National Marine Fisheries Service

West Coast Region



Final Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal Waters off of Southern California

Final

Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal Waters off of Southern California

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COVER SHEET

Title of Proposed Action:	Final Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal waters off of Southern California
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Abstract: The National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NOAA Fisheries) West Coast Region has developed a programmatic environmental impact statement (PEIS), in accordance with the National Environmental Policy Act (NEPA), that analyzes the potential impacts to the human environment that could result from identifying Aquaculture Opportunity Areas (AOAs) in Federal waters in the Southern California Bight (SCB) and evaluates the impacts of siting aquaculture in those locations. The intent of this PEIS is to support long-term planning for offshore aquaculture. This PEIS considers a long-term planning effort that is not a regulatory or permitting action and does not propose to authorize or permit any specific aquaculture-related activities or propose to approve any individual aquaculture projects.

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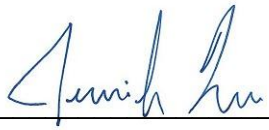
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Page and Time Limit Certification
Programmatic Environmental Impact Statement for the identification of Aquaculture Opportunity Areas in U.S. Federal Waters off of Southern California

NOAA has considered the factors mandated by NEPA; this EIS represents NOAA's good-faith effort to prioritize documentation of the most important considerations required by the statute within the congressionally mandated page limits; this prioritization reflects NOAA's expert judgment; and any considerations addressed briefly or left unaddressed were, in NOAA's judgment, comparatively unimportant or frivolous.

This EIS represents NOAA's good-faith effort to fulfill NEPA's requirements within the congressionally mandated timeline; the effort is substantially complete; in NOAA's expert opinion, it has thoroughly considered the factors mandated by NEPA; and in NOAA's judgment, the analysis contained in this EIS is adequate to inform and reasonably explain NOAA's final decision regarding the proposed action.



Jennifer Quan
Regional Administrator
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List of Acronyms and Abbreviations

AB	Assembly Bill
AIS	Automated Identification Systems
AOA	Aquaculture Opportunity Area
ASBS	Areas of Special Biological Significance
BES	Baseline Environmental Survey
BGA	Biogeographic Assessment
BIA	Biologically Important Area
BOEM	Bureau of Ocean Energy Management
BSEE	Bureau of Safety and Environmental Enforcement
CA	State of California
CAA	Clean Air Act
CAAP	Concentrated Aquatic Animal Production
CCC	California Coastal Commission
CCE	California Current Ecosystem
CDC	Centers for Disease Control and Prevention
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CFGC	California Fish and Game Commission
CFR	Code of Federal Regulations
chl	chlorophyl
CPFV	Commercial Passenger Fishing Vessel
CPS	Coastal Pelagic Species
CPUE	Catch Per Unit Effort
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Program
DDT	Dichlorodiphenyltrichloroethane
DHS	Department of Homeland Security
DO	Dissolved Oxygen
DOC	Department of Commerce
DOD	Department of Defense
DOT	Department of Transportation
DPH	Department of Public Health
EAA	Ecosystem Approach to Aquaculture
EFH	Essential Fish Habitat
e.g.	for example
EIS	Environmental Impact Statement
E.O.	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAD	Fish aggregating device
FDA	Food and Drug Administration
FEP	Fishery Ecosystem Plan (pursuant to MSA)
FGC	Fish and Game Code
FMC	Fishery Management Council
FMP	Fishery Management Plan (pursuant to MSA)
ft.	feet
FR	Federal Register

GDP	Gross Domestic Product
HAB	Harmful Algal Bloom
HACCP	Hazard Analysis Critical Control Point
HAPC	Habitat Areas of Particular Concern
HMS	Highly Migratory Species
HSP	Habitat Suitability Probability
IMTA	Integrated Multi-Trophic Aquaculture
ISSC	Interstate Shellfish Sanitation Conference
LA	Los Angeles
m	meter
M	million
MESC	Marine Exchange of Southern California
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSP	Marine Spatial Planning
NCCOS	National Centers for Coastal Ocean Science
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NISC	National Invasive Species Council
NMS	National Marine Sanctuary
NMFS	National Marine Fisheries Service
n.d.	no date
no.	number
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOS	National Ocean Service
NPDES	National Pollutant Discharge Elimination System
NSSP	National Shellfish Safety Program
OAQ	Office of Aquaculture
OCM	Office of Coastal Management
OCS	Outer Continental Shelf
OPAREA	[Military] Operating Area
OSTP	Office of Science and Technology Policy
p	page
pp	pages
PAHs	poly-aromatic hydrocarbons
PATON	private aids to navigation
PCBs	Polychlorinated Biphenyls
PEIS	Programmatic Environmental Impact Statement
PFMC	Pacific Fishery Management Council
POPs	Persistent organic pollutants
POTW	Publicly Owned Treatment Works
PRD	Protected Resources Division
PSMFC	Pacific States Marine Fisheries Commission
RFMO	Regional Fishery Management Organization
RHA	Rivers and Harbors Act
RMIS	Regional Mark Information System
RWQCB	Regional Water Quality Control Board
SAFE	Stock Assessments and Fishery Evaluation

