but feeds in the upper part of the water column on their preferred prey. Given the rarity of this species and the fact that they are generally found offshore in the deeper waters, the likelihood that an oceanic whitetip shark may be struck by a vessel is extremely low, and discountable. The Eastern Pacific DPS of scalloped hammerhead sharks are widely distributed in the eastern Pacific Ocean and is rarely found within the action area, and if it is, only solitary individuals are observed. Given the semi-migratory nature of these sharks, their widespread distribution and rarity within the action area, the likelihood that a scalloped hammerhead shark may be struck by a vessel is extremely low, and discountable. Giant manta rays are found offshore in oceanic waters near areas of high productivity such as off continental shelves, offshore pinnacles, seamounts and oceanic islands. As such, they are known to be threatened by commercial longline vessels that may hook and entangle them. The status review for giant manta rays did provide a summary of the threat of boat strikes and found that in areas of high maritime traffic, such as in the Caribbean, that there is potential risk. However, there was little quantitative information or evidence that any observed injuries were due to vessel strikes (Miller and Klimovich 2017). Given the rarity of giant manta rays within the action area as well as its patchy distribution, the likelihood that a vessel associated with the proposed action would strike a giant manta ray is extremely low, and discountable.

Little is known of the oceanic distribution of the two DPSs of steelhead (the South-Central California Coast DPS and the Southern California Coast DPS) although they are present in the action area. The 5-year status reviews for both DPSs were recently completed (NMFS 2023d), and the risk of a vessel strike was not listed as a threat. Given that the primary threats for both DPSs are focused on their spawning/rearing habitat, our limited knowledge of their distribution or vulnerability to vessel strikes in the SPCA, we conclude that the likelihood of a vessel strike to any individual(s) from these two DPSs to be extremely low, and discountable.

2.5.4.6 Additional Perspective on Magnitude of Oil/Gas Vessel Activity

In section 2.5.4.4 and 2.5.4.5, we determined that the risks of vessel collisions for ESA-listed species, including the potential for serious injury or mortality, could not be discounted across the long duration of the proposed project for at least the next 20 years. While we have used modeling of vessel strike risk, where available, to help us reach that conclusion, we also discussed why our ability to extend those models into precise quantitative predictions of future vessel strikes associated with the proposed action is limited, and that we conclude the our WCR vessel collision risk model is likely overestimating the risks to some degree (discussed in detail in section 2.5.4.4). In order to help generate a reasonable expectation for how many vessel strikes are anticipated in the future in association with O&G activities based on multiple lines of evidence, we considered other similar activities where NMFS has determined vessel strikes are expected to occur, to help provide context for the magnitude and extent of vessel traffic associated with O&G activities and potential levels of strikes that could be expected to occur as part of this proposed action. We also characterize why different approaches are used in different consultations on vessel collisions.

NMFS has examined vessel strike risk in other consultations across the country and on a variety of activities. Because each project is unique and poses a distinct risk, consultations have employed different mechanisms to assess the vessel collision risk for listed species. Here we will summarize three different analyses, characterize the relative magnitude and extent of vessel traffic involved compared to O&G operations that we have analyzed, and discuss why these analyses may be different from the approach that we are applying in this consultation.

In the mixed programmatic consultation with the USCG for the design, build, and operation of 25 cutters in their Offshore Patrol Cutter (OPC) Program (OPR-2021-03512), NMFS examined the risk posed by that action over the 30-year life period of the project, and anticipated that vessels will strike whales. Each OPC would spend between 185 to 230 days per year at sea, which translates to a total of 4,625 to 5,750 vessel at sea days per year across the 25 OPCs. These vessels would largely be in the waters 50 nautical miles or further from shore with homeports distributed across the country. NMFS used the historical strike record associated with USCG activity for the preceding 30 years to find a strike rate of large whales by USCG vessels. Because the USCG has strict reporting requirements for any interaction, extensive training for detecting marine mammals, and a strict chain of command, NMFS believed that the vessel strike record for USCG vessels likely reflects a good accounting of the number of collisions that have occurred. During those 30 years, there were 15 strikes of large whales, 12 of which were ESA-listed species, by USCG vessels between 1991 and 2021. NMFS assumed the same collision rate would occur over the next 30-year period, given that the amount of vessel activity would be similar to that over the last 30 years, and issued terms and conditions to further minimize the vessel strike risk.

While we also examined the historical strike record for the SPCA of the POCSR action area, there are no confirmed strikes of large whales by O&G related vessels in this area. However, vessel collisions with large whales may have occurred and have not been detected or reported detected by O&G related vessels in the SPCA of the POCSR. It is also difficult to directly compare the amount of vessel activity in a year as part of the OPC Program with the current proposed action given that there is no estimate for the total distance traveled by OPCs as part of the action and the amount of hours that the OPCs would be conducting activities at speeds that may result in a serious injury/mortality if a vessel strike were to occur. Additionally, there are no species density models for all of the offshore areas that the OPCs operate within. However, it is clear that the extent of vessel activity associated with the OPC Program is substantially greater than the scope and duration of O&G activity associated with the proposed action, and may result in a greater risk of vessel collision than is anticipated in the currently proposed O&G action. Certainly, other factors including species abundances, and spatial-temporal patterns of species and vessel traffic distributions across the area where vessel operations occur, will influence risk, but we are not able to more closely evaluate those factors across different actions and action areas at this time.

NMFS analyzed the strike risk of O&G related vessels and ESA-listed species in the Gulf of Mexico (OPR-2017-9234). NMFS conducted a full analysis of vessel collision risk for Bryde's and sperm whales along with five species of sea turtles. NMFS also analyzed the strike risk for Gulf sturgeon, oceanic whitetips, and giant manta rays but determined that a full risk analysis was not necessary given the lack of previous strike reports. The consultation used a proposed project length of 50 years based on the 40-year lease periods, including new leases for 10 years following the conclusion of the consultation. To assess this risk, NMFS staff used vessel traffic estimates provided by BOEM and AIS data obtained separately to calculate the amount of overall vessel traffic and the amount of O&G vessel traffic within 10 x 10 km grid cells in the action area. They also calculated the predicted abundance of the two whale species in the same grid cells. They then multiplied the total km of all vessel traffic and O&G specific vessel traffic in each grid cell by the species abundance estimate and then summed the grid cell vessel strike risk estimates to get a total vessel strike risk estimate for the two species. They then looked at the historical strike record in the Gulf of Mexico action area for the species, and estimated the proportion of those incidents that could be associated with O&G activity by multiplying the relative proportion of vessel strike risk associated with O&G vessel traffic by the estimated historic vessel strike incidents and then assumed the historic estimates are representative of what the strike risk would be like going forward. NMFS did a similar analysis for the ESA-listed sea turtle species in the Gulf of Mexico action area, comparing the vessel traffic based on AIS data with the species abundances. Because sea turtle strikes are more likely to go undetected by vessels, NMFS extended the review of historic strikes and stranding data to include four studies from other areas to supplement the record.

The analytical approach NMFS took in the Gulf of Mexico consultation ultimately produced estimates of vessel strikes and serious injuries/mortalities for several ESA-listed whale and sea turtle species to be anticipated in association with O&G activities. For this consultation on O&G operations in southern California, AIS data for O&G and overall vessel traffic within the SPCA of the POCSR was not available for our analysis. Instead we relied on the estimated number of vessel trips described by the Bureaus in the BA and created associated vessel tracks based on the platform groupings and associated ports to explore the extent of vessel collision risks. We used species abundance data for species where we had data, and we further refined the vessel collision risk calculations by incorporating a collision risk and mortality risk for vessel and whale encounters. We used the NMFS WCR vessel collision model to incorporate factors like avoidance and mortality as related to vessel speed instead of relying on a historical strike record for O&G activity within our action area. NMFS relied on the historical strike record in the Gulf of Mexico to estimate the risk for O&G activity based on known strikes, which we do not have for the currently proposed action. We do not have species abundance data for the ESA-listed sea turtle species in the SPCA of the POCSR action area to conduct a similar analysis.

Finally, NMFS examined vessel strike risk associated with U.S. Navy vessels in the Hawaii-Southern California Training and Testing (HSTT) Study Area as part of a proposed rule to modify the regulations and Letters of Authorization (LOAs) authorizing the take of marine mammals incidental to Navy training and testing activities within the HSTT between 2018 and 2025 (88 FR 68290). The request for modification was prompted by new information on vessel strikes where two different naval vessels struck two unidentified large whales off the coast of Southern California in June 2021 and July 2021 and a foreign naval vessel struck two fin whales off the coast of Southern California in May 2021. Additionally, a U.S. Naval vessel struck a whale presumed to be either a fin or a sei whale in May 2023.

To assess the vessel strike risk to large whales in the HSTT, NMFS calculated the number of at-sea days from 2016 to present based on an extrapolation of the 2010-2015 at-sea days because the actual number of annual at-sea days is currently classified. The derived number of at-sea days for 2016 was 2,056. This was only extrapolated for naval vessels 65 feet or longer. Based on historical data, NMFS anticipated the annual number of at-sea hours by U.S. Navy vessels in the HSTT action area was going to be around 26,800 hours per year (Starcovic and Mintz 2021). Based on information provided by the Navy, NMFS expected that about 25 percent of this vessel activity would occur within the Hawaii Range Complex (HRC) and 75 percent within the Southern California Range Complex (SOCAL; Mintz 2016), which does overlap partially with the action area in this consultation.

NMFS then used the number of at-sea days and the historic naval strike record to calculate a vessel strike rate for 2009 through mid-2023, which was 0.000111 strikes per at-sea day. NMFS then calculated the number of at-sea days for the remaining 2.5 years of the regulations and multiplied it by the daily strike rate to get an estimate of 0.57 strikes over the 2.5 year period. They used a Poisson distribution to derive the probability of a specific number of strikes from mid-2023 through 2025 and found an 11 percent chance that the Navy operations in the HSTT would result in more than one large whale during the remainder of the regulations period, making it likely that the Navy's activities could result in the take of five large whales by vessel strikes. NMFS then used information in the SARs, Rockwood et al. (2017), and the historic strike record of the Navy to estimate which stocks may be involved in the five large whale strikes. Given this, NMFS determined the remaining two strikes possible during the remainder of the regulations period may involve one Eastern North Pacific (ENP) stock blue whale, a Mainland-Mexico-CA/OR/WA stock humpback whale, or an ENP stock sei whale. NMFS noted that the risk of a vessel strike by a naval vessel may be lower than the risk of other vessel types given the crew sizing and training of observers on the bridge, accompaniment of vessels by aircraft, maneuverability of many military ships, and the slow speed of submerged submarines. Similar to the assumptions and rationale asserted for accurate accounting of vessel strikes by USCG vessels, NMFS is confident that the Navy's reported strikes are accurate, based on their strict internal procedures and mitigation requirements, and the Navy's discipline, extensive training, and strict chain of command (88 FR 68290).

Extent of O&G Vessel Activity in Comparison

As stated above, we do not have a historic strike record of large whales by O&G vessels in the action area to use for a comparable analysis for this proposed project. However, we have calculated the annual number of vessel hours to examine the extent of vessel activity in a similar manner to the number of at-sea vessel days. In their BA, BOEM states that vessel trips to each platform group occur almost daily, but did not provide enough information to calculate an equivalent at-sea day amount of traffic. Because the action area for the currently proposed project is much more confined than that HSTT, we are able to better estimate the species densities within the areas where the proposed activities would take place and calculate a vessel strike risk using existing literature and the vessel traffic information provided by BOEM.

To better understand the magnitude and extent of vessel activity associated with the proposed project in comparison to other analyzed projects, we have estimated the number of vessel hours per month, based on the approximate transit route lengths and vessel speeds described in the BA. If all of the transits described in the BA were by crew vessels, the proposed action would result in roughly 537 vessel hours per month, or about 6,450 hours per year. If the transits were all by supply vessels, it would result in roughly 839 vessel hours per month, or about 10,100 hours per year. The vessel hours associated with operation of crew and supply vessels, which are expected to make up a large majority of vessel traffic for this proposed action, would be roughly 24-38 percent of the predicted vessel hours per year for the Navy HSTT actions. The Bureaus communicated that nighttime operations are unlikely to occur (we assume a small amount still could), as part of the proposed action (E. Boydston, BOEM, personal communication, November, 2023). If we assume then that vessel days would last for roughly 12 hours on average, the proposed project would equate to 537 to 839 vessel days per year for the all crew and all supply vessel scenarios we examined. The vessel traffic from the crew and supply vessels for this proposed project would equate to approximately 10 to 16 percent of the predicted average annual at sea days for the USCG OPC Program. One thing to consider in these comparisons is that while the Navy HSTT and USCG OPC related vessel activities are much larger in the extent of operation compared to those described in the Bureau's BA for this proposed action, the number of vessels operating within the same general area at a time for those actions is much smaller than the density that would be involved in this proposed action. The action area for the Navy HSTT includes the Hawaiian Islands and the U.S. West Coast and the action area for the USCG OPC includes 50 nautical miles off all coastlines of the United States. Comparatively, the action area for this proposed project is much smaller with more vessels operating along the same routes most days of the year. This may result in the vessels moving through higher whale density areas during some transits at times compared to the vessels in the Navy HSTT and USCG OPC actions.

The most direct comparison of the magnitude of vessel traffic between this proposed action and the O&G activities in the Gulf of Mexico consultation is looking at the kilometers traveled. For the Gulf of Mexico consultation, BOEM estimated an average maximum annual number of transits at 173,002. NMFS then analyzed AIS data for all O&G activities and calculated a mean annual distance traveled of 9,461,363 km. Using the routes estimated for the currently proposed action based on the platform and shoreline groupings in Table 7 of the Bureau's BA, the annual total distance traveled would be 298,154 km for crew and supply vessels. This is roughly 3 percent of the O&G activity in the Gulf of Mexico. Similar to the other two consultations, the action area for this consultation is much smaller than the action area for the Gulf of Mexico action area. Additionally, the Gulf of Mexico consultation had access to more information about all types of vessels and the number of transits associated with the action than is available for this proposed project. However, it is clear that the proposed action involves much less vessel traffic than the action in the Gulf of Mexico.

2.5.4.7 Summary of Vessel Collision Analysis

In total, we have reviewed and considered the available information relevant to evaluating the potential for vessel collisions and resulting impacts to occur with ESA-listed marine mammals, sea turtles, and fish in association with project activities. For some ESA-listed species (as further specified in section 2.12 *Not Likely to Adversely Affect Determinations*), including all ESA-listed fish, invertebrates, and most ESA-listed marine mammals and sea turtles, that may occur in the action area and were considered, we concur with BOEM and BSEE and conclude it is extremely unlikely those species will be adversely affected by vessel collisions associated with the proposed action.

However, for ESA-listed whale species including fin, blue, and both the Central America and Mexico DPS humpback whales, and East Pacific DPS green sea turtles we cannot reach that same conclusion. These are species known and expected to be concentrated for significant periods of time throughout each year this proposed action continues, at relatively high densities in the action area. These are species known to be particularly vulnerable to vessel collisions in the action area, and there is uncertainty if any previously recorded strikes have involved O&G activities or not. Vessel activity associated with the proposed action occurs at a relatively high intensity level in the action area, at a magnitude/extent that suggest strikes are a non-negligible risk for these species given expectations of vessel strikes for these species in concert with other activities with high(er) magnitudes of vessel traffic, especially in concert with the activity continuing over a relatively long time period, expected to last at least the next 20 years.

Where we have quantitatively explored vessel collision risk using model frameworks that have been used by others to explore risk using the WCR vessel collision model (see Appendix B), those results suggest that vessel collisions and mortalities of several ESA-listed whales should be expected to occur, when the large majority of traffic that we have accounted for is considered. As described previously, we assume the results of the modeling are likely an overestimate of the real world risks of vessel collision, and do not provide precise predictions for the number to expect on an annual basis. However, they are compelling that these risks are non-negligible given that known risk factors for collisions including vessel speeds, trip distribution and frequency, and species densities, are included in those assessments. Ultimately, the WCR vessel collision risk models support the assertion that some vessel collisions and mortalities for these species should be anticipated over the course of this proposed action, especially given the continued project activities expected to last at least the next 20 years.

For green sea turtles, we are not able explore vessel collision risk quantitatively because model frameworks that could be applicable to this species and action area have not been developed and are not available. Qualitatively, the risk of some vessel collisions and mortality for this species is anticipated, given the amount of vessel activity, and the persistent presence of an expanding population in this area where green sea turtle vessel collisions are known to occur regularly already.

As a result, for ESA-listed blue, fin, Central America DPS and Mexico DPS humpback whales, and East Pacific DPS green sea turtles, we cannot concur with BOEM and BSEE, and we have determined that vessel collisions with individuals of these species, including some mortalities, are likely to occur and anticipated as a result of this proposed action.

Expected Whale Collisions

Given that the uncertainty associated with the model estimates of vessel collisions with whales does not make them suitable to use as a reasonable expectation for what to expect in the future, we look to other lines of evidence to gauge our expectations using inferences from the level of vessel collisions that are estimated to occur as part of other activities where the historical accounting is considered accurate. For most other activities such as Navy and USCG actions where strikes of whales are expected, there has been a long record of reported and/or confirmed collisions. Up until now, there has not been any reported or confirmed collisions with O&G vessels and whales in the action area, although one or more whale collisions may have occurred that were otherwise not detected or reported. Although we expect that some vessel collisions with large whale species may occur as a result of O&G activities continuing over at least the next 20 years, our analysis does not suggest that vessel collisions will be frequent or regular occurrences. The NMFS WCR vessel collision risk modeling results suggest that strikes are not necessarily predicted to occur every year for each species, or that strikes of any species necessarily occur each year, given the relatively small values of risk calculated. Our finding that those results are likely over estimates, and examination of other large-scale vessel actions that involve much higher levels of vessel activity that aren't anticipated to necessarily result in strikes of any species every year either, provide further support for this determination. Generally speaking, other activities where strikes of whale are expected to occur with much larger magnitudes of vessel traffic associated generally anticipate only fractions of whale collisions happening annually (across multiple species), on average; which effectively means that a single collision of any species is only expected to happen once over a period of multiple years as part of those activities, at most. As stated above, NMFS believes the accounting for these actions has been/is accurate.

For example, for the Navy HSTT actions, the percentage likelihood of striking any one ESA-listed blue, fin, or humpback whale over a 2.5-year period ranged from 3-8% for each species, and the likelihood of two strikes across that 2.5-year period ranged was <1% for each species (88 FR 68290). As a result, based generally on a comparison of the magnitude of vessel activity alone, we expect that strikes of any one whale associated with much less vessel traffic would occur much less frequently than "once every 2.5 years" with this proposed action.

With respect to the USCG OPC Program, the highest total number of vessel strikes estimated over the 30 year period evaluated for any ESA-listed whale species was four, in association with humpback whales (combined for both Central America and the Mexico DPSs), which equates to one strike out of every 7.5 years for this species. Other ESA-listed whale species were anticipated to be struck even less frequently (OPR-2021-03512). As a result, based generally on a comparison of the magnitude of vessel activity alone, we expect that strikes associated with much less vessel traffic would occur less frequently than "once every 7.5 years" with this proposed action.

We acknowledge that it is difficult to explicitly translate risks from different project areas and vessel activities to the proposed action based strictly on the magnitude of vessel activity that is associated with actions. The risks of strikes are inevitably connected to a wide range of factors beyond simply the magnitude of vessel activity that must be related to the numbers/densities of whales present across these different areas, along with a whole host of other species behavioral and environmental factors, as well as variable vessel characteristics including vessel size, speed, maneuverability, along with traffic density and activity patterns. For this consultation, we are unable to assemble all the information necessary to further calibrate the relative risks of collisions that may be associated by all these different actions. As a result, we are not able to take the evaluation of relative risks between USCG OPC and Navy HSTT actions with a past record of strikes used to generate future expectations, which are likely spread out across wide areas where at least some whale species are known to be vulnerable to vessel collisions, and O&G activities with no past record of strikes that result in relatively concentrated vessel traffic within a more confined area of southern California, where some ESA-listed species are known to be vulnerable to vessel collisions concentrate for extended periods of time, any farther at this time. Consequently, we are forced to make inferences across these activities based primarily on the magnitude of vessel traffic. Based on the available information, we have determined that O&G vessel activities are substantially less in terms of the extent of time spent on the water in transit/operation than these other activities, and collision risk should be measured accordingly to some degree, even if not explicitly. Even if the balance of factors tilts toward an increased underlying risk of vessel collisions per unit effort associated with O&G vessel activity compared to other activities, our inference and subsequent conclusions described below remain reasonably robust to even a large variance in underlying risks given the large difference in scale of the extent of vessel traffic associated with O&G vessel activity compared to these other actions.

Based on all the available information, including the record of vessel collisions in the action area, the modeling of vessel collision risk, and relative scale of vessel activity, we conclude it is reasonable to expect that multiple whales could be struck by O&G vessels over the course of the proposed action, expected to last at least the next 20 years, with strikes across all ESA-listed whale species infrequently occurring at a rate less than one per every 7.5 years, considering the relative magnitude of USCG OPC traffic that appears to be more than 5 times greater than the extent of O&G vessel activity. We also note that the Navy HSTT expectation to hit one whale (of any of several species) every 2.5 years is generally consistent with this "one strike per species every 7.5 years if you apply that rate to the three species (fin, blue, and humpback whales) we are considering in this consultation, and Navy HSTT vessel activity appears to be at least 3 time greater than the extent of O&G vessel activity. With respect to vessel strikes for each species, we conclude there would be some variation in the species involved in these infrequent collisions, with these collisions spread out across several species over time. As a result, without a more precise way to quantify our expectations consistent with "less than one per 7.5 years for each species", we anticipate that strikes for each ESA-listed species would likely occur no more than one every 10 years on average (i.e., no more than once every ten years, for each of the 3 whale species considered in this analysis - blue, fin, and humpback whales). We recognize that there are two ESA-listed DPS of humpback whales, and will assume that these expectations will generally hold true for each ESA-listed DPS. While the outcome of any individual strike could range from a limited short-term injury to death, our risk modeling suggests that mortality would be a frequent outcome for all of these species given the vessel size and speeds anticipated under the proposed action. Therefore, we assume that any one vessel strike that may occur every 10 years could result in a mortality for each species (i.e., one mortality in total of any one of the four listed species over 10 years).

Expected Sea Turtle Collisions

Although we expect that green sea turtle collisions may occur as a result of O&G activities continuing into the future for at least the next 20 years, our analysis does not suggest that vessel collisions with O&G vessels will be frequent or regular occurrences. There is limited information about the rate of sea turtle collisions from these other projects that were reviewed, although O&G activities in the Gulf of Mexico are anticipated to result in thousands of sea turtle collisions across several species (OPR-2017-9234). As described already, the extent of vessel traffic associated with O&G activities in the Gulf of Mexico is a couple of orders of magnitude higher, and there are some abundant sea turtle populations throughout the area where that vessel activities occur, making any direct comparisons exceedingly difficult.

A review of the number of whale and sea turtle collisions reported in southern California over the last 20 years (Figures 8a&b and 8c above) suggest that they have been reported at relatively similar rates during this period (60 whales and 79 sea turtles, or 1.5 and 2.0 per year, respectively). We acknowledge that collisions across both species are underreported, although it does seem more likely that sea turtle collisions may be harder to detect and report given their much smaller size than the typical whale. Although the totals of reported collisions have been relatively similar over this time in the action area, we conclude it is likely that more sea turtle collisions have occurred than whale collisions, reflecting that there is slightly higher risk for sea turtle collisions in general in the action area than whales, across all vessel traffic. However, for O&G vessel activities, only a portion of the vessel traffic occurs in the vicinity of higher densities and regular presence of green sea turtles near the Los Angeles/Long Beach area, where risks of vessel collisions with green sea turtles are highest.

Given the uncertainty of these factors and inability to further quantify the risks of green sea turtle collisions, we conclude that overall the risk of vessel collisions for green sea turtles is relatively similar to the risk for ESA-listed whale species. As a result, we anticipate that one strike of an East Pacific DPS green sea turtle would likely occur no more than one every 10 years on average. Given that our knowledge of sea turtle collisions comes from a record of dead stranded sea turtles with evidence of a vessel collision, we anticipate that any one vessel strike that may occur every 10 years could result in a mortality.

2.5.5 Decommissioning

As described in the *Proposed Federal Action* (section 1.3.10), decommissioning involves a suite of activities to remove O&G platforms and infrastructure that is expected to produce additional noise and disturbance, vessel activity, and the risk of discharges and release of debris. The decommissioning of each of the 23 existing platforms is expected to take about one year or more to complete. At this time, the Bureaus are only in the beginning stages of planning, and final decommissioning plans will require further analysis when applications for decommissioning are submitted for approval by BOEM and BSEE. Therefore, it is not possible to complete a full analysis of the potential effects of decommissioning, given the uncertainty in the methods and timing, along with other important considerations associated with each decommissioning project, as well as their potential impacts cumulatively. Individual consultation on all decommissioning activities will occur when BOEM and BSEE consider approval for decommission plans as necessary if those proposed activities "may affect" ESA listed species.

However, we do have a general understanding of what types of activities may occur during decommissioning, and some expectations for how those types may affect ESA-listed species and critical habitat. With respect to most of the activities that might be involved with decommissioning, the potential additional noise and disturbance, vessel activity, and discharges of materials that might be created is likely similar to other O&G activities that have been analyzed in this Opinion already. For example, nonexplosive severing tools that may be used for disassembly of platform components may produce similar risks as the activities used during well conductor removals. Although mitigation measures for this proposed action have not been established, mitigation that has been proposed for other ESA consultations on oil and gas decommissioning (e.g., Gulf of Mexico; OPR-2017-9234) has included pre-and-post activity survey and reporting to document impacts to the local environment, site clearance activities to remove debris after structure removal activities are completed, and use of PSOs to monitor for the presence of marine life and document any impacts during the use of explosives, which necessitates different levels of mitigation, monitoring, and reporting for protected species based on the charge size, water depth (species delineations), and use above or below the sea floor. For most of these activities and associated stressors, NMFS has concluded during previous consultations on decommissioning activities in other areas (e.g., Gulf of Mexico; OPR-2017-9234); they are not likely to adversely affect ESA-listed species or designated critical habitats, with the exception of vessel collisions and oil spill risks. While we can't make a final determination whether all decommissioning activities can or will not adversely affect ESA-listed species or designated critical habitats at this time, it is reasonable to expect most of the impacts that could occur will involve relatively minor temporary and localized risks that we will be able to discount or find insignificant when consultation does occur on specific decommissioning projects, as we have done with most impacts for other O&G activities within this Opinion.

One potential exception may be the potential for use of explosive severance methods. Current decommissioning cost projections for the SCPA only consider non-explosive severing tools for disassembly of platform components; however, the use of explosives cannot be completely excluded. Explosive severance, however, is the primary severance method of concern during decommissioning because it could lead to the disturbance, injury, or death of listed species exposed to the shock waves from underwater explosions, as detailed in other NMFS consultations on O&G decommissioning activities (e.g., in the Gulf of Mexico; OPR-2017-9234). As mentioned above, we expect these activities to involve the use of PSOs and monitoring/mitigation measures are expected to vary based on the charge size, water depth (species delineations), and use above or below the sea floor.

The use of explosive severance methods will likely trigger consideration of whether additional permitting of impacts to marine mammal species under the MMPA for Level A injury and Level B harassment by the Office of Protected Resources (OPR) is warranted. As necessary, any Incidental Harassment Authorization (IHA) or Letter of Authorization (LOA) issued by OPR will prescribe monitoring and minimization measures to address those potential impacts. Our understanding is that explosive severance typically involves a small number of detonations for each O&G structure (OPR-2017-9234). Each detonation event creates a variable radius of potential effects to listed species ranging from mortality to temporary disturbance, ranging from up to a couple hundred of meters, out to a kilometer or more, respectively, as determined by the size and location of the explosive charges used (OPR-2017-9234).

At this time, it is unclear if explosive severance will be associated with decommissioning of O&G structures in the POCSR, and what the extent of any of those effects will be. However, based on what is known about the scope of potential impacts, we expect that those impacts will be limited to relatively few detonation events spread out over time as different platforms engage in decommissioning at different times. We acknowledge there may be a range of potential effects, but we anticipate those will be minimized through any additional permitting that is required by OPR. Ultimately, we anticipate the effects would be confined to relatively few individuals of listed species that are present in the immediate vicinity of these activities, if they occur. Most likely, effects for most individuals will be sub-lethal disturbance or temporary impairment, and very few, if any, listed species will experience any adverse effects associated with serious injuries or mortality. To date, based on review of NMFS consultations on O&G decommissioning activities nationally, the use of explosive severance for O&G decommissioning has not been associated with any anticipated jeopardy or adverse modification determinations. Considering the relatively small scale of current O&G operations and infrastructure in the POCSR, and the relatively limited expectations for potential adverse effects, if any occur at all, we do not anticipate those effects to be meaningful at the population or habitat-wide scale for any ESA-listed species or designated critical habitat.

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.

Some continuing non-Federal activities are reasonably certain to contribute to the overall environmental health and habitat quality 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 earlier in the discussion of environmental baseline (section 2.4).

We did not identify additional state or private activities that are reasonably certain to occur within the action area, do not involve Federal activities (including permitting), and could result in cumulative effects to ESA-listed species and designated critical habitat within the action area. Activities that may occur in these areas will likely consist of actions related to ocean use policy and management of public resources, such as commercial and recreational fishing, aquaculture, energy development that includes offshore wind, and other spatial planning/management projects. However, none of these potential state, local, or private actions, can be anticipated with any reasonable certainty in the action area at this time, and most actions in marine waters would likely involve federal involvement (e.g., permitting) of some type.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in assessing the risk that the proposed action poses to species and critical habitat. 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 diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

Marine Mammals

When assessing the impact of proposed or ongoing projects on marine mammals under the MMPA, NMFS relies upon the concept of PBR level to assist or guide decision making about acceptable or appropriate levels of impact that marine mammal stocks can withstand. As described in the MMPA, PBR[12] is defined as "the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (OSP; 16 U.S.C. 1362 (20)." In addition, the MMPA states that PBR is calculated as the product of three elements: the minimum population estimate (Nmin) of the stock; half the maximum net productivity rate (0.5 R_{max}) of the stock at a small population size; and a Fr. PBR is an approach developed to assess incidental take of marine mammals under the MMPA. It uses conservative minimum population estimates and a Fr based on the population status and is also comprehensive because it calculates take (total take) per stock. The underlying analysis supporting the PBR concept examined the impact of population removals for a period of 100 years in terms of the time delay in populations reaching carrying capacity. These simulations evaluated the robustness of each case over a range of bias or uncertainty in productivity rates, abundance estimation, and mortality estimation (Wade 1998). Given this long-term simulation approach used to support this concept, the levels established under the PBR are most appropriate for examining the impact of annual average removals over a long period of time, and are not an indicator of some point beyond which the stock could not reach OSP at all, over shorter time periods, or within a given year.

It is important to note that 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 as listed as threatened or endangered. The concept of managing impacts to marine mammal populations to levels that do not significantly affect recovery times shares the general intent of the jeopardy standard of the ESA in terms of looking at both the continued existence and recovery of a population. However, the ESA does not rely specifically on the same metrics or directly relate the likelihood of recovery to potential delay of recovery. In this biological opinion, the ESA-listed marine mammals also are not necessarily protected at the same scale as stocks under the MMPA. For example, fin whales are listed under the ESA as a global population whereas the area protected under the MMPA in stocks such as the CA/OR/WA stock of fin whales that occurs off the west coast of the United States. Therefore, we use the PBR concept from the MMPA to help characterize the relative impact of O&G activities on the

[12] Included in the 1994 amendments to the MMPA.

MMPA stocks of ESA-listed marine mammals likely to be adversely affected and then relate those findings to the species as a whole under the jeopardy standard of the ESA.

2.7.1 Fin Whales

In this biological opinion, we have identified the CA/OR/WA stock of fin whales as the population of ESA-listed fin whales that may be affected by the O&G occurring off southern California, and we have considered the potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. As discussed throughout the *Effects of the Action* (section 2.5), we have determined that most of those effects are expected to be significant, or that the likelihood of them occurring to fin whales are discountable. However, we anticipate that one fin whale may be struck by a vessel in any year, although no more than one individual would be expected to be struck over any 10-year period, as the proposed action continues for at least the next 20 years. It is possible this incident may result in a mortality or serious injury to the individual, so we anticipate that this would occur to any individual in the population.

The best estimate of fin whale abundance of this stock is about 11,065 whales, and the most recent PBR level for this stock is 80 animals (Carretta et al. 2023). In any given year, the loss of one fin whale represents less than 0.01% of the total estimated population of the stock. Consistent with the approaches typically used in the SAR to compare known mortalities and serious injuries to PBR and impacts that occur over a broader period of time to gauge effects, the loss of one animal over a 10-year period (or 0.1 per year) represents approximately 0.1 percent of PBR on an annual basis, well below any level that would be expected to impact the timing of the CA/OR/WA stock of fin whales recovering to OSP. As mentioned in the *Environmental Baseline* section 2.4.1, significant threats to this stock include ship strikes and, to a lesser extent, incidental entanglement in commercial fishing gear. The most recent SAR for fin whales estimates the 5-year annual average mortality and serious injury to the CA/OR/WA stock of fin whales from all human-caused sources, including commercial fisheries (0.64 animals) + ship strikes (1.4 animals), is 2.24 animals, which is about three percent (2.8%) of this stock's PBR. Although Rockwood et al. (2017) estimates that annual ship strike deaths of fin whales along the U.S. West Coast may be 43 fin whales, NMFS recognizes that there is uncertainty surrounding what the true number of ship collisions and mortalities are for fin whales, and concludes that current level of vessel strikes (whether reflected by the Rockwood et al. (2017) estimates or not) do not appear to be impeding the recovery of these stocks (NMFS 2022b).

In this biological opinion, we consider that the O&G activities are expected to occur each year for at least the next 20 years, with the effects that have been described above. As described in section 2.4 *Environmental Baseline* and section 2.6 *Cumulative Effects*, we anticipate that most of the factors that have been affecting fin whales along the U.S. West Coast such as ship strikes are likely to continue for at least the next 20 years as well. While climate change may be influencing fin whale migrations and the distributions of prey, this factor is unlikely to substantially affect the relative exposure of fin whales to O&G production activities for at least the next 20 years, in any way that we can meaningfully predict at this time. In lieu of any information that suggests the magnitude of impacts resulting from all sources of mortality and serious injury to this stock will change due to climate change over the next 20 years, we anticipate that the magnitude of impacts on fin whales that have occurred in the past are expected to continue for at least the next 20 years, including the take associated with O&G activities. Since receiving protection from whaling, the stock is likely increasing, as indicated most recently from abundance estimates from surveys conducted off the U.S. west coast from 1996 through 2018. During the past fifty years, not one fin whale has been observed struck by vessels associated with O&G production, indicating the likelihood that a large number of fin whale strikes would occur as a result of this proposed action will be very low. In combination with the impacts of ship strikes and other known fishery interactions that lead to mortality and serious injury, we expect that the proposed action will not contribute to sources of mortality at a level that would threaten the ability or timing of this stock of whales to recover in the future.

In this Opinion, we must consider the impacts from the O&G activities on the globally-listed population of fin whales. The trend in the global population of fin whales is not definitive, yet there is some evidence of increased abundance from 1991 to 2018 (Moore and Barlow 2011, Nadeem et al. 2016, Becker et al. 2020a). The additional protection from the threat of whaling is believed to have relieved the major source of mortality for this species, particularly in the Northern Hemisphere. Based on the relatively small level of impact expected from the proposed action on the affected fin whale population (CA/OR/WA stock), there is no reason to expect these anticipated impacts would lead to effects on the global population that would be measurable in terms of reduction in the reproduction, numbers, and distribution of this species. As a result, we conclude that the incidental injury and resulting mortality of no more than one fin whale every 10 years associated with the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival or recovery of fin whales.

2.7.2 Humpback Whales

In this biological opinion, we have identified two ESA-listed DPSs of humpback whales that may be affected by the O&G activities occurring off southern California, and we have considered the potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. As discussed throughout the *Effects of the Action* (section 2.5), we have determined that most of those effects are expected to be significant, or that the likelihood of them occurring to ESA-listed humpback whales are discountable. Below we describe the adverse effects anticipated for each ESA-listed humpback whale DPS.

2.7.2.1 Mexico DPS Humpback Whales

Under the proposed action, we anticipate that one Mexico DPS humpback whale may be struck by a vessel in any year, although no more than one individual would be expected to be struck over any 10-year period, as the proposed action continues for at least the next 20 years. It is possible this incident may result in a mortality or serious injury to the individual, so we anticipate that this would occur to any individual in the population. For the purposes of this biological opinion, we assume that all age-classes are vulnerable and of equal significance and males are as vulnerable as females. We expect that these mortalities or serious injuries could occur to any individual in the population.

As described in the *Status of the Species* (section 2.2.2), the most recent estimate of the abundance of Mainland Mexico-CA/OR/WA stock humpback whales is 3,477, (minimum population size of 3,185). Based on this information, the most recent 2022 draft SAR (Carretta et al. 2023) calculated PBR of 65 whales for this stock, and given the residency time of this DPS yields a PBR in U.S. waters of 43 whales per year. The loss of one animal over the next 10 years (0.1 per year) as a result of the proposed action represents about 0.2% percent of PBR (43) for this stock on an annual basis.

While the current total abundance for the entire Mexico DPS is uncertain, the population size is highly likely to be at least 6,000 (likely more) based on an array of estimates which are conservative given the increasing abundance of humpback whales along the U.S. West Coast since that time. Considering the prospect of losing one individual from the population over the course of 10 years, this represents less than 0.1 percent (0.017) of the total Mexico DPS population over that time. This is a very small proportion of the total population.

The Mexico DPS population is increasing at healthy levels, and this level of impact is expected to be undetectable for such a robust population that has been showing signs of improvement in recent decades, as indicated by the 2016 listing as threatened as opposed to the formal global listing as endangered.

In the *Status of the Species* (section 2.2.2) and *Environmental Baseline* (section 2.4.1) we summarized information from the most recent SAR for the portion of the Mexico DPS that occurs in the action area (Mainland Mexico - CA/OR/WA stock), which estimated that mortality and serious injury from commercial fisheries amounted to a total of 11.4 Mexico DPS whales per year. These estimates are specific to all of the commercial fisheries, including the many unidentified fisheries, and take into account *unidentified whales*, which are prorated to humpback whales based on location, depth, and time of year (Carretta 2018). Serious injuries/mortalities due to marine debris, recreational and tribal fisheries were estimated to be 0.56 Mexico DPS whales per year.

As summarized in the *Environmental Baseline* (section 2.4.1), a total of fourteen vessel strikes involving humpback whales were observed off the U.S. west coast (2016-2020), totaling 13.2 serious injuries/mortalities, or 2.6 whales/year. Given that 58% of these whales could be from the Mexico DPS, approximately 1.5 whales per year represents the annual average of recent known vessel strikes of the Mexico DPS within the action area. As noted earlier, NMFS recognizes that there is uncertainty surrounding what the true number of ship collisions and mortalities are for humpback whales, and concludes that current level of vessel strikes (whether reflected by the Rockwood et al. (2017) estimates or not) do not appear to be impeding the recovery of these stocks (NMFS 2022b).

Given the estimated human-caused serious injury/mortality due to commercial fisheries (11.4), plus the serious injury/mortality due to marine debris, recreational, and tribal fisheries (0.56) and known vessel strikes (1.5), yields 13.5 humpback whales removed from a population of at least 3,185 whales (minimum) or the best estimate of 3,477 animals (CV=0.101). When compared to PBR for the portion of the Mexico DPS that occurs within the action area (43 animals), the serious injury/mortality of 13.5 animals equates to 31% of PBR. Although uncertain, including the 10.2 prorated mortalities from estimated vessel strikes from Rockwood et al. (2017) results in a total of 22.1 animals, or 51% of the PBR for the portion of the Mexico DPS that occurs within the action area. As acknowledged previously, the Mexico DPS is distributed widely across the North Pacific. The extent of similar threats across the entire DPS has not been described to the same detail, but we assume they are occurring at some level throughout.

As with most large whales, removal of the threat of whaling has relieved the primary source of mortality that resulted in reduced population sizes and the listing of this species as threatened. In addition, the work of the California Dungeness Crab Fishing Gear Working Group and the Risk Assessment Mitigation Program, and other State-managed Dungeness crab fisheries, have developed strategies to address humpback whale entanglements, including fleet advisories, fishing depth constraints, vertical line reductions, fishery closures, and the use of approved alternative gear.

Although a number of threats facing humpback whales remain, this species does not appear to be at significant risk of extinction, especially in the North Pacific. While a recovery plan for the newly listed Mexico DPS has not yet been developed, we would expect that plan to address the recent increase in reported entanglements that have been observed along the U.S. West Coast, which include both U.S. and international sources of entanglements. In combination with what is known about the impacts from ship strikes and other known fishery interactions that lead to mortality and serious injury, we expect that the loss of one individual from this population every 10 years as a result of vessel strikes associated with O&G activities will not result in a detectable impact on the Mexico DPS of humpback whales, particularly considering the positive growth rate of this DPS (at least 5-6% growth per year) that has been occurring for the last 15 years. As a result, we conclude that the incidental injury and resulting mortality of no more than one Mexico DPS humpback whale every 10 years associated with the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival or recovery of the Mexico DPS humpback whale.

2.7.2.2 Central America DPS Humpback Whales

Under the proposed action, we anticipate that one Central America DPS humpback whale may be struck by a vessel in any year, although no more than one individual would be expected to be struck over any 10-year period, as the proposed action continues for at least the next 20 years. It is possible this incident may result in a mortality or serious injury to the individual, so we anticipate that this would occur to any individual in the population. For the purposes of this biological opinion, we assume that all age-classes are vulnerable and of equal significance and males are as vulnerable as females. We expect that these mortalities or serious injuries could occur to any individual in the population.

As described in the *Status of the Species* (section 2.2.2), Central America/Southern Mexico-CA/OR/WA stock of humpback whales is estimated to be approximately 1,496 individuals, and is showing a positive growth rate of 1.6 % (Curtis et al. 2022). Based on this information, the most recent 2022 SAR (Carretta et al. 2023) calculated PBR of 5.2 whales for this stock, which given the residency time of this stock in U.S. waters yields a PBR of 3.5 whales per year. The loss of one animal over the ten years (0.1 per year) as a result of the proposed action represents about 3 percent of PBR (3.5) for this stock on an annual basis. While NMFS will continue to evaluate the relationship between the humpback whale DPSs and recognized DIPs moving forward, at this time we consider the inclusion of southern Mexico humpbacks and the abundance and trend estimates recently published by Curtis et al. (2022) as being reflective of the current status of the Central America DPS.

Following along a similar approach for cataloging current threats and impacts for the portion of the Central America DPS that occurs within the action area (effectively the entire Central America DPS) in the *Status of the Species* (section 2.2.2) and *Environmental Baseline* (section 2.4.1), we summarized information from the most recent SAR for the Central America DPS which estimated that mortality and serious injury from commercial fisheries amounted to a total of 8.1 Central DPS whales per year (not including the estimated mortality/serious injury due to the vessel strikes associated with O&G activities, as estimated through 2020). These estimates specific to all of the commercial fisheries, including the many unidentified fisheries, takes into account *unidentified whales*, which are prorated to humpback whales based on location, depth, and time of year (Carretta 2018). Serious injuries/mortalities due to marine debris, recreational and tribal fisheries were estimated to be 0.35 Central America DPS whales (Carretta et al. 2023).

As summarized in the *Environmental Baseline* (section 2.4.1), a total of fourteen vessel strikes involving humpback whales were observed off the U.S. west coast (2016-2020), totaling 13.2 serious injuries/mortalities, or 2.6 whales/year. Given that 42% of these whales could be from the Central America DPS, approximately 1.1 whales per year represents the annual average of recent known vessel strikes of the Central America DPS within the action area. As noted earlier, NMFS recognizes that there is uncertainty surrounding what the true number of ship collisions and mortalities are for humpback whales, and concludes that current level of vessel strikes (whether reflected by the Rockwood et al. (2017) estimates or not) do not appear to be impeding the recovery of these stocks (NMFS 2022b).

The most recent draft SAR for the Central America-CA/OR/WA stock of humpback whales (Carretta et al. 2023) has calculated a PBR of 3.5 whales per year. Given the estimated human-caused serious injury/mortality due to commercial fisheries (8.1), plus the serious injury/mortality due to marine debris, recreational, and tribal fisheries (0.35) and known vessel strikes (1.1), yields 9.6 whales removed from a population of at least 1,284 whales (minimum) or the best estimate of 1,496 animals (CV=0.171). When compared to PBR for the portion of the Central America DPS that occurs within the action area (3.5 animals), the serious injury/mortality of 9.6 animals equates to 274% of PBR, or ~2.7 times greater than PBR for this stock. Although uncertain, including the 6.5 prorated mortalities from estimated vessel strikes from Rockwood et al. (2017), results in a total of 14.9, which is 4.3 times greater than the PBR for the portion of the Central America DPS that occurs within the action area. As described earlier, the portion of the Central America DPS that occurs within the action areas is effectively the entire population, so the levels of impact described for the Central America-CA/OR/WA stock effectively represent the totals in U.S. waters.

Considering the prospect of potentially losing one individual from the population over ten years represents about 0.07 percent of the total Central America DPS population. This is a small proportion of the total population. In this biological opinion, we anticipate that the proposed

O&G activities will continue for at least the next 20 years. The Central America DPS population is increasing, although not apparently at the same rate as the Mexico DPS. However, this remains an area of uncertainty that will need additional study moving forward given the underlying context of the observed increases in humpback whales off the U.S. West Coast, making it difficult to draw conclusions about the factors that might explain why different populations of humpback whales that have significant presence off the U.S. West Coast are growing at different rates at this time.

Although humpbacks continue to be entangled and struck by vessels, the number of confirmed reports in the last four years (< 20 animals per year during 2019-2022) has shown a decline since the number of confirmed reports from 2015-2018, where between 30 and nearly 50 humpbacks were entangled (NMFS 2023b). We know some of these humpbacks likely are represented by the Central America DPS, and that some may be serious injuries or mortalities.

As with most large whales, removal of the threat of whaling has relieved the primary source of mortality that resulted in reduced population sizes and the listing of this species as threatened. In addition, the work of the California Dungeness Crab Fishing Gear Working Group and the Risk Assessment Mitigation Program, along with other State-managed Dungeness crab fisheries, have developed strategies to address entanglement risk of humpbacks that include fleet advisories, fishing depth constraints, vertical line reductions, fishery closures, and the use of approved alternative gear.

One of the primary factors in the recent listing decision to retain an endangered status for this DPS is that the population is estimated to be at risk of extinction due to such a relatively small population size. Since that time, NMFS has determined the population has grown, although this population should still be considered relatively small. While a recovery plan for the newly listed Central America DPS has not been developed, we would expect that plan to address the recent increase in entanglements that have been observed along the U.S. West Coast, which include both U.S. and international sources of entanglements. In combination with what is known about the impacts from ship strikes and other known fishery interactions that lead to mortality and serious injury, we conclude that the loss of one individual from this population every 10 years as a result of O&G activities will not result in a detectable impact on the Central America DPS of humpback whales, particularly considering the positive growth rate of this DPS (estimated 1.6% growth per year) that has been occurring for the last 15+ years. As a result, we conclude that the limited incidental injury and resulting mortality of no more than one Central America DPS humpback whale every 10 years associated with the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival or recovery of the Central America DPS of humpback whales.

2.7.3 Blue Whales

In this biological opinion, we have identified the Eastern North Pacific stock of blue whales as the population of ESA-listed blue whales that may be affected by the O&G occurring off southern California, and we have considered the potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. As discussed throughout the *Effects of the Action* (section 2.5), we have determined that most of those effects are expected to be significant, or that the likelihood of them occurring to blue whales are discountable. However, we anticipate that up to one blue whale may be struck by a vessel in any year, although no more than one individual would be expected to be struck over any 10-year period, as the proposed action continues for at least the next 20 years. It is possible this incident may result in a mortality or serious injury to the individual, so we anticipate that this would occur to any individual in the population.

The best estimate of blue whale abundance of this stock is about 1,898 whales, and the most recent PBR level for this stock is 4.1 animals (Carretta et al. 2023). In any given year, the loss of one blue whale represents approximately 0.05% of the total estimated population of the stock. Consistent with the approaches typically used in the SAR to compare known mortalities and serious injuries to PBR and impacts that occur over a broader period of time to gauge effects, the loss of one animal over a 10-year period (or 0.1 per year) represents approximately 2.4 percent of PBR on an annual basis, well below any level that would be expected to impact the timing of the CA/OR/WA stock of blue whales recovering to OSP. As mentioned in the *Environmental Baseline* (section 2.4.1), significant threats to this stock include ship strikes and, to a lesser extent, incidental entanglement in commercial fishing gear. The most recent SAR for blue whales estimates the 5-year annual average mortality and serious injury to the CA/OR/WA stock of blue whales from all human-caused sources, including commercial fisheries (1.54 animals) + ship strikes (0.8 animals), is 2.34 animals, which is about 57 percent of this stock's PBR. Although Rockwood et al. (2017) estimates that annual ship strike deaths of blue whales along the U.S. West Coast may be 18 blue whales, NMFS recognizes that there is uncertainty surrounding what the true number of ship collisions and mortalities are for blue whales, and concludes that current level of vessel strikes (whether reflected by the Rockwood et al. (2017) estimates or not) do not appear to be impeding the recovery of these stocks (NMFS 2022b).

In this biological opinion, we consider that the O&G activities are expected to occur each year for at least the next 20 years, with the effects that have been described above. As described in section 2.4 *Environmental Baseline* and section 2.6 *Cumulative Effects*, we anticipate that most of the factors that have been affecting blue whales along the U.S. West Coast such as ship strikes are likely to continue for at least the next 20 years as well. While climate change may be influencing blue whale migrations and the distributions of prey, this factor is unlikely to substantially affect the relative exposure of blue whales to O&G production activities for at least the next 20 years, in any way that we can meaningfully predict at this time. In lieu of any information that suggests the magnitude of impacts resulting from all sources of mortality and serious injury to this stock will change due to climate change over the next 20 years, we anticipate that the magnitude of impacts on blue whales that have occurred in the past are expected to continue for at least the next 20 years, including the take associated with O&G activities. Since receiving protection from whaling, the stock is likely increasing, as indicated most recently from abundance estimates from photographic mark-recapture surveys conducted off the U.S. west coast from 1989 through 2018. During the past fifty years, not one blue whale has been observed struck by vessels associated with O&G production, indicating the likelihood that a large number of blue whale strikes would occur as a result of this proposed action will be very low. In combination with the impacts of ship strikes and other known fishery interactions that lead to mortality and serious injury, we expect that the proposed action will not contribute to sources of mortality at a level that would threaten the ability or timing of this stock of whales to recover in the future.

In this Opinion, we must consider the impacts from the O&G activities on the globally-listed population of blue whales. The trend in the global population of blue whales is not definitive, yet there is some evidence of increased abundance, and the current global mature population size is uncertain, but estimated to be in the range of 5,000-15,000 mature individuals. The additional protection from the threat of whaling is believed to have relieved the major source of mortality for this species, particularly in the Northern Hemisphere. Based on the relatively small level of impact expected from the proposed action on the affected blue whale population (Eastern North Pacific stock), there is no reason to expect these anticipated impacts would lead to effects on the global population that would be measurable in terms of reduction in the reproduction, numbers, and distribution of this species would be significant or detectable, especially given the effects will continue. As a result, we conclude that the incidental injury and resulting mortality of no more than one blue whale every 10 years associated with the proposed action is not reasonably expected to cause an appreciable reduction in the likelihood of survival or recovery of blue whales.

Sea Turtles

2.7.4 East Pacific DPS Green Sea Turtles

In this biological opinion, we have identified that green sea turtles from the East Pacific DPS may be affected by the O&G activities occurring off southern California, and we have considered the potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. As discussed throughout the *Effects of the Action* (section 2.5), we have determined that many of those effects are expected to be significant, or that the likelihood of them occurring to East Pacific DPS green sea turtles are discountable. However, with respect to oil spills, we anticipate that an oil spill up to 1,000 bbl could occur, resulting in 26 green sea turtles adversely affected, with up to half of those (13) succumbing to mortality, over the course of the proposed action lasting at least the next 20 years. We also anticipate that one green sea turtle may be struck by a vessel in any year, although no more than one individual would be expected to be struck over any 10-year period, as the proposed action continues for at least the next 20 years. It is possible this incident may result in a mortality or serious injury to the individual, so we anticipate that this would occur to any individual in the population.

The East Pacific DPS green turtle is listed as threatened under the ESA. The IUCN (2021) assessed the East Pacific green sea turtles as “vulnerable,” resulting in the downlisting of their endangered status (IUCN 2021). Seminoff et al. (2015) ranked the DPS as having a low risk of extinction based on the abundance of nesting females. NMFS and USFWS have proposed designating critical habitat for the East Pacific green sea turtle DPS within U.S. jurisdiction (88 FR 46572; July 19, 2023).

The abundance of nesting females in Mexico has substantially increased since Mexico instituted a complete ban on the harvest of sea turtles (including their eggs), with recent estimates at the two main beaches in Michoacán at 100,000 to 105,000 nesters in Colola and 4,000-6,000 nesters in Maruata (Delgado-Trejo, Instituto de Investigaciones Sorbre los Recorsos Nationale, personal communication, November 22, 2023). From the 2015 status review, there are over 3,600 nesting females in Ecuador (3,603 females in the Galapagos and 15 on the mainland) and over 2,800 nesting females in Costa Rica (2,826) (Seminoff et al. 2015). This population is likely increasing owing in part to the significant conservation efforts around the region as well as the Inter-American Convention on the Conservation and Protection of Sea Turtles, of which all three countries hosting nesting East Pacific DPS green sea turtles are contracting parties.

Although the significance of the northern foraging aggregations off southern California is not fully understood, it is possible that healthy and robust groups of green turtles living at the northern edge of their home range are indicative of a population showing some signs of recovery as opposed to being on the verge of extinction. Threats to green turtles within the U.S. west coast EEZ include occasional bycatch in some coastal fisheries and exposure to boating and vessel traffic, especially in dense population centers such as southern California. With the exception of occasional boat strikes and entrainment in power plants historically (section 2.4.2.2), we have not identified any other serious threat to the population of green turtles in the action area.

The potential loss of 13 adult female green turtles due to O&G activities during any year as a result of an oil spill, assuming all mortalities that might occur could be adult females, from a population of over 110,000 adult females in the East Pacific DPS equates to about 0.01 percent of the adult female population. Likely some portion of those mortalities would be associated with males and/or juveniles. As explained previously, we expect that the impacts of such a spill will generally diminish in a relatively short amount of time, and that the exposure of East Pacific DPS green sea turtles will be minimized.

The potential loss of one adult female green turtle over any 10-year period (or 0.1 per year), during the proposed action continuing for at least the next 20 years, due to O&G activities during any year as a result of a ship strike, equates to less than 0.01 percent of the adult female population. We believe the effect on the population would be undetectable, particularly considering the natural variation in factors such as environmental productivity and survival rates for all sea turtles, including green turtles, in addition to the evidence of an increasing trend.

In addition to the risk of extinction, we must also consider the impact of proposed actions on the prospects for recovery of ESA-listed species under the jeopardy standard. The recovery tasks and goals identified by NMFS and USFWS (1998) for eastern Pacific green sea turtles are focused on the research and conservation activities that NMFS has been actively engaged in. As with other ESA-listed sea turtle species in the Pacific it seems likely that any abundance goals for populations, including the populations in the eastern Pacific, rest on factors of productivity and mortality throughout their range that are not likely to be affected by the occasional removal of one adult female every few years.

Given the best available information, we conclude that the limited anticipated incidental injury and resulting mortality of East Pacific DPS green sea turtles associated with the proposed action is not likely to appreciably reduce the likelihood of survival or recovery of this species.

2.7.4.1 Proposed East Pacific DPS Green Sea Turtle Critical Habitat

In this biological opinion, we have identified the proposed critical habitat designation for East Pacific DPS green sea turtles may be affected by O&G activities occurring off southern California, and we have considered the potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. As discussed throughout the *Effects of the Action* (section 2.5), we have determined that most of those effects are expected to be insignificant, or that the likelihood of them occurring to the proposed critical habitat for East Pacific DPS green sea turtles are discountable. However, our analysis suggest that effects to foraging resources could be variable, but it is likely that at least some negative impacts to and reduction of foraging resources may occur throughout a relatively large portion of the nearshore proposed critical habitat for East Pacific DPS in the action area, if an oil spill up to 1,000 bbl were to occur in association with the Beta Unit. As a result, we anticipate that an oil spill could adversely affect foraging features associated with proposed critical habitat for East Pacific DPS green sea turtles.

As described earlier in section 2.5.3.9, the modeled risk to sea turtles from an accidental break in the pipeline transporting oil from three of the platforms in the Beta Unit (Edith, Ellen and Eureka) showed relatively high risk of oil reaching nearshore areas within the proposed critical habitat designation near the San Gabriel River/SBNWR complex (~40-60 percent chance of at least 5 bbl of oil reach locations), adjacent areas south near Huntington Harbor and Bolsa Chica (60-70%), off Huntington Beach (40-50%), to the Newport Bay area (20%), decreasing to negligible levels south of San Onofre, as well as negligible levels out at Catalina Island.

The size of the area of proposed critical habitat that may be adversely affected is relatively large, stretching around 45 miles (~72 km) of nearshore coastline, ranging from the mean high water line to 20 meters depth. The entire proposed critical habitat area includes most of ~150 miles (~241 km) of nearshore coastline ranging from Santa Monica Bay to the U.S. Mexico border. However, given the variable level of impact that might occur throughout, we assume that only a portion of the proposed critical habitat would experience adverse effects through negative impacts and reduced foraging resources. While these coastal nearshore areas are important, the available information suggests that the estuarine areas are where most green sea turtles in the area spend the vast majority of their time. As a result, the potential impairment of green sea turtle foraging is not as substantial across the entire proposed critical habitat area while foraging features in these estuarine areas remain unaffected.

While there may be some adverse effects to the foraging resources, we expect that these effects will abate relatively quickly as response activities work to minimize the impacts of the oil spill, along with natural processes that work to break oil down and diminish the continuation of impacts relatively quickly. Ultimately, we expect that any adverse effects from a 1,000 bbl oil spill to the proposed critical habitat will be temporary, and seagrass and invertebrate resources will recover relatively quickly, and the foraging feature in the affected area, which is only a portion of the entire proposed critical habitat area, will return to its previous condition and capacity to support the needs of green sea turtle foraging. As a result, we expect that the proposed action will not appreciably diminish the value of critical habitat for the conservation of East Pacific DPS green sea turtles as a whole.

Marine Invertebrates

2.7.5 Black Abalone

In this biological opinion, we have identified that black abalone may be affected by the O&G activities occurring off southern California, and we have considered the potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. As discussed throughout the *Effects of the Action* (section 2.5), we have determined that most of those effects are expected to be insignificant, or that the likelihood of them occurring to black abalone are discountable. However, with respect to oil spills, we anticipate that an oil spill up to 1,000 bbl could occur, resulting in some level of adverse effects ranging from 12 black abalone in the segment of coast from Corona del Mar to Dana Point, resulting from a spill at the Beta Unit, to 30,344 black abalone at Santa Cruz Island, resulting from a spill at the Santa Ynez Unit, including within a stretch of coast designated as critical habitat affected by oil ranging from 6 to 33 km, depending on the location of the spill.

Black abalone have declined throughout a large portion of their range (south of Cayucos), primarily due to historical overfishing and disease-related mass mortalities, although recruitment has been observed at a few sites in southern California, indicating natural recovery is occurring. Black abalone at sites north of Cayucos remain healthy and stable, but face continued threats from withering syndrome and other diseases, illegal harvest, elevated water temperatures, oil spills, and sedimentation events.

The TAP model simulations show that there is up to a 22% probability of oil being transported to the shoreline, if an oil spill up to 1,000 bbl were to occur in association with the Point Pedernales Unit, in an area where black abalone densities are greater than one abalone per square meter, and to rocky intertidal habitat designated as critical habitat (within the segment from Montaña de Oro State Park south to an area south of Government Point). Probabilities are lower for oil to make it to other known areas of relatively high black abalone density, although they are not zero. However, we note that areas where the probability of oil making it shore is highest are areas where black abalone abundance/density is low, or they do not occur.

Direct effects to black abalone that may be exposed to oil may be lethal, through smothering or suffocating, or through toxic effects of exposure to oil through ingestion of oiled food or direct uptake from the environment. Sublethal effects may include abnormal larval development, reduced growth (Crowe et al. 2000), reduced or altered reproductive development, and increased susceptibility to disease. As black abalone depend on rocky intertidal habitat, the alteration of their habitat as a result of exposure to oil may make areas unsuitable for black abalone to occupy (or remain) particularly if oil remains in cracks and crevices.

Table 12 shows the estimated number of black abalone for each SubRegion, along with the associated data used to generate these estimates. If an oil spill results in oil reaching an area with high densities of black abalone (e.g., sites on Santa Cruz Island), large numbers may be affected (e.g., thousands of black abalone). Although some black abalone could die as a result of exposure, our expectation is that a large mortality event is unlikely given the relatively low volume of oil that would contact these areas. For individual areas, the estimated number of black abalone affected ranges from 12 black abalone in the segment of coast from Corona del Mar to Dana Point, to 30,344 black abalone at Santa Cruz Island (resulting from 12 km of oiled shoreline there).

The actual numbers of black abalone affected by oil from an oil spill will depend on the location, size, and duration of the spill, as well as spill response activities. Should a spill occur and make it to an area where black abalone occur, most likely, a portion of the individuals will die, some of the remaining portion that survive may experience stress and sub-lethal effects, such as reduced growth and altered reproductive development, and other individuals may experience no adverse effects. As explained previously, we expect that the impacts of such a spill will generally diminish in a relatively short amount of time, and that the exposure of black abalone will be minimized.

The available information suggests that the extent and speed of recovery of the habitat supporting black abalone following exposure to an oil spill, and subsequently the health and abundance of black abalone, could be highly variable, and will depend on the extent and type of oil that may spill in rocky intertidal habitat and the exposure of the coastline to currents and wave action. Most of the areas of concern are places where wave action can be quite high, especially around the northern Channel Islands and north of Point Conception, and we conclude it is likely that if only relatively low volumes of oil reach these coastlines, the potential adverse effects should be minimized by these conditions to some degree. We also conclude that the implementation of oil spill response will further minimize the exposure of rocky intertidal habitat to oil should an oil spill occur.

In total, the available information suggests that an oil spill up to 1,000 bbl could adversely affect black abalone in a number of different locations throughout the action area, including Santa Cruz Island where over 30,000 black abalone occur. However, the relatively low probabilities that oil will reach the coastlines in areas of concern in large volumes, along with the anticipated natural conditions and human interventions to respond, will act to reduce these effects. Ultimately, regardless of how many black abalone may be adversely affected, including suffering mortality, the extent of impact of any one spill will be limited to one stretch of coastline 33 km or less. As a result, only a small percentage of the California coastline where black abalone occur will be impacted. Even a fairly significant mortality event confined to one area is not likely to affect the abundance or distribution of black abalone throughout the rest of their range across a wide area of the coast in southern and central California. Ultimately, over time, we anticipate that black abalone populations will be able to recover in any areas that are affected by the relatively small spill that is anticipated, in the low probability that they are impacted to a significant degree. As a result, we do not expect that an oil spill resulting from the proposed action will cause an appreciable reduction in the likelihood of both the survival and recovery of a black abalone.

2.7.5.1 Black Abalone Critical Habitat

In this biological opinion, we have identified the critical habitat designation for black abalone may be affected by the O&G occurring off southern California, and we have considered the potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. As discussed throughout the *Effects of the Action* (section 2.5), we have determined that most of those effects are expected to be significant, or that the likelihood of them occurring to the designated critical habitat for black abalone are discountable. However, our analysis suggests that all of the critical habitat features will likely experience at least some negative impacts throughout a relatively large portion of the intertidal shoreline within critical habitat for black abalone in the action area, if an oil spill up to 1,000 bbl were to occur in any number of oil spill scenarios. As a result, we anticipate that an oil spill could adversely affect all critical habitat features within designated critical habitat for black abalone including within a stretch ranging from 6 to 33 km.

While the public increasingly appreciates the value of protecting rocky intertidal systems, these habitats remain gravely threatened and subject to massive local and regional anthropogenic perturbations, including overexploitation, pollution, habitat alteration, species invasions, and climate change related impacts (sea level, ocean acidification, hypoxia, temperature increases, etc.), among other threats. Although seemingly ubiquitous, rocky intertidal ecosystems are quite a narrow linear feature of the coastal habitat. Based on AHA surveys, the estimate of total rocky intertidal habitat in California is only ~5 square kilometers (~2 square miles). This small overall footprint designates rocky intertidal habitats as the rarest of ecosystem types and makes them particularly sensitive and vulnerable to anthropogenic disturbances and stressors, including oil spills (Raimondi et al. 2019).

Black abalone critical habitat remains in good condition to support the species' survival and recovery. Most effects on black abalone critical habitat have been limited to narrow geographic areas. For example, changes in community structure have been observed at a few sites following the decline of black abalone. Thermal effluent from a coastal power plant has increased local water temperatures at one of the sites. Landslides, debris flows, and other sedimentation events have buried localized areas of critical habitat along the central California coast. Factors that could affect critical habitat on a larger geographic scale include sea level rise, ocean acidification, and elevated water temperatures resulting from climate change. The effects of these factors on critical habitat are highly uncertain. Continued fires are expected to increase sedimentation and runoff along the central and southern California coast. Researchers are assessing the potential risks to black abalone critical habitat.

Should an oil spill occur at one of the platforms or pipelines, there is the potential for large areas of critical habitat to be affected by oil, depending on the location, size, and duration of the spill, with effects as described above. The probability that oil will reach areas designated as critical habitat for black abalone varies depending on the location of a potential spill (up to 22% if an oil spill up to 1,000 bbl were to occur in association with the Point Pedernales Unit).

Adverse effects to black abalone critical habitat would occur if the rocky substrate is covered in oil for any length of time. Crustose coralline algae (an important component of juvenile settling habitat), important macroalgae food resources, and water quality features may all be adversely affected. However, the available information suggests the extent of these adverse effects could be highly variable, and will depend on the extent and type of oil that may spill in rocky intertidal habitat and the exposure of the coastline to currents and wave action. Most of the areas of concern are places where wave action can be quite high, especially around the northern Channel

Islands and north of Point Conception, and we conclude it is likely that if only relatively low volumes of oil reach these coastlines, the potential adverse effects should be minimized by these conditions to some degree. We also conclude that the implementation of oil spill response will further minimize the exposure of rocky intertidal habitat to oil, should an oil spill occur.

In terms of the extent of critical habitat that may be adversely affected by an oil spill, the modeling results suggest that the amount of critical habitat that may be exposed to and affected by oil resulting from a spill ranged from 6 km (3.7 miles) on Santa Rosa Island to 33 km (20.5 miles) on Santa Catalina Island. Given that critical habitat for black abalone extends across many hundreds of miles of California coastline, extending north through central California, the amount of black abalone critical habitat that will potentially be impacted will be a relatively small portion of the entire designated area.

Our anticipation is that a spill anticipated under this proposed action will not have effects on the critical habitat features of designated critical habitat for black abalone that will last a long time. Ultimately, we expect that any adverse effects to the critical habitat features of rocky substrate, food resources, juvenile settlement habitat, and suitable water quality will be temporary, and will recover relatively quickly in the affected area. Ultimately, over time, we anticipate that black abalone critical habitat that will be adversely affected, which is only a portion of the entire proposed critical habitat area, will be able to recover in any areas that are affected by a relatively small oil spill that is anticipated, in the low probability that they are impacted to a significant degree. As a result, we do not expect that an oil spill resulting from the proposed action will reduce the conservation value of designated black abalone critical habitat.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of the following ESA-listed species: fin whales, Mexico DPS and Central America DPS humpback whales, blue whales, East Pacific DPS green sea turtles or black abalone. It is also NMFS' biological opinion that the proposed action is not likely to adversely modify designated critical habitat for black abalone, or proposed designated critical habitat for East Pacific DPS green sea turtles.

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). "Harass" is further defined by interim guidance as to "create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering." "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. As noted further below, some forms of take associated with this action and addressed elsewhere in this biological opinion are not covered by this exemption.

2.9.1 Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as a result of the proposed action. While the proposed action may continue for an indefinite time period, we assume that the proposed action is expected to occur for at least the next 20 years. Specifically, we expect that activities are likely to result in the incidental take of ESA-listed species, resulting from exposure to oil spills, including some mortalities and other sub-lethal adverse effects to the health of individuals that are reasonably certain to occur as a result of the proposed action. We also expect the incidental take of ESA-listed species by death or injury associated with vessel collisions that are reasonably certain to occur as a result of the proposed action.

Table 14. Extent of take anticipated for each species. N.A. represents that take associated with that source is not anticipated. As explained below, take associated with oil spills is not exempted, nor is take of marine mammals from vessel strikes. The table includes anticipated levels of take along with additional surrogates of take that will be monitored.

	Source of Incidental Take	
Species	**Oil spill**	**Vessel collision**
Fin whale	N.A.	no more than one strike/mortality every 10 years on average; or no more than 10,100 hours of crew and supply vessel operations (combined) per year
Blue whale	N.A.	no more than one strike/mortality every 10 years on average; or no more than 10,100 hours of crew and supply vessel operations (combined) per year
Mexico DPS humpback whale	N.A.	no more than one strike/mortality every 10 years on average; or no more than 10,100 hours of crew and supply vessel

	Source of Incidental Take	
		operations (combined) per year
Central America DPS humpback whale	N.A.	no more than one strike/mortality every 10 years on average; or no more than 10,100 hours of crew and supply vessel operations (combined) per year
East Pacific DPS green sea turtles	26 individuals in total adversely affected by direct contact with oil, including up to 13 mortalities; or up to 72 km of oiled coastline from Alamitos Bay to San Onofre	no more than one strike/mortality every 10 years on average; or no more than 10,100 hours of crew and supply vessel operations (combined) per year
Black abalone	up to 30,344 black abalone adversely affected by direct contact with oil; or up to 12 km of oiled shoreline on Santa Cruz Island; or up to 33 km of oiled shoreline somewhere besides Santa Cruz Island in designated critical habitat for black abalone	N.A.

This biological opinion includes exposure scenarios that could result in non-jeopardizing take of ESA-listed whales from vessel collisions. However, because such take has not been authorized under the MMPA, this ITS does not exempt incidental take of such whales under the ESA. *See* 16 U.S.C. § 1536(b)(4). NMFS would issue a revised ITS that includes marine mammals if and when an authorization for such take under section 101(a)(5) of the Marine Mammal Protection Act were issued and other issuance criteria were met. This ITS will exempt incidental take of East Pacific green sea turtles from vessel collisions.

Although this ITS cannot cover these marine mammal takes, this chapter will however provide surrogates for monitoring take of marine mammals, and NMFS would consider whether reinitiation is required if there were exceedance of such anticipated surrogate levels. *See* 50 C.F.R. §§ 402.16(a)(1)-(2). This ITS also provides no exemptions for take of any ESA-listed species from oil spills because oil spills are not a lawful activity, but we also provide in this chapter surrogates for monitoring oil spill take and provide discussion of the potential for oil spills to lead to reinitiation of consultation.[13]

2.9.1.1 Surrogates for Extent of Take from Oil Spills

Take of ESA-listed East Pacific DPS green sea turtles and black abalone from an oil spill resulting from the proposed action is anticipated to occur as described in section 2.5 *Effects of the Action* and Table 14 above in this section. Although this ITS does not exempt take associated with an oil spill, we describe the use of surrogates for the extent take from oil spills that can be used to help inform when reinitiation of consultation is warranted or should be considered, based on concern for the level of impacts that may have occurred for these ESA-listed species, in addition to any information collected by the Bureaus or NMFS on how many green sea turtles and black abalone are documented to be impacted by an oil spill.

East Pacific DPS Green Sea Turtles

For East Pacific DPS green sea turtles, we have estimated that a total of 26 individuals may experience some level of adverse health effects, and that up to half those individuals (13) could die, as a result of an oil spill occurring in the Beta Unit. As already noted, this ITS cannot provide an exemption for this take. However, we remain interested in monitoring it so that in appropriate circumstances we could assess whether reinitiation of consultation may be warranted. Directly monitoring oil spill impacts on individuals is not always practical, as the ability to monitor the potential effects of an oil spill are challenging in the marine environment for many reasons. Oil spills may travel and affect large areas, which requires the mobilization of large numbers of vessel, aerial, and/or land-based resources to monitor fully at any given time, and over the duration of time a spill/response may last. Green sea turtles in particular are highly mobile species, that may travel large distances in short periods of time away from where they originally contacted oil, making it difficult to locate and identify them as potentially having been subjected to contact and effects from the oil spill previously. They spend the vast majority of their time underwater, and may escape detection based on visual observation of individuals within an affected marine area. In addition, some of the adverse effects may be sub-lethal, and not immediately obvious even if animals are observed in the vicinity of an affected area during any monitoring that occurs. While any individuals that might be sick, injured, or killed could strand and be detected in the affected area, it is also possible that a deceased individual could sink to the bottom and/or otherwise be carried away from the area by tides, currents and weather patterns, or other marine predators, and ultimately not detected. Given all these factors, we conclude it may not be possible to detect and enumerate the full extent of adverse effects to green sea turtles that may occur, especially sub-lethal adverse effects. As a result, we will also use surrogates to monitor the extent of take of East Pacific DPS green sea turtles, if an oil spill occurs.

Our expectations for the extent of take that is anticipated are premised on the modeled scenarios associated with spills occurring in different locations. We have used those modeled scenarios of

[13] The Clean Water Act (33 U.S.C. § 1251 *et seq*.) as amended by the Oil Pollution Act of 1990 (33 U.S.C. § 2701 *et seq*.) prohibits discharges of harmful quantities of oil, as defined at 40 C.F.R. § 110.3, into waters of the United States.

how oil from an anticipated oil spill may move around following a spill to anticipate the effects that are reasonably likely to occur. As a result, the extent of take we have anticipated to occur is causally linked to both the location and extent of coastline affected by an oil spill within the proposed critical habitat for East Pacific DPS green sea turtles. Characterization of location and extent of coastline affected by an oil spill[14] will directly help inform an assessment of the extent of take of East Pacific DPS green sea turtles that may have occurred as the result of an oil spill, in addition to any information collected by the Bureaus or NMFS on how many green sea turtles are documented to be impacted by an oil spill. The biological opinion assesses the impacts of the take of up to 26 green sea turtles as likely to occur with an oil spill anticipated to occur originating from the Beta Unit, resulting in up to 72 km of oiled coastline (within proposed green sea turtle critical habitat) stretching from Alamitos Bay to San Onofre, California. Our anticipated level of take was generated on the assumption that a spill of this size, in this location, would expose a portion of the green sea turtles that congregate and reside in the coastal area in the vicinity of the Beta Unit, within this defined stretch of California coastline. As a result, we have determined that there is a causal connection between the location and extent of coastline oiled, and the extent of take that occurs. We believe that location and extent of coastline that is oiled provides a measurable take surrogate. We note that take of East Pacific DPS green sea turtles can occur as a result of an oil spill from other locations, resulting in different locations and extents of coastline affected. But our analysis suggests that take in those scenarios is expected to be less than what is expected to occur as a result of the scenario described by this take surrogate. If an oil spill resulted in exposure to oil of more than 72 km of coastline stretching from Alamitos Bay to San Onofre, California, this would indicate that the level of take anticipated in the biological opinion had been exceeded. We would also assess other relevant factors in assessing any significant oil spill occurrence, so this is not exhaustive of the situations that could result in reinitiation of consultation (as discussed further in section 2.11 *Reinitiation of Consultation* below).

Black Abalone

For black abalone, we have estimated that take of black abalone could occur in association with a spill associated with the Santa Ynez Unit, and the biological opinion considers the impact of up to 30,344 black abalone experiencing some level of adverse health effects, including some mortalities, as a result of an oil spill occurring under several oil spill scenarios associated with the Santa Ynez Unit. As already noted, this ITS cannot provide an exemption for oil spill take, but we remain interested in monitoring such take so that in appropriate circumstances we could assess whether reinitiation of consultation may be warranted. We recognize that the ability to monitor the potential effects of an oil spill on black abalone are challenging in the marine environment for many reasons. Oil spills may travel and affect large areas, which requires the mobilization of large numbers of vessel, aerial, and/or land-based resources to monitor fully at any given time, and over the duration of time a spill/response may last. Black abalone are not mobile species, but they can be difficult to locate in the intertidal environment where they can live deep within cracks and crevices in rocky shoreline that cannot be readily surveyed. In

[14] Under Area Contingency Plans developed under the Oil Pollution Act and National Contingency Plan (40 CRR 300), NMFS, as a member of the Regional Response Team, will be notified with all important information about relevant oil spills in the action area, including the source and cause of oil spills, as well as details on the containment, cleanup, and disposal activities.

addition, the shorelines they are located in may not be readily accessible by humans using any vessel or land-based means given their remote locations, including rugged coastlines out on the Channel Islands or on the mainland. In addition, some of the adverse effects may be sub-lethal, and not immediately obvious even if animals are observed in the vicinity of an affected area during any monitoring that occurs. It is also possible that a deceased individual could be dislodged and transported away from affected areas by tides, currents and weather patterns, or other marine predators, and ultimately not detected. Given all these factors, we conclude it may not be possible to detect and enumerate the full extent of adverse effects to black abalone that may occur, especially sub-lethal adverse effects. As a result, as with green sea turtles, we will use surrogates to monitor the extent of take of black abalone, if an oil spill occurs.

The extent of take we have anticipated to occur is linked to both the location and extent of coastline affected by an oil spill where black abalone are abundant, including areas in the northern Channel Islands such as Santa Cruz Island, and on the mainland near Point Conception. Some of the areas that could be affected by an oil spill also include areas that have been designated as critical habitat for black abalone. Characterization of location and extent of coastline affected by any oil spill will directly help inform an assessment of the extent of take of black abalone that may have occurred, in addition to any information collected by the Bureaus or NMFS on how many black abalone are documented to be impacted by an oil spill. This biological opinion considered the impact of the take of up to 30,344 black abalone as likely to occur with an oil spill originating from the Santa Ynez unit, reaching Santa Cruz Island, and oiling up to 12 km of coastline there (all within designated critical habitat). We have also estimated that up to 33 km of coastline could be oiled elsewhere beside Santa Cruz Island within designated critical habitat for black abalone, where black abalone densities are highest. Thus, the occurrence of a spill that oiled more than 12 km of designated critical habitat coastline for black abalone on Santa Cruz Island, or oiled more than 33 km within designated critical habitat for black abalone anywhere else in the action area besides Santa Cruz Island, would exceed the oil spill take scenario included in our assessment, and indicate that the level of take anticipated in the biological opinion had been exceeded. We would also assess other relevant factors in assessing any significant oil spill occurrence, so this is not exhaustive of the situations that could result in reinitiation of consultation (as discussed further in section 2.11 *Reinitiation of Consultation*, below). We note that take of black abalone would be expected to occur as a result of an oil spill from many locations, resulting in different locations and extents of coastline affected (see Table 14). Our analysis suggests that take in those scenarios is expected to be less than what is expected to occur as a result of the scenarios described for Santa Cruz Island and relied upon in the biological opinion. We also expect that less than 33 km of coastline of black abalone critical habitat would be oiled under all other scenarios.

2.9.1.2 Surrogates for Extent of Take from Vessel Collisions

Take of ESA-listed fin, Mexico DPS and Central America DPS humpback, and blue whales, and East Pacific DPS green sea turtles from collisions with O&G vessels resulting from the proposed action is anticipated to occur as described in section 2.5 *Effects of the Action* and Table 14 above in this section. Although this ITS cannot provide an exemption for such take due to the lack of MMPA authorization, we define a surrogate for monitoring such take, as a means of assessing whether take has exceeded the levels assessed in this biological opinion so as to indicate a need for reinitiation of consultation.

For four of these ESA-listed species, we have anticipated that one individual from each species could be struck by an O&G vessel in any year, although no more than one individual from each species would be expected to be struck over any 10-year period. We have anticipated that this would occur to any individual in the population (male or female; juvenile or adult), and that mortality from any collision is expected. We recognize that the ability to monitor vessel collisions is challenging, given that collisions may occur and go unnoticed by vessels and unreported, especially for smaller species like green sea turtles. Given all these factors, we conclude it may not be possible to directly detect or monitor the full extent of adverse effects to ESA-listed species that may occur as a result of vessel collisions with O&G vessels. As a result, we will use a surrogate to monitor and quantify the extent of take of ESA-listed fin, Mexico DPS and Central America DPS humpback, and blue whales, and East Pacific DPS green sea turtles, from collisions with O&G vessels, beyond any information collected by the Bureaus or NMFS on collisions between O&G vessels and ESA-listed species.

As part of our analysis of vessel collision risks, we looked at information provided by BOEM on the extent of vessel activity that occurs as part of O&G operations. We acknowledge the vessel traffic that our analysis focused on was limited to crew and supply vessels, since information on the extent of other types of vessel activity was not available. However, crew and supply vessels operate on a near daily basis, while other vessel activities that we expect are far less frequent, so we conclude that the vessel activity that we have focused on, included in the vessel collision modeling, does account for a large majority of the total vessel activity that occurs as part of the proposed action. Specifically, we generated several different metrics to characterize the extent of vessel traffic for use in quantifying the amount of vessel traffic associated with O&G crew and supply vessels, based on analysis of information provided by BOEM on the number of trips these vessels make per month. One specific metric that was generated using the anticipated vessel speeds and routes that would be expected for crew and supply vessels (combined) operating across all Units resulted in an estimate of up to 10,100 vessel operation hours per year. This information on the magnitude of vessel traffic in terms of vessel transit hours was used in turn to help generate our anticipated level of take associated with O&G vessel activity based on the assumption that vessel collisions are a product of, and causally linked to, the magnitude of vessel activity within the action area. Given that our analysis is explicitly linked to magnitude of vessel activity, which can be described and measured in terms of the number of vessel operation hours, we have determined there is a causal relationship between the number of vessel operation hours associated with crew and supply vessels, and the extent of vessel collisions that will occur. After conferring with BOEM, we believe that the number of vessel operation hours associated with O&G crew and supply vessels, can be accounted for on an annual basis, as this metric is readily accessible to BOEM based on information that is already collected from O&G operators, and will be a reliable take surrogate. If the extent of crew and supply vessel activity combined exceeds 10,100 hours in a given year, that would indicate that the level of take from vessel collisions exceeded the levels considered in this biological opinion. As further discussed in Section 2.11 below, this is not the only factor that could be considered in evaluating whether vessel traffic indicates a need to reinitiate consultation.

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 the species or destruction or adverse modification of critical habitat.

2.9.3 Reasonable and Prudent Measures

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

NMFS believes the reasonable and prudent measures described below are necessary and appropriate to minimize the impacts of incidental take on threatened and endangered species:

1. BOEM and BSEE shall implement measures to monitor the extent of vessel collisions with ESA-listed species.

2.9.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, BOEM and BSEE must comply (or must ensure that any applicant complies) with the following terms and conditions.[15] BOEM and BSEE 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 of section 7(o)(2) for the proposed action would likely lapse.

The following terms and conditions implement reasonable and prudent measure #1:

1. The Bureaus shall ensure that all O&G vessel operators report collisions with marine mammals and sea turtles to the NMFS West Coast Region Marine Mammal and Sea Turtle Stranding Program Coordinator, Justine Viezbicke, at 562-980-3230 or Justin.Viezbicke@noaa.gov, as soon as practicable.
2. The Bureaus shall collect, summarize, and report to NMFS, information on O&G vessel activity, including hours of vessel operation per vessel type, on an annual basis. Additionally, BOEM shall collect, summarize, and report to NMFS, information on the number and/or extent of other types of O&G vessel activity, on an annual basis.
3. Annually, the Bureaus shall submit a report to NMFS West Coast Region Protected Resources Division, summarizing the extent of O&G vessel activities, including the hours of vessel operation per vessel type each year, gathered through term and condition #2. This report should also include a summary of any additional measures that were evaluated, implemented, or recommended by the Bureaus to minimize the risk of O&G vessel collisions with ESA-listed species. This report should be submitted to the Branch Chief (Dan Lawson - Dan.Lawson@noaa.gov), Long Beach Protected Resources

[15] As already noted, this Incidental Take Statement and its terms and conditions do not provide for any exemption from ESA take prohibitions with respect to marine mammals, or any ESA-listed species due to oil spills.

Division, 501 W Ocean Blvd, Long Beach, CA 90802 by April 1st each year, or some other mutually agreed upon date.

4. If a report of a vessel collision of any ESA-listed species is documented, the Bureaus and NMFS shall meet to discuss the circumstances and potential implementation of any measures to reduce the risk of additional collisions occurring, as soon as practicable.

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).

1. The Bureaus should continue to support monitoring efforts for black abalone throughout southern California, especially within the boundaries of where black abalone may be affected by O&G operations. Should an oil spill occur, current information on the abundance and distribution of black abalone will be critical to informing an assessment of the impact on black abalone individuals and populations. Coordination with NMFS Protected Resources Division and other members of the Black Abalone Recovery Team (contact Susan Wang, Black Abalone Recovery Coordinator, at susan.wang@noaa.gov or (562) 980-4199) could help direct resources toward support of black abalone monitoring.
2. The Bureaus should support restoration projects designed to mitigate impacts to rocky intertidal habitat that may be associated with natural events such as sedimentation from storm events, or man-made events such as oil spills, or augmentation of existing populations to facilitate recovery. Coordination with NMFS Protected Resources Division and other members of the Black Abalone Recovery Team could help direct resources toward support of restoration activities, including translocation of black abalone to facilitate survival of individuals in peril, as well as facilitation of population recovery in areas where black abalone populations may be absent or in low abundance.
3. The Bureaus should explore and consider using their authorities and resources to implement additional voluntary or mandatory vessel speed restrictions on O&G vessel activities, beyond the 10 knot vessel speed limit and accompanying measures proposed by the Bureaus for use in association with well conductor removal operations. As reflected by the *Effects Analysis* (section 2.5.4) and *Incidental Take Statement* (section 2.9) in this Opinion, there are risks of collisions with ESA-listed whales and sea turtles associated with other O&G vessel activities, including vessels that operate on a very regular basis such as crew and supply vessels, as well as vessels used as part of other activities. All vessel traffic presents a risk for collisions, and the available information suggests that collisions with vessels traveling at speeds greater than 10 knots increase the risk of fatal collisions for large whales.
4. As part of exploration and consideration of additional measures to minimize the risk of vessel collisions, the Bureaus should consider using existing tools to help advise O&G vessel operators when risks of collisions with ESA-listed species may be highest. For example, NOAA, USCG, and EPA annually issue a voluntary Vessel Speed Reduction (VSR) request that goes into effect May 1 to December 15 within a large area of southern

California that encompasses the action area for O&G operations. While the VSR request is for vessels 300 gross tons (GT) or larger to reduce speeds to 10 knots when transiting within the designated VSR zones (also includes zones off San Francisco and Monterey Bay), all O&G vessel operating in these areas during these times should be aware of the heightened risk and encouraged to minimize speeds whenever possible as a risk reduction measure during this time. In addition, Whale Safe (https://whalesafe.com/) is a tool that can be used by anyone to help track when available data suggest that whale presence and the risk of vessel collisions is relatively high/low within the Santa Barbara Channel. The Bureaus should consider how to use their resources to promote use of this information to minimize vessel collisions risk by O&G vessels, whenever possible.

2.11 Reinitiation of Consultation

This concludes formal consultation on the development and production of oil and gas reserves and beginning stages of decommissioning within the Southern California Planning Area of the Pacific Outer Continental Shelf Region. Under 50 CFR 402.16(a): "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: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If 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 written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action."

If the action resulted in the occurrence of take of a listed species exceeding the levels specified in Table 14, we would consider that a trigger for reinitiation of consultation. Given the difficulty of directly observing and monitoring some forms of possible take, as described in section 2.9.1 *Amount or Extent of Take*, we have identified surrogates of take to help inform assessments of how much take of ESA-listed species has occurred, in association with effects from oil spills and collisions with O&G vessels, in addition to any information collected by the Bureaus or NMFS on how many ESA-listed species are directly reported to be impacted by these effects. While the take anticipated from oil spills, as well as marine mammal take not authorized under the MMPA, cannot be exempted by this ITS, we discuss further here how such take will be monitored to inform potential reinitiation decisions.

As discussed above, an oil spill resulting in exposure to oil of more than 72 km of proposed critical habitat coastline for East Pacific DPS green sea turtles stretching from Alamitos Bay to San Onofre, California, would exceed the oil spill take scenario included in our assessment, and indicate that the level of take of the East Pacific green sea turtle DPS anticipated in the biological opinion had been exceeded. As also discussed above, the occurrence of a spill that oiled more than 12 km of designated critical habitat coastline for black abalone on Santa Cruz Island, or if more than 33 km of coastline within designated critical habitat for black abalone anywhere else in the action area, would indicate that the level of take anticipated in the biological opinion for black abalone had been exceeded. If the extent of crew and supply vessel activity combined exceeds 10,100 hours in a given year, that would indicate that the level of take from vessel collisions exceeded the levels considered in this biological opinion for ESA-listed whales.

Our monitoring based on vessel traffic and oil spill occurrences will also consider other information as relevant, and could indicate a need to reinitiate consultation under the other reinitiation triggers such as 50 C.F.R. 402.16(a)(2) (new information) or (a)(3) (change in proposed action).

For example, as previously discussed, take of black abalone could occur as a result of an oil spill from many potential locations, resulting in different locations and extents of coastline occupied by the species being affected (see Table 12). In the event of a spill that affected one of those locations, we would assess whether it accorded with or called into question our expectations from the model analysis relied upon in this biological opinion.

With respect to oil spills, based on oil spill risk modeling conducted and provided by BOEM, we have assumed that an oil spill up to 1,000 bbl is expected, and our expectations for the extent of take that is anticipated are premised on the volume of oil that spills. If an oil spill occurs as a result of the proposed action that exceeds 1,000 bbl, we will consider if reinitiation of formal consultation is required. In addition, we note that there are a wide range of scenarios that could involve a single spill, or a series of spills, less than the 1,000 bbl spill maximum volume that has been anticipated, that could occur over the duration of the proposed action, expected to last at least then next 20 years, which would cause us to consider if reinitiation is warranted. While it is not possible to describe all such scenarios ahead of time, we generally would describe such scenarios as ones that will present some obvious source of concern about the level of impact that may have occurred to ESA-listed species or critical habitats. For example, if a surprisingly large volume of oil reaches areas of particular concern, or notable spills occur and affect the same areas repeatedly, or if oil spill trajectories reach unanticipated locations, we will also consider if reinitiation is warranted.

2.12 Not Likely to Adversely Affect Determinations

The following ESA-listed species and designated critical habitats are not likely to be adversely affected by the proposed action, for the reasons explained below.

Marine Mammals

2.12.1 Sperm whale

Sperm whales are found throughout the North Pacific, and they are often concentrated around oceanic islands in areas of upwelling, and along the outer continental shelf and mid-ocean waters. Known as deep diving whales, their diet consists of many larger organisms that also occupy deep waters of the ocean. Their principal prey is large squid but they will also eat large demersal and mesopelagic sharks, skates, and fishes. Sperm whales are typically found foraging in deep water, canyons and escarpments and would therefore rarely be found in the action area. From shipboard surveys conducted by NMFS off the U.S. West Coast from 1991-2014, there has not been any sightings of sperm whales within the action area (Carretta et al. 2023)

The potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. We analyzed the pathways of these effects described in the *Effects of the Action* (section 2.5), and have determined that none of those effects are expected to be significant, or that the likelihood of them occurring to sperm whales are discountable, based primarily on the anticipated limited exposure of sperm whales to the proposed action given their offshore distribution, and/or apparent limited vulnerability to project activities in the action area. Therefore, we conclude that sperm whales are not likely to be adversely affected by the proposed action.

2.12.2 Southern Resident DPS Killer Whale

There are three ecoptypes of killer whales; transients, offshores, and residents - and each can be distinguished genetically, morphologically and behaviorally. Transients are most common worldwide and generally prey on marine mammals. Less is known about offshores, although they appear to be opportunistic feeders. Residents are generally piscavores and maintain stable family units, and are often "resident" to a specific area. Along the U.S. West Coast, it has been estimated that there are at least 349 West Coast transients (Muto et al. 2021) and 276 offshore (Carretta et al. 2023) killer whales, compared to 75 Southern Resident DPS killer whales (SRKWs).[16] Based on the relative population sizes, it is likely that any killer whale interaction with activities associated with O&G would be a transient or offshore killer whale.

Offshore and transient killer whales have been observed along the entire U.S. West Coast, including southern California. SRKWs spend a substantial amount of time within the inland waters of Washington state and Vancouver Island, Canada. There are a number of whale watch vessels along the U.S. West Coast and there have been reports of SRKWs off the coast of Northern and Central California in the winter and spring, but no whale watch company has reported seeing SRKWs south of Monterey Bay. This general trend in distribution is supported by recent tagging work. In order to better understand the winter distribution of the SRKWs, in early 2012, the NWFSC (Northwest Fisheries Science Center) began satellite tagging individual whales from the SRKW. There have been limited tracks, but whales tracked into California waters have not traveled south of Monterey Bay (Carretta et al. 2023). Based on the relative number of SRKWs and their distribution, it is extremely unlikely that any killer whales that interact with the activities associated with O&G off of California would be a SRKW.

The potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. We analyzed the pathways of these effects described in the *Effects of the Action* (section 2.5), and have determined that none of those effects are expected to be significant, or that the likelihood of them occurring to are discountable based primarily on the anticipated limited exposure of SRKW to the proposed action given their distribution is confined to north of the action area. Therefore, we conclude that SRKWs are not likely to be adversely affected by the proposed action.

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[16] Recent census data by the Center for Whale Research is that the population stands at 75 whales as of July, 2023. https://www.whaleresearch.com/orca-population

2.12.3 Western North Pacific Gray Whales

Gray whales are presently recognized as two populations in the North Pacific Ocean and recent genetic studies using both mtDNA and nuclear markers have demonstrated significant differentiation between the western North Pacific (WNP) and eastern North Pacific (ENP) populations (LeDuc et al. 2002; Lang et al. 2011; Weller et al. 2013). The WNP gray whales are listed as endangered under the ESA. ENP and WNP gray whales were once considered geographically separated along either side of the ocean basin, but recent photo-identification, genetic, and satellite tracking data indicate WNP gray whales may be accompanying ENP gray whales along their U.S. West Coast migrations. Information from tagging, photo-identification and genetic studies show that some whales identified in the WNP off Russia have been observed in the ENP, including coastal waters of Canada, the U.S., and Mexico (Lang 2010; Weller et al. 2012; Mate et al. 2015; Urbán et al. 2019). Photographs of 379 individuals identified on summer feeding grounds off Russia (316 off Sakhalin; 150 off Kamchatka) were compared to 10,685 individuals identified in Mexico breeding lagoons, with a total of 43 matches found (Urbán et al. 2019). The number of whales documented moving between the WNP and ENP represents 14% of gray whales identified off Sakhalin Island and Kamchatka according to Urbán et al. (2019). Cooke et al. (2018d) note that the fraction of the WNP population that migrates to the ENP is estimated to be 45-80%.

In the fall, gray whales migrate from their summer feeding grounds, heading south along the coast of North America to spend the winter in their breeding and calving areas off the coast of Baja California, Mexico. Calves are born in shallow lagoons and bays from early January to mid-February. From mid-February to June, gray whales can be seen migrating northward with newborn calves along the West Coast of the U.S. Northbound gray whales, which include all age classes, migrate from February to June and southbound gray whales typically migrate within 10 kilometers from shore during the southbound migration, but some individuals have been observed farther offshore, usually less than 50 kilometers from the coastline. In the Bight, gray whales do travel around and through the Channel Islands, in addition to a migratory route in between the mainland and the Channel Islands.

Based on tagging data, we assume that when WNP gray whales migrate along the coast of North America to Baja California, they are likely slightly delayed from the ENP's "start date" by at least a couple of weeks based on distance and average swim speed (i.e., they have to swim from Sakhalin Island, Russia before joining the ENP route). The first migratory ENP gray whales can be observed in California as early as October, depending on the year, but mid-to late November is typical and approximately 10 percent of the population is expected to have made the migration by the end of December. Thus, it is possible that a WNP gray whale's migratory route could overlap with the action area, particularly from November to January during the southbound migration. However, there is no evidence indicating that WNP gray whales behave differently than an ENP whale and are more susceptible to interaction with activities associated with O&G.

The estimated population size from photo-ID data for Sakhalin and Kamchatka in 2016 was 290 whales (90% percentile intervals = 271 – 311; Cooke et al. 2018d). Systematic counts of gray whales migrating south along the central California coast have been conducted by shore-based observers at Granite Canyon most years since 1967. The current minimum population estimate for non-ESA-listed ENP gray whales is 26,960 (Carretta et al. 2023). The most recent minimum estimate of endangered WNP gray whale abundance is 271 individuals (Carretta et al. 2023). At any given time during the migration, WNP gray whales could be part of the approximately 27,000 gray whales migrating through the CCE. However, the probability that any gray whale observed along the U.S. West Coast would be a WNP gray whale is extremely small, i.e., less than 1%, even if the entire population of WNP gray whales were part of the annual gray whale migration in the ENP.

The potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. We analyzed the pathways of these effects described in the *Effects of the Action* (section 2.5), and have determined that all of those effects are expected to be significant, or that the likelihood of them occurring to large whales are discountable, with the exception of vessel strikes for blue, fin, and humpback whales. We do not have the density data necessary to execute quantitative modeling of vessel collision risk for gray whales. However, we could generally assume that a small number of gray whale strikes could occur, based on similar general patterns of vessel collision reports for gray whales in the action area as some other large ESA-listed whales. However, if or when such an event were to happen with any O&G vessel activity, it is a very low likelihood that it would involve an ESA-listed WNP gray whale, based on the fact that over 99% of the gray whale population that migrates through the action area belongs to the ENP gray whale population. Ultimately, given their limited exposure to the proposed action, we conclude that the risk of adverse effects are discountable, and that WNP gray whales are not likely to be adversely affected by the proposed action.

2.12.4 Guadalupe Fur Seals

Guadalupe fur seals are known to occur near Guadalupe Island, Mexico, their primary breeding area, and more recently have been observed breeding in small numbers on San Miguel Island (NMFS-Alaska Fisheries Science Center unpublished data). In recent years, Guadalupe fur seals have been increasing in numbers in the Channel Islands and several strandings have been observed along central California coast, and in 2015 an Unusual Mortality Event was declared, which lasted through 2021.[17]

The potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. We analyzed the pathways of these effects described in the *Effects of the Action* (section 2.5), and have determined that none of those effects are expected to be significant, or that the likelihood of them occurring to Guadalupe fur seals are discountable, based on either their limited potential exposure to the proposed action given their offshore distribution, and/or their apparent limited vulnerability to these impacts in the action area (e.g., vessel strikes). Therefore, we conclude that Guadalupe fur seals are not likely to be adversely affected by the proposed action.

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[17] https://www.fisheries.noaa.gov/national/marine-life-distress/2015-2021-guadalupe-fur-seal-and-2015-northern-fur-seal-unusual

2.12.5 Other ESA-listed Marine Mammal Species

Other marine mammal species may be in the action area include North Pacific right whales and sei 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. Sei whales are distributed far out to sea in temperate waters worldwide and do not appear to be associated with coastal features (Carretta et al. 2023).

The potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. We analyzed the pathways of these effects described in the *Effects of the Action* (section 2.5), and have determined that none of those effects are expected to be significant, or that the likelihood of them occurring to these ESA-listed marine mammals are discountable, based on either their limited potential exposure to the proposed action given their offshore distribution or rare occurrence in the action area. Therefore, we conclude that sei whales and North Pacific right whales are not likely to be adversely affected by the proposed action.

2.12.6 Central America DPS and Mexico DPS Humpback Whale Critical Habitat

As summarized earlier, critical habitat was designated in 2021 (86 FR 21082; April 21, 2021) for the Central America and Mexico DPS of humpbacks, both of which are found in the action area and affected by the proposed action. The essential feature defined for both DPSs is prey species, primarily euphausiids and small pelagic schooling fish of sufficient quality, abundance, and accessibility within humpback whale feeding areas.

The potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. We analyzed the pathways of these effects described in the *Effects of the Action* (section 2.5), and have determined that none of those effects are expected to be significant, or that the likelihood of them occurring to humpback whale designated critical habitat are discountable, based on the limited potential exposure and/or vulnerability of prey features to the proposed action within designated critical habitat. Therefore, we conclude that the designated critical habitat for Central America and Mexico DPS humpback whales is not likely to be adversely affected by the proposed action.

Sea Turtles

2.12.7 Sea Turtle Species

Based on what we know from stranding (2004-2023) and sighting (2015 to present) records and fishery observer program reports (1990-present), leatherbacks, loggerheads and olive ridleys are occasional, albeit rare, visitors to the action area in Southern California. Leatherbacks are generally pelagic in nature, and their distribution is most concentrated off central California and areas in the Pacific Northwest. Leatherback critical habitat is located within the very northern part of the action area, specifically extending as far south as Point Arguello, east of the 3,000 meter depth contour. Loggerheads have been captured in the California drift gillnet fishery (1990-present; NMFS observer program), although their presence appears to be closely correlated with anomalously warm sea surface temperatures, such as during El Niño conditions. They are also mostly pelagic in nature, with higher concentrations found more offshore and south/southwest of the action area. Most olive ridley turtles lead a primarily pelagic existence, migrating throughout the Pacific, from their nesting grounds in Mexico and Central America to the deep waters of the Pacific that are used as foraging areas. Given the pelagic and highly migratory nature of the species their occurrence in the action area off southern California is expected to be rare.

The potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. We analyzed the pathways of these effects described in the *Effects of the Action* (section 2.5), and have determined that none of those effects are expected to be significant, or that the likelihood of them occurring to any of these ESA-listed sea turtles are discountable, based primarily on their limited occurrence in the action area and potential exposure to project activities. Therefore, we conclude that ESA-listed leatherback, North Pacific Ocean DPS loggerhead and olive ridley sea turtles are not likely to be adversely affected by the proposed action.

2.12.8 Leatherback Critical Habitat

Leatherback critical habitat was designated in 2012 (77 FR 4170) and is located within the northern part of the action area, specifically starting at Point Arguello, and extending north to the end of the action area, east of the 3,000 meter depth contour. The primary constituent element considered essential for the conservation of leatherbacks is "the occurrence of prey species, primarily scyphomedusae of the order Semaeostomeae (Chrysaora, Aurelia, Phacellophora, and Cynea), of sufficient condition, distribution, diversity, and density necessary to support individual as well as population growth, reproduction, and development of leatherbacks." Leatherbacks from the Western North Pacific migrate to central California from across the Pacific Ocean to access very large plumes of jellyfish in the summer and fall months.

The potential effects from the proposed action on the primary prey of leatherbacks, jellyfish, include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. We analyzed the pathways of these effects described in the *Effects of the Action* (section 2.5), and have determined that none of those effects are expected to significantly affect prey with designated critical habitat, or that the likelihood of them occurring to leatherback prey within designated critical habitat are discountable, based on the limited potential exposure of leatherback critical habitat to the proposed action, along with the offshore distribution or rare occurrence of leatherbacks foraging in the small part of the action area that overlaps with designated critical habitat. Therefore, we conclude that the designated critical habitat for leatherback sea turtles is not likely to be adversely affected by the proposed action.

2.12.9 Marine Invertebrates

White abalone occur in very low densities within the action area, primarily resulting from historical overfishing, at about 0.1% of estimated pre-exploitation abundance. They are generally found in waters 40-50 meters deep. The sunflower sea star was proposed to be listed as a threatened species in 2023 (88 FR 16212), noting that regional population declines have exceeded 95% in some areas. The sunflower sea star occupies nearshore subtidal marine waters shallower than 450 m deep, and may occupy areas within the action area, even though there are currently low densities.

The potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. We analyzed the pathways of these effects described in the *Effects of the Action* (section 2.5), and have determined that none of those effects are expected to be significant, or that the likelihood of them occurring to white abalone or sunflower sea stars are discountable, based primarily on their limited occurrence and distribution in the action area and potential exposure to project activities. In particular, our analysis in section 2.5.3.6 *Effects of Oil Spills on Marine Invertebrates* concluded that it would be extremely unlikely that white abalone would be exposed to oil from an oil spill. Therefore, we conclude that white abalone and sunflower sea stars are not likely to be adversely affected by the proposed action.

2.12.10 Fish

There are a number of ESA-listed fish species in the proposed action area, including: Southern California and South-Central California Coast steelhead DPSs, Southern DPS green sturgeon, eastern Pacific DPS of scalloped hammerhead and oceanic whitetip sharks, and giant manta rays. None of these fish species are concentrated in marine waters within the action area near anticipated project activities. Green sturgeon are generally found north of the action area, with their designated critical habitat extending only as far south as Monterey Bay (74 FR 52300). The range of eastern Pacific DPS of scalloped hammerhead sharks does extend up into southern California, although the primary habitat for scalloped hammerhead sharks is found in waters warmer than 22°C south and west of the U.S. EEZ and throughout the Eastern Tropical Pacific region (78 FR 20718). While the range of the oceanic whitetip in the Eastern Pacific is noted as extending as far north as southern California waters, based on the available data, the distribution of the species appears to be concentrated in areas farther south, and in more tropical waters (Young et al. 2017). This is also true of giant manta rays, which are distributed across the globe in tropical and warm temperate bodies of waters (Mourier 2012). They are rarely found off the U.S. West Coast, occasionally as bycatch in offshore fisheries, but there have been no identified individuals or subpopulations within the EEZ (NMFS 2022c).

The potential effects from the proposed action include exposure to noise from various activities, discharges of waste, oil spills, vessel strikes, and future decommissioning. We analyzed the pathways of these effects described in the *Effects of the Action* (section 2.5), and have determined that none of those effects are expected to be significant, or that the likelihood of them occurring to these ESA-listed fish are discountable, based on either their limited potential exposure to the proposed action given their offshore distribution or rare occurrence in the action area, and/or their apparent limited vulnerability to these impacts (e.g., vessel strikes). In particular, our analysis in section 2.5.3.7 *Effects of Oil Spills on Marine Fish* concluded that it would be extremely unlikely that white abalone would be exposed to oil from an oil spill. Therefore, we conclude that Southern California and South-Central California Coast steelhead DPSs, Southern DPS green sturgeon, eastern Pacific DPS of scalloped hammerhead and oceanic whitetip sharks, and giant manta rays are not likely to be adversely affected by the proposed action.

3. 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.

3.1 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 federal and state agencies and members of the public that may be directly involved in O&G activities that may be affected by the outcomes of the proposed action and this biological opinion. Other interested users include non-governmental organizations that monitor O&G activities along southern California, including regulatory actions that affect O&G. The document will be available within 2 weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

3.2 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.

3.3 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 (Magnuson–Stevens Act) implementing regulations regarding EFH (Essential Fish Habitat), 50 CFR part 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 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 reviewed in accordance with West Coast Region ESA quality control and assurance processes.

Appendix A. NMFS' Use of the Trajectory Analysis Planner (TAP) in Support of Consultation on Offshore Oil and Gas Development and Production Activities in the Southern California Planning Area

Background

As described in Appendix A-4 of the BOEM/BSEE's Biological Assessment (BA) (BOEM 2023), BOEM conducted oil spill trajectory modeling to determine the movement and fate of spilled oil if a spill occurred in the Southern California Planning Area (SCPA) from existing offshore oil and gas (O&G) operations. BOEM collaborated with NOAA's Office of Response and Restoration to create a regional-specific TAP (https://tap.orr.noaa.gov/#locations/south-california/impact_analysis) for the SCPA, which involved the development of a database created by analyzing statistics from a large number of simulated spill trajectories. The model output allows us to model a realistic oil spill scenario over a range of different regional oceanographic regimes (e.g., upwelling, relaxation, and eddy-driven flow). The model permits users to select features of the model's output for graphic display, including spill source (platform or pipeline), time since start, and level of concern. Figure A-1 (below) displays the Pacific Outer Continental Shelf Region (POCSR) map we used to model our spill trajectories.

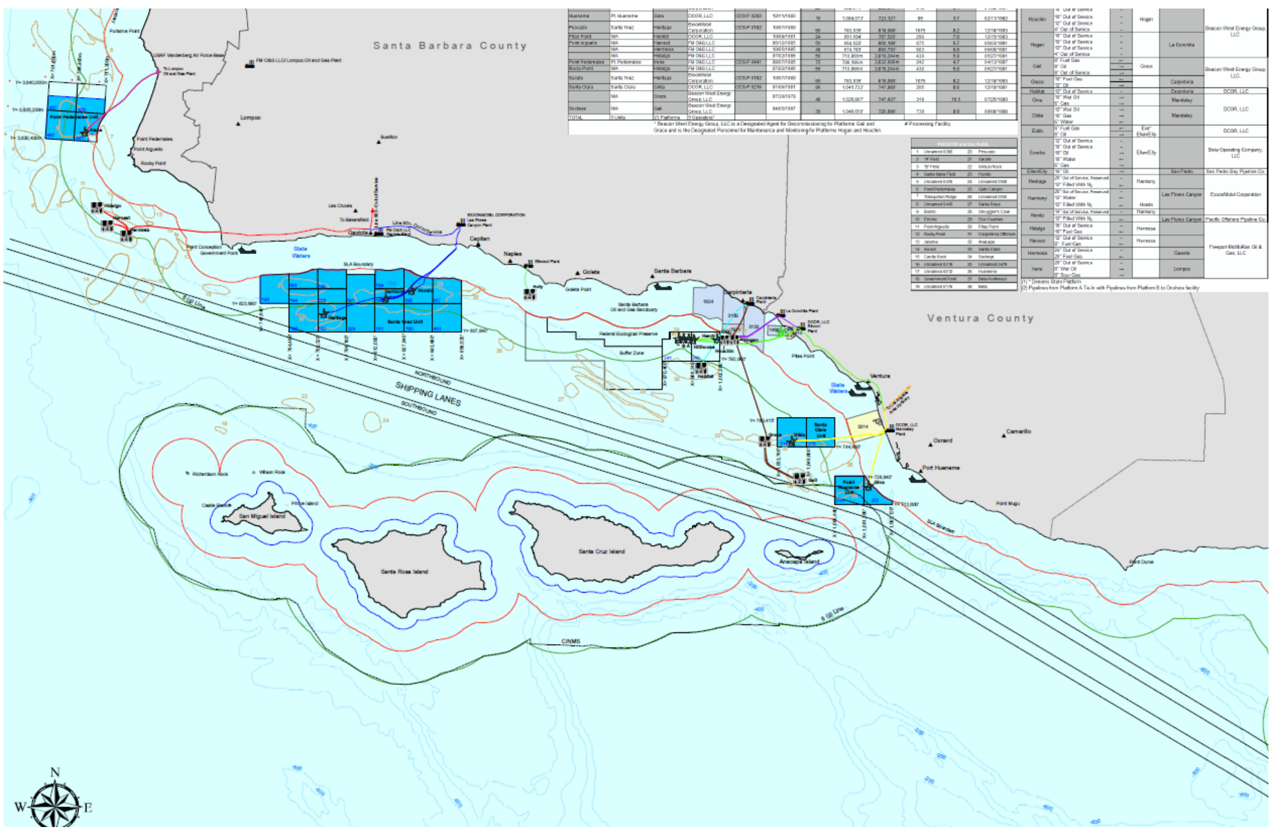


Figure A-1. POCSR map.

To make these probability estimates, TAP analyzes statistics from hundreds of simulated oil spill trajectories generated by NOAA's oil spill trajectory model, GNOME (General NOAA

Operational Modeling Environment). GNOME predicts how an oil spill will spread and move within a local area, taking into account both the bathymetry and shoreline configuration of a particular body of water and ocean currents and winds, the two forces that move oil across the water surface.

For a given region of interest, a time series of historical environmental information long enough to capture inherent variability of natural systems is required to use as forcing for the GNOME modeling. Then, using randomly selected dates within the limits of the forcing time series, GNOME is used to generate the hypothetical spill trajectories from specified spill locations. Finally, results of these trajectory analyses are compiled into data files containing the statistics for where, when, and how much oil would be predicted to impact sites in the region of interest.

To visualize these data, TAP provides an interactive graphical display. This allows us the ability to manipulate the display to answer the questions relevant to our analysis of risk to ESA-listed species and designated critical habitat, given their exposure. This includes an impact analysis, which helps us to answer the question, "if oil is spilled at a given spot, what shoreline locations are likely to be affected?" A site oiling analysis helps us to visualize how an area of concern (e.g., critical habitat designation) would likely be exposed to oil from a spill at a given location. Lastly, a threat zone analysis helps us to answer the question, "where might a spill occur that could threaten a particular location of concern?" For the specific regional TAP for the SCPA, users can select the mode, as described above (impact, oiling, or threat analysis), and can also suggest a scenario based on season: summer (May-October), winter (November-April) or all year. A user can also set the "spill rate" to a particular number of barrels spilled per day, the "time since the start of the spill" (from 1, 2, 3, 5, 7, 14 and 21 days) and a "level of concern" related to a volume of oil that reaches a given area. Generally, the anticipated volume of oil that may be spilled is divided up into a given volume per day, spilling at a constant rate over a period of days, until the total volume anticipated is reached. From there, the spill trajectory can continue to be modeled for any desired length of time since the start of the spill. Within the TAP model, the level of concern is the specified threshold for a volume of oil that will make it to a specific location. Based on a level of concern that can be adjusted (e.g., 1, 5, 10, 50, 100 barrels per cell), the model runs multiple scenarios and the results represent the percentage of spills occurring where the resulting volume of oil over that threshold reaches a given cell (cells in the model represent a 2.3 km x 2.3 km area). The SCPA TAP was developed to provide users with the unique oil type released from each source, and in our case, for each platform or pipeline (spill source), the oil type is identified, as is the location (lat/long). For example, at platform Irene, the oil type is "AD02286" and we can use the Adios database (https://adios.orr.noaa.gov/oils) to identify this as Point Arguello Heavy (crude oil). This information is incorporated into the TAP, but is also informative in understanding effects to protected species and habitat. In the SPCA, there are 23 platforms included in the spill source tab and 4 pipelines (and their associated platforms). From each of these sources, we can simulate a spill trajectory, depending on our area of interest.

NMFS' use of TAP to model oil spills

For our analysis of oil spill trajectories, we used the TAP to model oil spills from pipelines and platforms within areas of offshore O&G operations in southern California, using the parameters provided by BOEM in the BA describing the maximum spill scenario they anticipated. The scenario BOEM described involved modeling a maximum hypothetical spill of 1,000 bbl from each location using a spill rate of 200 bbl per day for 5 days. We used the scenario provided by BOEM to help assess the potential impacts to important areas of interest (e.g., coastlines, islands, open ocean, critical habitats, etc.), depending on which ESA-listed species or critical habitat we were analyzing may be affected by such an oil spill. We used the level of concern set at 5 bbl per cell that BOEM used to support their analysis in the BA, in order to calculate the percentage of 1,000-barrel spills for which at least 5 bbl of oil may reach any specific cells (i.e., or locations) associated with areas of interest/concern over a simulated 3-week period (21 days) following a spill. These calculated percentages represent our estimates of "risk" described in our analysis.

Information was not available that would allow NMFS to predict the relative likelihood of a spill of a given size occurring at one location versus another. There is considerable uncertainty regarding spill locations, since, as BOEM notes, oil spills are inherently accidental events that are "neither authorized nor intended to occur." For the purpose of our assessment of potential effects from an oil spill, we consider the likelihood of a spill occurring at any one location to be effectively equally as likely as a spill at any other location. As a result, we simulate and evaluate the risks associated with oil spills across locations throughout the action as if an anticipated spill was equally likely and expected to occur at each location.

We chose to focus our model scenarios using platforms and pipelines throughout the SCPA, and, by simulating oil spills, assessing the impact to known areas that might present risk to ESA-listed species and critical habitat. For example, for an oil spill originating from facilities/pipelines off Lompoc, Gaviota, or Santa Barbara, we can project how and where a 1,000 bbl oil spill would typically be transported, and subsequently, how likely it would impact the northern Channel Islands, where we have important rocky intertidal habitat and designated critical habitat for black abalone. Similarly, for a spill originating from facilities within the Beta Unit Complex (offshore and southwest of Huntington Beach), we can project how and where a spill might typically be transported and whether it might be likely to impact proposed designated critical habitat for green sea turtles in the coastal areas of Bolsa Chica, north of Huntington Beach or offshore to Catalina Island.

For our biological opinion (Opinion), we simulated/modeled oil spill trajectories for the following species/habitats of interest: green sea turtles (and proposed critical habitat), black abalone (and designated critical habitat) and humpback whale critical habitat. While modeling oil spill trajectories from various platforms and pipelines throughout the SPCA informs the overlap between an accidental oil spill and the extent of open ocean or coastal waters used by foraging and migrating large whales (i.e., fin, blue and humpback whales), we did not use the TAP to evaluate the risk to individual large whales. As described in more detail in the BA, blue, fin, and humpback whales are wide ranging, particularly given the identification of the recently identified biologically important areas (BIAs) for all three species. All three of these large whale species forage extensively throughout the area and are widely distributed, as evidenced by the size of their BIAs, including their "core" feeding areas. Therefore, we accept and consider that most all scenarios of oil spills will result in overlap the distributions of these highly mobile species as part of our analysis without any modeling, and conclude that modeling an oil spill trajectory from every field or unit throughout the POCSR to describe the potential overlap with a much larger area used and accessible to large whales would not be very informative. Critical habitat has recently been identified for both distinct population segments of humpback critical habitat, so we modeled oil spill trajectories in areas with high/very high conservation value, including the Santa Barbara Channel and the northern Channel Islands, to help us understand how the trajectory of oil spills may impact areas important to humpback whale essential biological features. The results of each oil trajectory scenario analysis that we used/referenced within the Opinion are illustrated and described in the following pages of this appendix.

Trajectory modeling analysis for green sea turtles and proposed critical habitat

Using the TAP resource, we simulated a maximum 1,000 bbl spill using the parameters provided by BOEM in order to understand the percentage of such spills in which at least 5 bbl of the oil would reach cells (or locations) associated with our area of concern in Los Angeles and Orange counties (generally the nearshore areas, including estuaries and bays, most of which are proposed for designation of critical habitat). Because the nearshore areas surrounding Catalina Island (located southwest of Beta Unit) are proposed for critical habitat designation, we also considered the risk to green turtles there. We simulated spills originating from four platforms (Edith, Ellen, Elly and Eureka) and the main pipeline from platforms Edith/Ellen/Eureka. Modeled spill trajectories from all four platforms followed nearly identical patterns, radiating from the source and reaching the nearshore areas and shoreline from Long Beach south to Laguna Beach. The risk (i.e., percentage of spills where at least 5 bbl would reach locations within a given area) for coastal areas of concern decreases as the trajectory of the spill moves south of Newport Beach.

Figure A-2 shows the modeled trajectory analysis for an accidental spill from platform Edith. As described in more detail in the Opinion, the modeled risk to sea turtles in the Long Beach (San Gabriel River) and Seal Beach National Wildlife Refuge (SBNWR) areas, from oil spilled from the four platforms under the scenarios evaluated resulted in a 30% probability of at least 5 bbl of oil reaching those locations, depending on the location of the modeled spill. South of these areas, in Huntington Harbor and Bolsa Chica, which includes areas that are considered high conservation value for proposed East Pacific DPS green sea turtle critical habitat (NMFS draft biological report 2023), the risk averaged around 20%. Further south (Bolsa Chica lowlands and Huntington Beach south to Newport Beach), the risk gradually declined to below 15-20% For areas south of San Onofre, the risk decreased to negligible levels (0-5%).

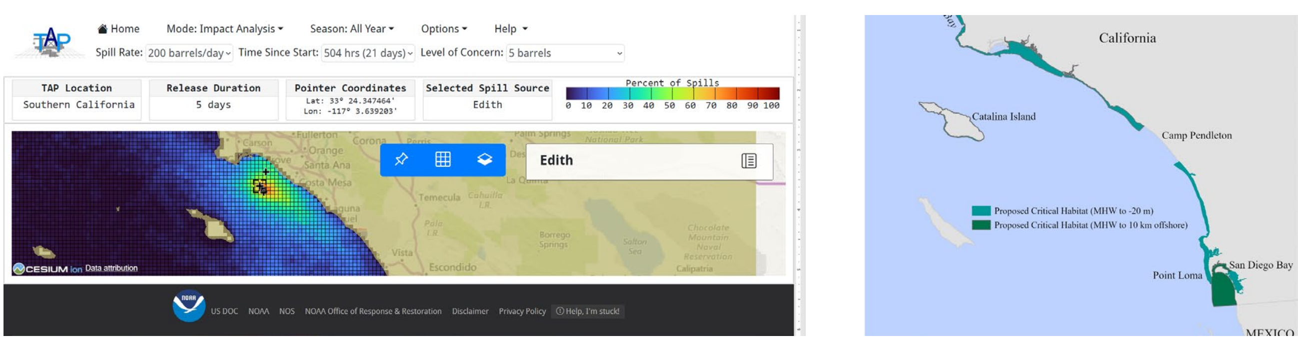


Figure A-2. Spill trajectory model results for an accidental spill from Platform Edith in the Beta Complex (left panel) and East Pacific DPS green sea turtle proposed critical habitat (right panel).

Figure A-3 shows the modeled trajectory analysis from an accidental break in the pipeline transporting oil from three of the platforms in the Beta Unit. The modeled oil spill trajectory showed higher risk to green sea turtles in the nearshore area of the San Gabriel River/SBNWR complex and associated bays (~40-60 percent chance of at least 5 bbl of oil contacting locations within sensitive areas after a 1,000-barrel spill), likely due to the proximity of the pipeline to the shoreline. The modeled risk to adjacent areas south (Huntington Harbor and Bolsa Chica) was also high, ranging between 60-70%. South of these areas, the modeled risk to sea turtles was still relatively high, from 40-50%. The modeled risk to sea turtles traveling further offshore (closer to the modeled source of an accidental pipeline rupture), was up to 80% closest to the source. Sea turtles also forage around Catalina Island (located ~22 miles from the mainland), which is also proposed for critical habitat. Using the TAP resource, the modeled risks to sea turtles foraging around Catalina Island from any accidental oil spills from platforms or the pipeline in the Beta Unit were negligible (0-5%).

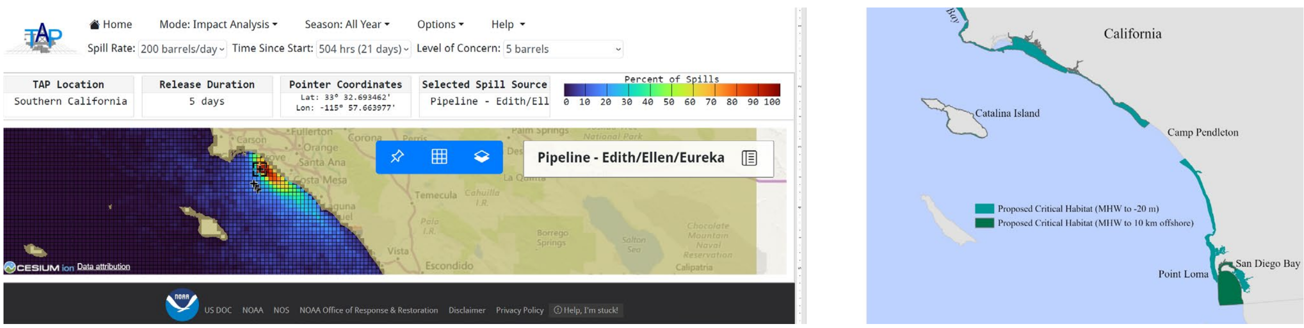


Figure A-3. Spill trajectory model results for an accidental spill from the pipeline in the Beta Complex (left panel) and East Pacific DPS green sea turtle proposed critical habitat (right panel).

Trajectory modeling analysis for black abalone and designated critical habitat

As described in the Opinion, in the POCSR, black abalone and their known rocky intertidal habitat, including designated critical habitat, may be exposed to oil due to oil spills within the Point Pedernales Unit, the Santa Ynez Unit, the Port Hueneme Unit, and the Beta Unit. Using the TAP resource, we simulated a maximum 1,000 bbl spill (200 bbl over 5 days, with our level of concern set at 5 bbl) in order to understand the percentage of spills where at least 5 bbl of spilled oil would reach locations within a particular area of concern; that is, coastal and offshore island shorelines that include rocky intertidal areas with known presence of black abalone from surveys, as well as those areas that include designated critical habitat for black abalone.

Within the Point Pedernales Unit, platform Irene is the only facility currently operating, with one pipeline transporting oil to an oil and gas plant in Lompoc. We simulated an oil spill occurring from the platform, and the majority of the oil traveled south, with very little oil reaching the shore (~0-18%) where black abalone are located (and critical habitat, which has been designated from Montaña de Oro State Park to just south of Government Point). Should an incident occur at the pipeline associated with platform Irene, the risk of an oil spill reaching the shoreline in this area was higher, ranging from 0-21.5% [Figure A-4 (platform Irene) and Figure A-5 (pipeline Irene)]. Therefore, there is potential exposure of black abalone and their critical habitat to oil from oil spills occurring from platform Irene, at least up to a 21.5% probability under that scenario.

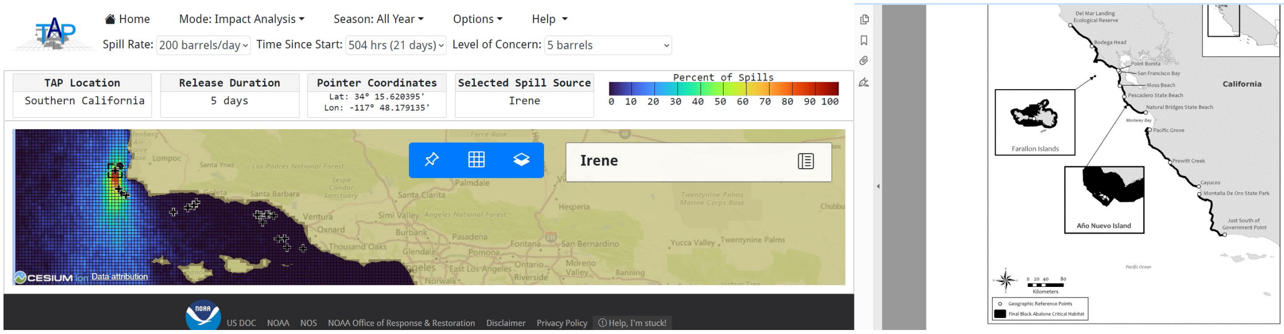


Figure A-4. Spill trajectory model results for an accidental spill from Platform Irene in the Point Pedernales Unit (left panel) and black abalone critical habitat, Montaña de Oro State Park to Government Point (right panel).

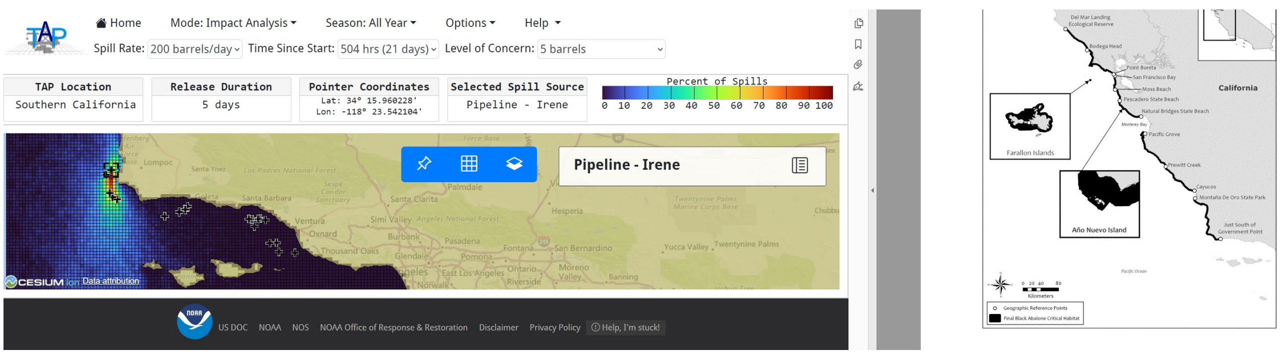


Figure A-5. Spill trajectory model results for an accidental spill from Pipeline Irene in the Point Pedernales Unit (left panel) and black abalone critical habitat, Montaña de Oro State Park to Government Point (right panel).

Focusing on black abalone occurring further south, in the northern Channel Islands (San Miguel Island, Santa Rosa Island, Santa Cruz Island, and Anacapa Island, all designated as black abalone critical habitat), the nearest O&G facilities are within the Santa Ynez Unit, including three platforms (Heritage, Harmony and Hondo). One main pipeline is used to transport oil to the Las Flores Canyon Plant. In our TAP simulations of an oil spill event occurring at any one of the three platforms, the trajectory of the oil traveled southwest. The risk of oil reaching the mainland coast near Santa Barbara was from 0-9%, for all three platforms. The risk of oil reaching any of the northern Channel Islands, ranged from 0-6.5% from Heritage (Santa Cruz Island and Santa Rosa Island, with a 15% risk at a few locations on Santa Rosa Island); 0-7% from Harmony (Santa Cruz Island and Santa Rosa Island) and 0-9% from Hondo (Santa Cruz Island and Santa Rosa Island) (Figure A-6). The risk of oil from a pipeline incident in this unit ranged from 0-14.5% for the mainland coast near Santa Barbara, and 0-5% for Santa Cruz, Santa Rosa, and Anacapa Islands (Figure A-7). While the numbers and densities of black abalone are relatively low on the mainland coast near Santa Barbara and on Anacapa Island, the numbers and densities of black abalone on Santa Cruz Island and Santa Rosa Island are relatively high. Therefore, there is potential exposure of black abalone and their critical habitat on the northern Channel Islands to oil from oil spills occurring at the Santa Ynez platforms and pipeline, although the probability is only up to 15%.

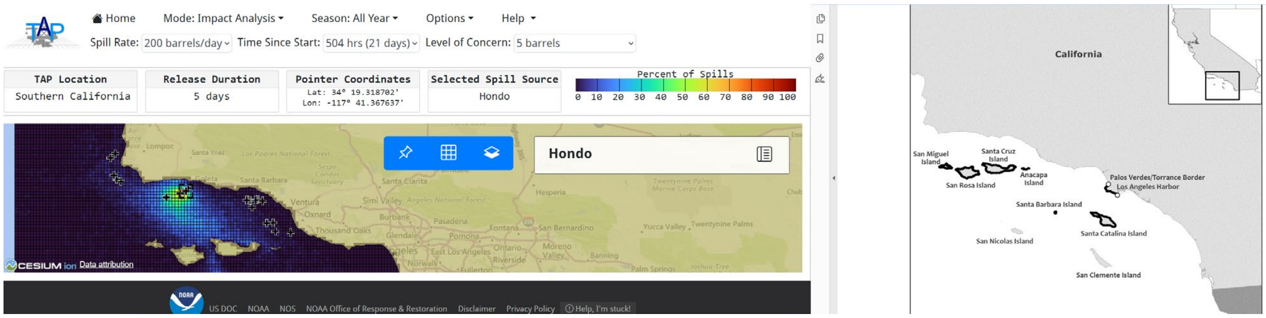


Figure A-6. Modeled spill trajectory from Platform Hondo in the Santa Ynez Unit (left panel) and black abalone critical habitat in the northern Channel Islands (right panel).

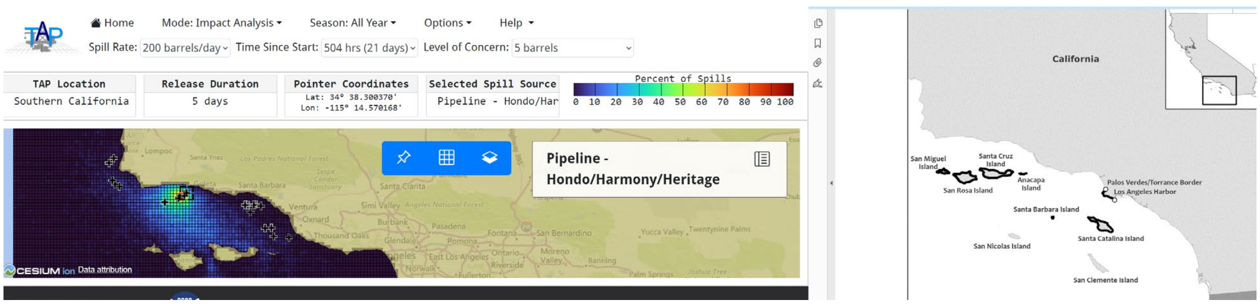


Figure A-7. Modeled spill trajectory from Hondo/Harmony/Heritage platform in the Santa Inez Unit (left panel) and black abalone critical habitat (right panel).

As described in the Opinion, north of the northern Channel Islands and offshore of Carpinteria, there are several active facilities and pipelines within Dos Cuadras (field name). A review of an oil incident occurring at A, B, C and Hillhouse and their associated pipeline revealed oil projected to be transported both north and south along the coastline, but was not projected to reach areas offshore, including the northern Channel Islands (modeled risk at 0-3%). This was similar for platforms Habitat, Houchin, and Hogan, in the same area (Figure A-8, platform Houchin), and for platforms Grace, Gilda, Gail, and Gina further south along the coast. The risk of oil from platforms Grace, Gilda, Gail, and Gina reaching Anacapa Island was slightly higher, ranging from 0-10.5% (Figure A-9, platform Grace).

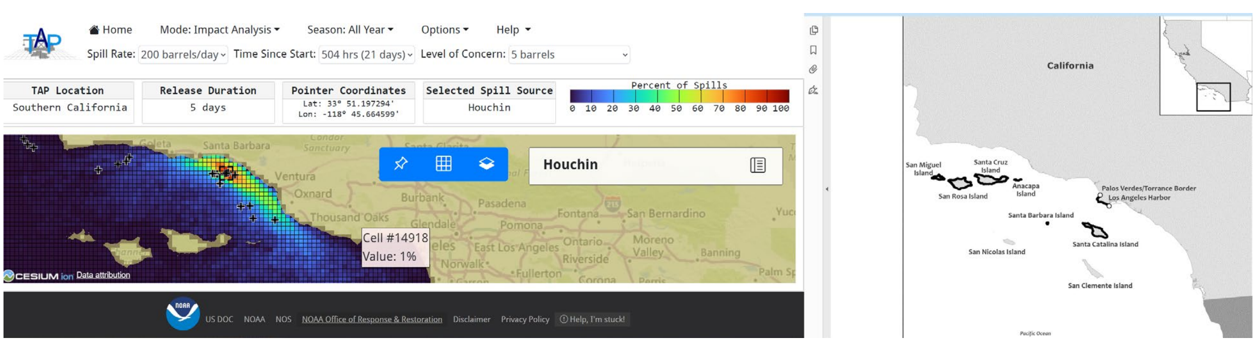


Figure A-8. Spill trajectory model results for an accidental spill from Platform Houchin in the Dos Cuadras field unit (left panel) and black abalone critical habitat, northern Channel Islands (right panel).

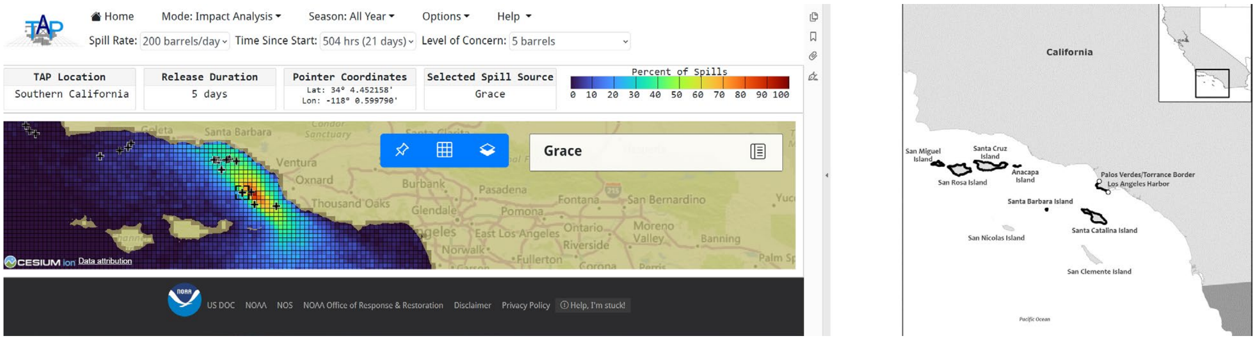


Figure A-9. Spill trajectory model results for an accidental spill from Platform Grace in the Santa Clara Unit (left panel) and black abalone critical habitat, northern Channel Islands (right panel).

The risk of oil from a platform or pipeline incident within the Dos Cuadras field (platforms A, B, C, and Hillhouse) reaching the mainland coast was higher (0-39.5%), with the greatest risk along the segment of coast from Goleta to Oxnard (Figure A-10, platform B).

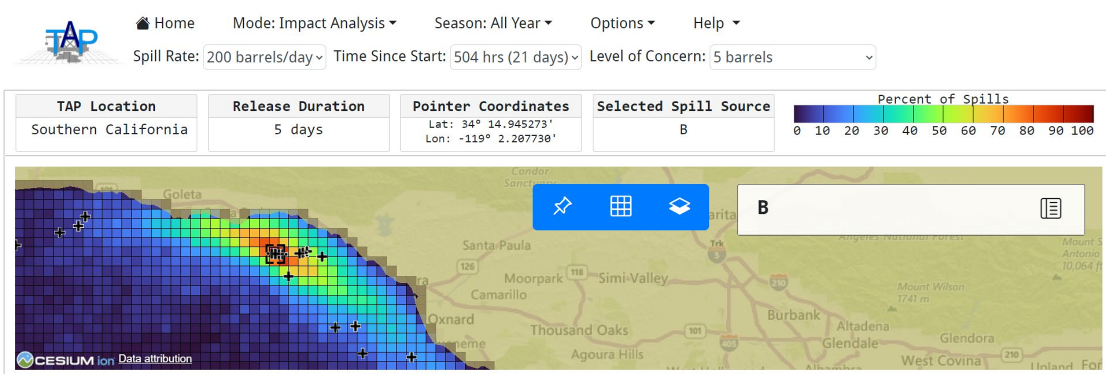


Figure A-10. Spill trajectory model results for an accidental spill from Platform "B" in the Dos Cuadras field, with the mainland California coastline.

Southeast of the northern Channel Islands, black abalone habitat is located along the shore of Palos Verdes Peninsula (from the Palos Verdes/Torrance border to Los Angeles Harbor) and from Corona Del Mar State Beach to Dana Point, as well as offshore on Santa Catalina Island, Santa Barbara Island, San Nicolas Island, and San Clemente Island. The Palos Verdes Peninsula, Santa Catalina Island, and Santa Barbara Island are designated as black abalone critical habitat. Beta Unit contains several facilities located offshore of Huntington Beach: platforms Edith, Ellen, Elly, and Eureka and the pipeline for Edith, Ellen, and Eureka. Model simulations of an oil incident occurring off the four platforms or at the pipeline showed risks of oil reaching rocky intertidal habitat associated with black abalone 0-12.5% only at the southern tip of the Palos Verdes peninsula; and 0-13% for Corona Del Mar to Dana Point (Figure A-11, platform Eureka). Model simulations showed a negligible risk of oil reaching Santa Catalina Island (0-1.5%), which is designated as critical habitat.

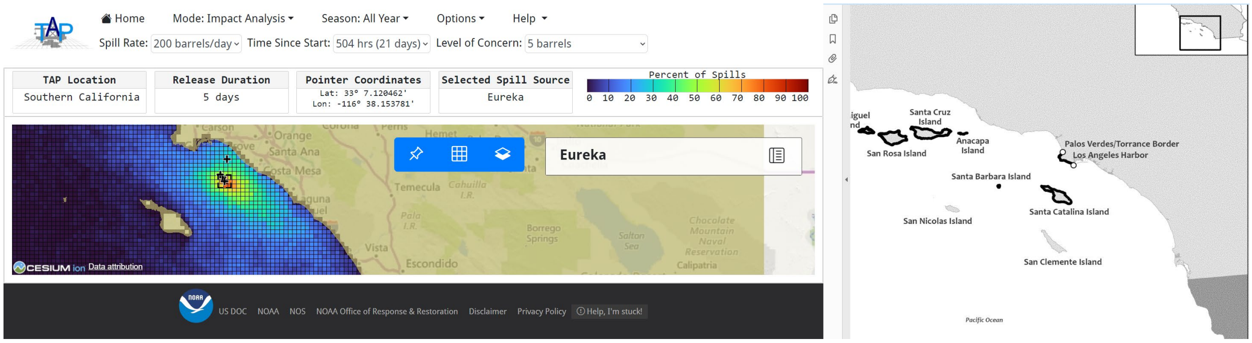
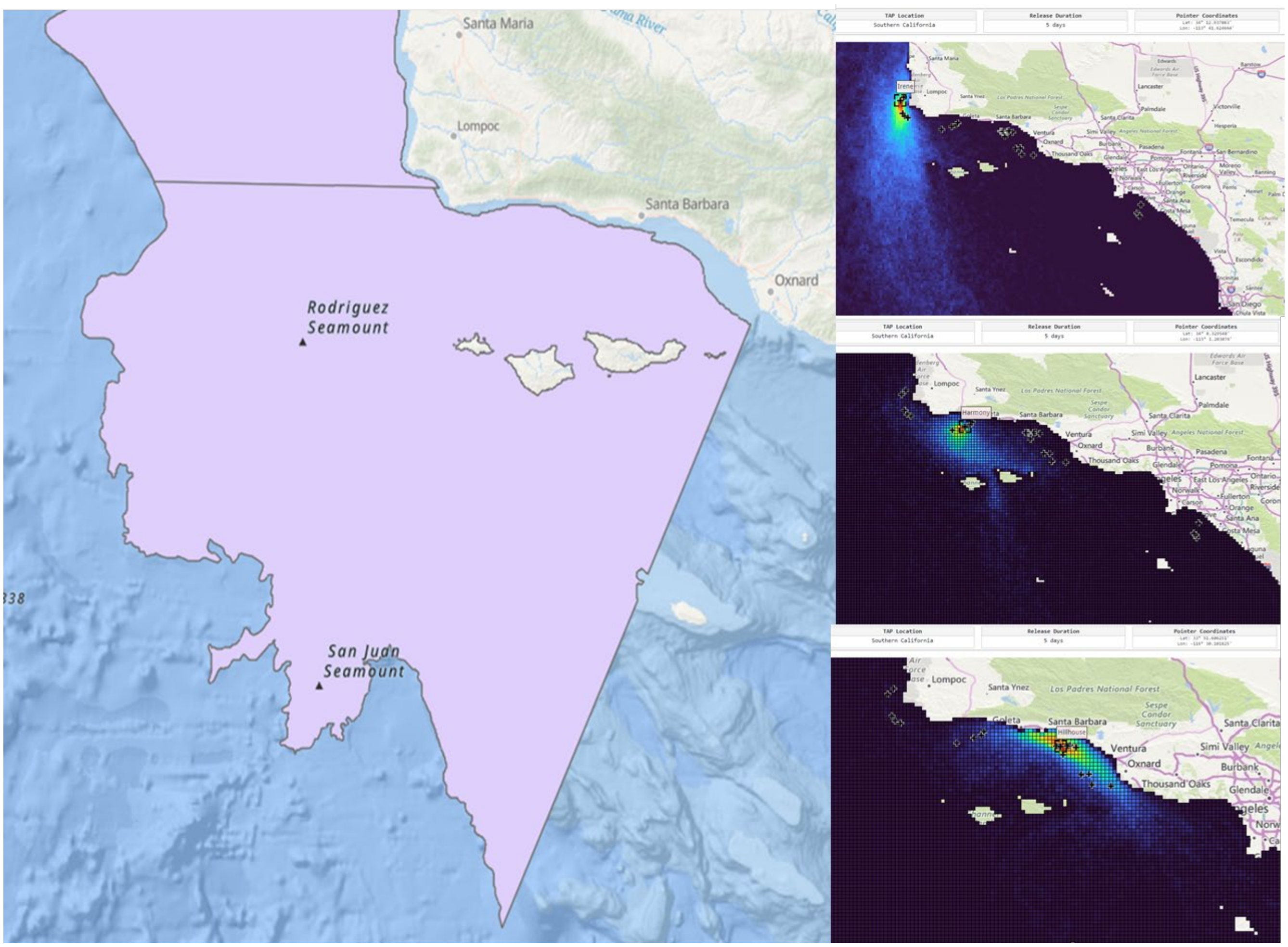


Figure A-11. Modeled spill trajectory results for an accidental spill from Platform Eureka in the Beta Unit (left panel) and black abalone critical habitat, risk to Palos Verdes Peninsula, Santa Catalina and Santa Barbara Island (right panel).

Spill trajectory analysis for humpback whale critical habitat

As summarized in the Opinion, there is an overlap between humpback whale designated critical habitat Units 17 and 18 (Figure A-12), and various pipelines and oil platforms within the POCSR. The nearshore boundaries of Unit 17 and Unit 18 are the 30-m and 50-m depth contour, respectively, with the offshore boundaries defined as 3,700-m depth contour. These two areas include nearly all of the platforms and pipelines included in the POCSR, except for Beta Unit, off Huntington Beach. As a result, we accepted that the risk that oil from an oil spill associated with the proposed action will reach areas of designated critical habitat throughout the action area is essentially 100% under most scenarios before we ran any models. Instead of looking at the probability that oil may contact humpback whale critical habitat under different scenarios, we instead focus on characterizing the relative extent of the designated critical habitat within the action area that will be affected by a 1,000 bbl oil spill that is anticipated under the proposed action, which could occur at various locations throughout the action area.



Figures A-12: A map of the designated critical habitat for both Central America DPS and Mexico DPS for humpback whales (left) within the action area, alongside modeled spill trajectory results (right) for accidental spills from 3 different platforms [Irene (top), Harmony (middle), and Hillhouse (bottom)] within designated humpback whale critical habitat.

Using the TAP resource, we simulated a maximum 1,000 bbl spill (200 bbl over 5 days, with our level of concern set at 5 bbl reaching a given area) in order to understand the percentage of such spills in which at least 5 bbl of oil would reach locations within designated critical habitat (offshore areas surrounding Santa Barbara and Ventura Counties) over 21 days. The modeled risks (Figure 12) to humpback whales from an accidental break in platforms offshore from Point Conception to Santa Barbara County showed the probability of reaching feeding areas designated as critical habitat. Almost all pipelines and platforms within the action area, excluding those within the Beta group, have the potential to present oil spill risks to humpback whale critical habitat.

With respect to the extent of humpback whale critical habitat that might be affected by oil within the action area, Figure 12 illustrates that a spill up to 1,000 bbl could affect a wide area of designated critical habitat. Although we have not specifically quantified it, a visual review of these oil spill trajectory model results suggests that roughly 10-25% of critical habitat could be affected by oil during an oil spill, especially if the spill originates from the Point Pedernales Unit. While that estimate is extremely crude, the model results do support the assertion that less area of critical habitat will be impacted by oil from an anticipated oil spill than the amount of critical habitat area that will remain unaffected.

APPENDIX B. VESSEL COLLISION RISK MODELING

General Description of Modeling Approach

To explore the risk of a vessel collision occurring with ESA-listed large whale species (blue whale, humpback whale, and fin whale) from vessel traffic associated with the development and production of Oil and Gas within the SPCA of the POCSR, NMFS WCR adapted the vessel strike risk and mortality model for large whales presented in Rockwood et al. (2017). The Rockwood et al. (2017) model predicts areas of high vessel collision risk and estimates a number of annual mortalities that may occur as a result of the magnitude and distribution of vessel activity and the distribution and densities of whales. The Rockwood et al. (2017) model estimates the risk of collisions given all vessel traffic in an area. NMFS WCR adapts this model, while relying on the same literature and framework that Rockwood et al. (2017) established, to estimate the risk of a vessel collision with several whale species along specific vessel routes that are expected to be used in the proposed action. As with the Rockwood et al. (2017) model (and consistent with the framework used in Rockwood et al. 2020, 2021) our adapted approach can be broken down into three main components: encounter risk, strike risk, and mortality estimation. The final output is an estimate of annual collisions and mortalities for the three focal large whale species across the relevant vessel routes (humpback whale, blue whale, fin whale). However, we don't directly equate the calculations of risk as absolute values of estimated strikes and mortalities given the necessary assumptions in the model design that are described in this section, and the caveats and limitations of our quantitative approach (which are discussed in the *Model Constraints, Caveats, and Considerations* portion at the end of this section). NMFS is currently actively exploring the utility of these models in a number of efforts, including assessment of North Atlantic right whale vessel collision risk on the U.S. East Coast. In the interim, we rely upon these model results to inform the general magnitude of vessel collision risks associated with the extent and location of vessel activity associated with this proposed action.

Whale Density Data

The WCR vessel collision risk model incorporates whale density data for humpback whales, blue whales, and fin whales in the action area from Becker et al. (2020a), at a resolution of 10 km^2. The Becker et al. (2020a) estimates represent average distributions of the three species for the summer/fall survey months (July through December) based on surveys from 1991 through 2018. The timeframe over which the Becker et al. (2020a) data were collected captures environmental variability including typical and atypical conditions, including the 2014-2016 marine heatwave. While there is currently work underway to create similar density estimates for the winter/spring months, the data specific to these months are not available at this time. To best reflect the available survey data and seasonal peak of whale abundance, the model therefore estimates annual rates of encounters and collisions assuming whales are only present in the action area for six months of the year, consistent with the Rockwood (2017) approach. While fin and humpback whales are also present in the U.S. EEZ outside of the July through December window (see Carretta et al. 2023), the abundances are generally believed to be lower during winter/spring months and the habitat use may be further offshore (Campbell et al. 2015; Becker et al. 2017).

As such, the vessel collision risk is likely lower during the winter/spring months. By treating the summer/fall six month period as the only time of year when collisions occur, the annual estimates are underestimated, as they ignore the potential for collision during winter/spring months. However, given the lack of more precise information on whale presence during winter/spring months we conclude it is appropriate to focus on the collision risk during the summer/fall months when there is peak abundance for all three species.

Vessel Data

The WCR vessel collision risk model incorporates information provided by the Bureaus about vessel activity associated with the proposed action. Information about vessel activity includes key characteristics of the vessels used including vessel size and anticipated vessel speeds. In addition, we use information provided by the Bureaus on the anticipated number of vessel transits associated with regular O&G activities including frequent vessel activity moving between platforms and local ports. Finally, in order to operate the NMFS WCR vessel collision risk model, we generated anticipated vessel routes based on our understanding of how, when, and where project vessels move throughout the proposed action area. The Bureaus provided information on vessel characteristics and transits for crew vessels and supply vessels. However, the BA identifies other types of vessel that are utilized as part of the proposed action such as oil spill prevention and response vessels, anchor handling or tug supply vessels, diving support vessels, inspection maintenance and repair vessels, and vessels for remotely operated vehicle (ROV) support. No information on the characteristics of transits of these vessels was provided in the BA or through additional exchanges with BOEM, and therefore the vessel strike risk associated with these other vessel types is not captured in our analysis. As such, the NMFS WCR vessel collision risk model only examines crew vessels and platform supply vessels associated with the proposed action, which may underestimate the total risk of a vessel collision. However, given the very regular operation of crew and supply vessels on a near daily basis compared to these other vessel activities that we expect are far less frequent, we conclude that the vessel activity that we have included in the modeling does account for a very large percentage of the total vessel activity that occurs as part of the proposed action.

Vessel Characteristics: Size and Speed

In their BA, BOEM identified two size classes of vessels: smaller crew vessels, often approximately 15 m long, and larger supply vessels that range from 50 to 100 m long. From these vessel lengths and communications (E. Boydston, BOEM, personal communication, November, 2023) providing information for example vessels for these two size classes, we selected vessel widths for this model of 9 m for crew vessels and 28 m for supply vessels. Similarly, vessel speeds were only provided for the crew vessels and platform supply vessels. The crew vessels have a maximum speed of 25 kn (no average speed provided) and platform supply vessels (assumed to be part of the larger vessels referenced on page 13 of the BA) travel at average speeds between 10 to 16 kn. Speeds for other types of vessels that are part of the proposed action were not provided. In the absence of more detailed information we selected 25 kn as the transit speed for crew vessels, and 16 kn as the transit speed for supply vessels as we anticipate that vessels will transit quickly between locations as part of their regular operations.

Transit Numbers

The NMFS WCR vessel collision risk model calculates risk based on the number of transits for a single year. Table 7 of the BA (Table 13 in section 2.5.4.4; Table B-1;) provides a number of transits per month for each platform group to shoreline route. The total number of transits per month across all routes based on Table B-1 would be 450 round trips. The BA also states that "support vessels in the Pacific Region, including both crew and supply boats, have averaged approximately 16 trips per week per platform (Bornholdt and Lear 1995, 1997). We decided to use the transit numbers provided in B-1, as they have a breakdown by route and this portion of the BA is dedicated to describing the vessel collision risk of the proposed action. We also included the six supply trips per month to the Point Arguello platforms described in the paragraph immediately preceding Table 7 of the BA. Table B-1 does not distinguish between the number of transits for two size classes provided. Because of this, we ran the model two ways, once with all of the transit parameters set to the crew vessel, and once with all of the transits assumed to be platform supply vessels. The true ratio is somewhere between these two assumptions, but it is not possible to more precisely determine where based on the information provided, and therefore our results of estimated collisions and mortalities using both assumptions represent boundary conditions. Because the numbers in Table B-1 are given for round trips, we multiplied those numbers by two to get the out and back counts for transits along each route to calculate a number of monthly transits, and then multiplied by 12 to convert the transits per month to transits per year. The number of estimated collisions and mortalities per vessel, as described above, was then multiplied by the monthly number of transits for each route, and those monthly estimates were summed to estimate the annual rates of collisions and mortalities. As described above, this model is making predictions based on whale density data from the 6-month peak whale period (July-December), so estimates of cumulative annual collisions and mortalities were calculated assuming whales were only present during those months. As with the Rockwood et al. (2017) model, we assume these values represent the majority of strike risk for the year because all three species show decreased abundance during winter and spring months. Additionally, the BA does not provide the number of transits associated with other vessel operations that are part of the proposed action. Also, other parts of the BA indicated there could be higher rates of crew or supply vessel traffic on a given day than are represented in Table B-1, although that wasn't further described or consistent with the rest of the information provided about those vessel activities. As such, this analysis does not represent a full accounting of the total vessel traffic and is likely an underestimate of the total vessel collision risk associated with the proposed action.

Table B-1. Estimated numbers of operator vessel trips per month to groups of platforms from Table 7 in the BA.

Platforms or groups of platforms visited	Departure location from shore	Estimated # trips per month
Heritage, Hondo, Harmony (Santa Ynez Unit)	Goleta	26
A, B, C, Hillhouse, Habitat, Henry	Santa Barbara	87
A, B, C, Hillhouse, Habitat, Henry	Port Hueneme	30
Gina, Gilda	Port Hueneme	87
Hogan, Houchin	Carpinteria	43
Gail, Grace	Carpinteria	43
Edith, Ellen, Elly (Beta Unit)	Port of Los Angles	134

Transit Routes and Timing

The vessel collision model uses set transit routes to calculate vessel collision risk. Table 7 of the BA (Table B-1) lists platforms (or groups of platforms) and the shoreline location that vessels depart to and from. However, some of these platform groups are different from the platform units listed in Table 2 of the BA. Additionally, some other platform groupings were provided in the text of the BA. We assumed that the groupings in Table B-1 were the appropriate platform groups to use for our analysis, and generated corresponding transit routes from the platform groups to the associated shoreline location using the *sf* package in R (v1.0.15; Pebesma and Bivard 2023; Pebesma 2018). In conversations with BOEM staff, we learned that nighttime operations are not typical or common; therefore we ran the vessel collision model using daytime whale depth parameters. However, the whales may be within the top 15 m of the water column for a greater proportion of time during the night than during the day (Table B-2; Calambokidis et al. 2019). As such, any night time operations conducted as part of the proposed action would likely be associated with a higher risk of collision with large whales, if vessels travel at the same speeds, and the NMFS WCR vessel collision model may be underestimating the risk of a collision. However, such trips would only represent a very small fraction of the total transits, and therefore the total risk, associated with each route. Given the anticipated small and uncertain fraction of night time vessel operations that may be anticipated as part of the proposed action, we did not model any night time vessel operations. However, our overall analysis does recognize that some night time operations may occur.

Encounter Risk

For the encounter risk between vessels and whales, we used the approach outlined in Rockwood et al. (2017) to define a critical encounter radius based on the vessel width and the radius of a circle calculated from the whale's length and width, which represents the assumed scenario that the ship will approach the whale bow first given the ship is moving much faster than the whale. This approach was originally derived in Martin et al. (2016), with Rockwood et al. (2017) changing from the estimated probability function for animal velocity Martin et al. (2016) used to mean swimming velocities. Further justification of that change can be found in the text of Rockwood et al. (2017) and supporting information S2 File. We used the same whale characteristics from literature that Rockwood et al. (2017) incorporated describing the average sizes and swimming speeds for each species analyzed (Table B-2). The proportion of time in the upper 15 meters of the water column values are from Calambokidis et al. (2019).

Table B-2. Large Whale Characteristics used in vessel collision risk modeling.

Species	Width (meters)	Length (meters)	Swimming Speeds (km/hr)	Proportion of time in Upper Water Column - Daytime (15m)
Blue whale	2.96	20.9	2.64	0.36
Fin Whale	2.65	18.48	3.48	0.49
Humpback Whale	3.21	13.5	3.37	0.54

We then calculated the estimated encounter rate between one whale and one vessel based on an integration of the critical encounter radius, whale speed, vessel speed, and area over which the encounter could occur based on encounter theory (see Rockwood et al. 2017). We used the average whale speeds and encounter radius calculations from Table B-2, vessel parameters described above in *Vessel Characteristics: Size and Speed* for either "supply" or "crew" vessels, and set the area equal to the size of grid cells defining our available whale density data ($10km^2$).

As described in Martin et al. (2016) and Rockwood et al. (2017), the encounter rate is an estimate of the risk of one whale and one vessel occupying the same (two-dimensional) space at the same time, creating the potential for a collision. To estimate a number of expected encounters, this encounter rate was multiplied by the estimated whale density for each species in each grid cell.

Risk of Collision

The collision rate, or strike risk, is the product of the encounter rate, the probability of the whale being at a depth shallow enough that the vessel could contact the whale (strike depth), and the probability that a whale does not avoid the vessel to prevent a collision from occurring. The model is designed to estimate the risk of vessel collision per each density grid cell that a vessel route crosses, and then sums the estimated collisions for all grid cells that a route will travel through.

We used estimates for the proportion of time these three whale species spend within the top 15 meters of the water column during daylight (Table B-2; Calambokidis et al. 2019) to estimate the probability of a whale being within the strike depth, similar to the approach that Garrison et al. (2022) took for estimating collision risk for North Atlantic right whales. Some models use the draft of the vessel to calculate the strike depth (Rockwood et al. 2021), with one study suggesting that the propeller suction effect can be up to twice the ship's draft (Silber et al. 2010). This model relies on the proportional times presented in Calambokidis et al. (2019), which provides different proportions of times at depth based on day and night measurements of whale depth information. We are likely using a larger strike depth than what may be impacted by vessels of the sizes analyzed here, because of the need to make simplifying assumptions in the absence of actual draft and propeller information. Additionally, it is not possible to further refine the proportional times presented in Calambokidis et al. (2019) to adjust the strike depth. This simplifying assumption based on the best available data may result in an overestimate of the collision rate in the NMFS WCR vessel collision risk model.

Avoidance behaviors by whales are not well understood. Some studies, such as McKenna et al. 2015, found that blue whales initiated an avoidance dive during 55% of observations. Studies of humpbacks in Hawaii (Currie et al. 2017) and Alaska (Gende et al. 2011) found that as vessel speed increased, the distance at which whales encountered vessels decreased suggesting that more avoidance maneuvers may be possible at slower vessel speeds (Garrison et al. 2022). We used the logistic avoidance model from the supplemental materials for Rockwood et al. (2017) to estimate the probability that a whale does not avoid a strike, as a logistic function between the avoidance rate and vessel speed (i.e. decreasing avoidance behavior with increasing vessel speed). This approach is based on the fact that studies such as Gende (2011) have found a negative and non-linear relationship between ship speed and successful avoidance, and uses observed data from McKenna et al. (2015) to parameterize the avoidance model (Rockwood et al. 2017, S2). Rockwood et al. (2017) explored a constant avoidance rate (55% avoidance based on McKenna et al. 2015) and a no avoidance scenario. However, the logistic relationship is the most supported by observations and other analyses of the three (Rockwood et al. 2017; 2021). The vessel collision rate, as estimated from these parameters, was then multiplied by the whale density for each species in each grid cell to estimate a number of collision events per grid cell.

Mortality risk

The final component is the probability of a collision resulting in a whale mortality, given that a collision has occurred. Conn and Silber (2013) developed a regression describing the observed relationship between a vessel speed and the likelihood of a fatal strike occurring. To estimate the risk of mortality, we multiplied the collision rate by the output of their logistic regression describing the likelihood of mortality given the vessel speed for each grid cell. The number of mortalities was then estimated by multiplying the whale densities by the mortality rate. Conn and Silber (2013) included more cases involving slower moving vessels than in Vanderlaan and Taggart (2007), but may still underestimate the risk associated with slower speeds due to the small sample size.

These estimates of the numbers of whale collisions and mortalities per grid cell were then summed for all grid cells belonging to a particular route, and represent the collision and mortality events associated with a single vessel transit along that path. The number of estimated collisions and mortalities per vessel were then multiplied by the number of expected transits associated with each route, as described below, for the season of peak whale density as described by Becker et al. (2020a; July through December).

Model Outputs and Results

Based on the approach described above, several patterns emerged in the estimates of vessel collisions and lethal strike events:

Although slower moving, the supply vessel scenario resulted in more than double the risk of collisions and mortalities than the crew vessel scenario, even though crew vessels were set to travel at faster speeds. This finding is consistent with the fact that slower vessels spend more time transiting in each area, resulting in more time for a collision to occur, and the supply vessels are associated with a larger encounter radius. This type of relationship is discussed in Conn and Silber (2013). These authors stressed the importance of accounting for the effects of vessel speed on whale mortality to address a possible increased encounter rate at slower vessel speeds. More collisions do not directly relate to more mortalities since faster vessel speeds are associated with increased lethality (Conn and Silber 2013; Garrison et al. 2022).

Fin whales appear to be at highest risk of collisions and mortalities in these scenarios, followed closely by humpback whales, with blue whales having the lowest estimated collisions and mortalities across scenarios.

Based strictly on these model results, if all of the transits were of crew vessels none of the routes were anticipated to result in a vessel strike of one or more of the three whale species in a single year. If, however, all of the transits were of larger supply vessels, a single strike of a humpback or fin whale per year was predicted, although less than one whale of any of these species was estimated to be killed per year. Looking at the average between the vessel type scenarios, the results would suggest that the risk for each of the species would amount to less than one vessel collision and 0.5 mortalities in any given year.

Table B-3. Results of vessel collision risk modeling assuming all vessel transit were crew vessel transit.

Scenario - All crew vessels		Humpback Whale		Blue Whale		Fin Whale	
Route	Transits (per year)	Collisions (per year)	Mortalities (per year)	Collisions (per year)	Mortalities (per year)	Collisions (per year)	Mortalities (per year)
Beta Unit_Port of Los Angeles	3,216	0.003	0.002	0.041	0.029	0.05	0.035
Gail and Grace Unit_Carpinteria	1,032	0.033	0.023	0.02	0.014	0.045	0.032
Gina and Gilda Unit_Port Hueneme	2,088	0.029	0.021	0.025	0.018	0.054	0.038
ABC3H_PH Unit_Port Hueneme	720	0.035	0.025	0.02	0.014	0.042	0.03
Point Arguello Unit_Port Hueneme	144	0.065	0.046	0.015	0.01	0.053	0.038
Hogan and Houchin Unit_Carpinteria	1,032	0.003	0.002	0.002	0.001	0.003	0.002
ABC3H_SB Unit_Santa Barbara	2,088	0.082	0.058	0.034	0.024	0.076	0.054
Santa Ynez Unit_Goleta	624	0.077	0.054	0.015	0.011	0.049	0.035
Annual Total	10,944	0.327	0.232	0.172	0.121	0.373	0.264

Table B-4. Results of vessel collision risk modeling assuming all vessel transit were supply vessel transit.

Scenario - All supply vessels		Humpback Whale		Blue Whale		Fin Whale	
Route	Transits (per year)	Collisions (per year)	Mortalities (per year)	Collisions (per year)	Mortalities (per year)	Collisions (per year)	Mortalities (per year)
Beta Unit_Port of Los Angeles	3,216	0.01	0.005	0.138	0.065	0.173	0.081
Gail and Grace Unit_Carpinteria	1,032	0.116	0.055	0.07	0.033	0.157	0.074
Gina and Gilda Unit_Port Hueneme	2,088	0.104	0.049	0.084	0.04	0.19	0.089
ABC3H_PH Unit_Port Hueneme	720	0.123	0.058	0.069	0.032	0.147	0.069
Point Arguello Unit_Port Hueneme	144	0.229	0.107	0.05	0.024	0.185	0.087
Hogan and Houchin Unit_Carpinteria	1,032	0.011	0.005	0.005	0.002	0.012	0.006
ABC3H_SB Unit_Santa Barbara	2,088	0.29	0.136	0.116	0.054	0.265	0.124
Santa Ynez Unit_Goleta	624	0.27	0.127	0.053	0.025	0.172	0.081
Annual Total	10,944	1.153	0.542	0.584	0.275	1.299	0.61

The route from platform group A, B, C, Hillhouse, Henry, and Habitat (ABC3H) to Santa Barbara had the highest estimated risk for collisions and mortalities for both humpback and fin whales of any route. After the ABC3H unit to Santa Barbara route, the Santa Ynez Unit to Goleta route predicted the highest risk of collisions and mortalities for humpback whales, although it has relatively few transits compared to other routes. By contrast, after the ABC3H unit to Santa Barbara route, several routes had comparable estimates of collision and mortality risk for fin whales. For blue whales, the Beta Unit to Long Beach route had the highest risk for collisions and mortalities of any route, reflecting that it also had the most transits of any route and is in an area of higher blue whale use.

Model Constraints, Caveats, and Considerations

Although we used the best available information (i.e., parameter values, modeled relationships) based on the scientific literature, the modeling results should only be viewed in the context of real world responses and data limitations, and does not represent known or precisely anticipated levels of vessel collisions. These values are best utilized as a framework for analyzing the potential scope and likelihood of proposed action impacts, and which actions may avoid or minimize the risk of vessel collisions to ESA-listed whales.

There are a number of assumptions inherent in this modeling approach. In addition to some simplifying assumptions described above based on the information provided, several parameter values are averages or constants that don't capture the variability in natural and environmental characteristics that would also create variability in risk estimates. This is a common limitation in environmental modeling. As discussed above, avoidance behaviors by large whales are not well understood. Garrison et al. (2022) incorporate a "reaction distance" at which a North Atlantic right whale initiates an avoidance response to an approaching vessel. A reaction distance is not readily available for blue, fin, and humpback whales. Additionally, we were not able to include stochastic behavioral responses for how fast and far away a whale would swim if an avoidance behavior was initiated in response to an approaching vessel. Because of these limitations, the strike risk model may be underestimating the probability that a whale successfully avoids a collision. The model may also be overestimating the collision rate by using a generalized proportion of time that the large whales are within the strike depth. The model is not capable of adjusting collision rates based on the behavior of large whales, such as foraging or traveling, at the time a vessel is approaching. It is possible that individuals may react differently to vessel approaches based on the behavior state that they are in.

In addition, the model currently does not capture potential changes in speed throughout a transit, or evasive maneuvers that vessel captains may take to avoid collisions with whales. BOEM states that all project-related crews are provided the approved POCSR operations training program which includes information on marine mammal species that may be present in the action area. Captains may also be aware of voluntary speed reductions issued by the USCG and NOAA during periods of high vessel collision risk, but may choose to not participate. Ultimately the WCR vessel collision risk model does not incorporate any of these voluntary strike risk minimization measures with respect to analyzing crew and supply vessel trips. We acknowledge that well conductor removal activities do incorporate vessel speed mitigation measures. If vessel speed measures were considered for incorporation into other vessel activities such as crew or supply vessels, this could be assessed through the WCR vessel collision risk model. As discussed earlier in this section, because information was only provided for the traffic associated with supply and crew vessels, the model does not explore the total risk of collision associated with the proposed action from other vessel types. The model may also be underestimating the risk associated with nighttime operations, although these are assumed to represent a very small proportion of the O&G related transits.

This approach also does not capture how changing ocean conditions may result in changes in those parameters from year to year, although the underlying density models represent the average of variable conditions over multiple decades. As discussed above, the best available density data is an average distribution of the three species for the summer/fall survey months. It does not provide estimated densities for large whales during the winter/spring months when they are likely to still be present, but in lower densities. Therefore our approach, which uses estimates from the summer/fall months to represent annual collision and mortality rates, very likely underestimates annual rates by omitting the months of lower densities when collisions are still possible but far less likely. Additionally, it does not account for any range shifts that these large whale species may experience in response to interannual variability in food resources or long-term impacts of climate change. The Becker et al. (2020a) whale density data does include the years 2014-2016 when there was a marine heatwave along in the Eastern North Pacific Ocean. This marine heatwave has been linked to changes in humpback whale distributions, moving larger proportions of whales into the nearshore area (Santora et al. 2020). While the years with this type of distribution change are included in the average, the model is not able to isolate what the vessel strike risk would be in similar marine event type years that may increase the overlap of whales, especially humpback whales, with the O&G vessel traffic.

These assumptions and limitations are important, as they generally define the boundaries of the scope and application of this modeling approach. However, in completing this quantitative analysis of risk, we have applied the best scientific and commercial information about risks of vessel collisions that is available and has been provided as part of this consultation.

Interpretation, including consideration of timeframe of action and key considerations of analysis

We are cautious in our interpretation of the results from modeling vessel collision risk within the bounds of the uncertainties and limitations of the information and assumptions used to generate these calculations for O&G vessel activity. As discussed in detail above, we know the model does not incorporate all vessel traffic from all project activities (only supply and crew transits), and doesn't capture all risk associated with winter/spring seasons and nighttime operations accurately. We also are uncertain about the ratio of supply and crew vessel traffic, and how vessel traffic might change over time as operations trend toward diminishing production, heading toward decommissioning. Perhaps most importantly, there is uncertainty within the modeling framework itself as there is convincing evidence that the risk of collisions is overestimated by this and similar approaches in the literature as avoidance behavior and capabilities may be greater than what is currently predicted in this framework. As a result, we do not treat these model results as an explicit estimate of the number of collisions and mortalities expected to occur for these species each year during this proposed action, or for use in generating anticipated levels of take. But the model results do provide the basis for several key inferences and conclusions that help us understand the scope and likelihood of risks of vessel collisions from the proposed action and what we can expect to happen in the future.

The results from the models suggests that magnitude of vessel activity and extent of its overlap with high densities of several whale species for extended periods of time during a year creates a non-negligible risk of vessel collisions and resulting mortalities for those species. This level of risk is further extended in association with the long-term continuation of the proposed activities given the best available information on the vessels, their movements, and the species in the action area. This risk is going to be present annually for at least the next 20 years, while not necessarily at the same level or extent as vessel activity should decrease as operations move toward decommissioning stages.

The results also provide clear indication that certain types of vessel activities present greater risks based on key characteristics of their operations. The model suggests that supply vessel trips present a higher level of risk than crew vessel trips. Although we don't have precise information on the ratio of crew versus supply vessel activity to expect, we find it reasonable to assume that crew vessel trips are at least as or more frequent than supply trips based on our general understanding of O&G operations and the descriptions of vessel activity provided in BOEM's BA. Gauging the boundaries of the model results accordingly, we infer that the level of risk calculated does not predict that there are/would be strikes of each species every year, or that strikes of any species would necessarily occur each year, given the fractional values less than one represented within the boundaries of the model results and known sources of uncertainty. Ultimately, however, we do think the models support the assertion that some vessel collisions and mortalities for each of these species (humpback whale, blue whale, fin whale) should be anticipated over the course of this proposed action, especially given the duration of continued project activities. Although mortality is not a certain outcome from all vessel collisions based on the information we have reviewed in this Opinion, we consider that mortality is a possible outcome from any collision involving O&G traffic.

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