SB	State Bill
SCB	Southern California Bight
SCC	Southern California Countercurrent (also known as the Davidson Current)
SERO	Southeast Regional Office
SHPO	State Historic Preservation Officer
SLC	State Lands Commission
SST	Sea surface temperature
SWFSC	Southwest Fisheries Science Center
U.S.	United States
U.S.C.	United States Code
USCG	United States Coast Guard
USACE	United States Army Corps of Engineers
VMS	Vessel Monitoring System
WCR	West Coast Region

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Executive Summary

A. Introduction

This Final Programmatic Environmental Impact Statement (FPEIS) analyzes the potential impacts to the human environment that could result from identifying Aquaculture Opportunity Areas, hereafter referred to as AOAs, in Federal waters in the Southern California Bight (SCB), and generally evaluates the impacts of siting aquaculture in those locations. An AOA is a defined geographic area that has been evaluated to determine its potential suitability for commercial aquaculture. The AOA options analyzed in this PEIS are based on information including a marine spatial planning process. They are between 500 and 2,000 acres, in accordance with the planning goals chosen in the spatial analysis, and may be suitable for all types of aquaculture. This spatial planning process considered administrative boundaries, national security (i.e., military operating areas), navigation and transportation, energy and industry infrastructure, commercial and recreational fishing, natural and cultural resources, and oceanography (i.e., non-living resources), to identify areas that have the highest potential to support three to five marine aquaculture operations and the least amount of conflict with other ocean uses (Morris et al 2021). The AOA options were developed using an evaluation of available spatial data within the SCB, feedback received during public scoping, as well as the best available science and literature on aquaculture and the region.

NOAA Fisheries (NMFS) prepared this PEIS to comply with the National Environmental Policy Act (NEPA)[1] and Executive Order (E.O.) 13921, *Promoting American Seafood Competitiveness and Economic Growth*. This PEIS will not result in the approval of any activities. NMFS developed this PEIS to identify AOAs and evaluate the impacts of siting aquaculture in those locations. This PEIS considers a long-term planning effort that is not a regulatory or permitting action and does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Project-specific NEPA analyses, consultations, and permits may be needed in the future. Future proposed aquaculture projects may tier from the PEIS if the lead agency determines the PEIS is appropriate for its needs.

B. Purpose and Need for the Proposed Action

The Federal action proposed in this PEIS is to identify one or more AOAs that may be suitable for multiple future offshore aquaculture projects in Federal waters of the SCB (outside of state waters within the U.S. Exclusive Economic Zone), and to evaluate the impacts of siting aquaculture in those locations. AOAs identified through this process could be considered potentially suitable for finfish, shellfish, macroalgae, or multi-species aquaculture. The proposed action is a long-term planning effort. It is not a regulatory or permitting action and does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. The analysis may be used to inform such processes for individual projects proposed later in time.

The purpose of the proposed action is to apply a science-based approach to identify AOAs in Federal waters. The goal of identifying AOAs is to promote American seafood competitiveness, food security, economic growth, and to support the development of domestic commercial aquaculture, consistent with

[1] NOAA's compliance with agency obligations arising under the National Environmental Policy Act of 1969 (42 U.S.C. §§ 4321–4347) is guided by the NOAA Administrative Order (NAO) 216-6A, and the Companion Manual to the NAO entitled "Policy and Procedures for Compliance with the National Environmental Policy Act and Related Authorities." Because this NEPA review began on May 3, 2022, the DPEIS relied on CEQ's Phase 1 NEPA regulations, which were in effect at the time and codified at 40 C.F.R. Parts 1500-1508. After the publication of the DPEIS, CEQ rescinded its NEPA regulations, effective April 11, 2025. 90 FR 10610 (Feb. 25, 2025). To prevent delay and prioritize efficiency and certainty, this specific NEPA review continues to include elements previously required by the CEQ NEPA provisions. Doing so will help ensure appropriate consideration is given to environmental, economic, and technical considerations during its decision making process, in accordance with 42 U.S.C. § 4332(2)(B).

sustaining and conserving marine resources and applicable laws, regulations and policies. The proposed action is needed to meet the directives of E.O. 13921 to address the increasing demand for seafood, facilitate long-term planning for marine aquaculture development, and address interests and concerns regarding offshore marine aquaculture siting.

C. Public Involvement

NMFS consulted and coordinated with multiple Federal agencies and the Pacific Fishery Management Council, and coordinated with State government and tribal governments throughout development of the EIS. Following the publication of E.O. 13921 on May 7, 2020, NMFS began a public outreach effort that included stakeholder engagement, video and print informational products, and soliciting input from stakeholders, including the commercial and recreational fishing communities, academia, non-governmental organizations (NGOs), the general public, and coastal and ocean managers. Part of the initial public outreach effort included publication of a Request for Information (RFI) in the Federal Register (85 FR 67519, Oct. 23, 2020). The RFI solicited public input to help identify data needs, data sources, and project requirements for offshore aquaculture. At the same time, the National Center for Coastal Ocean Science (NCCOS) worked with the NMFS regional offices in Southern California to collect data for a spatial modeling analysis for the region. The work by NCCOS was published as a peer-reviewed technical memorandum entitled, "An Aquaculture Opportunity Area Atlas for the Southern California Bight," hereafter referred to as "the Atlas" (Morris et al. 2021).

NMFS used the results in the Atlas, along with public input gathered through the RFI, to develop the Notice of Intent (NOI) for the PEIS. NMFS published an NOI on May 23, 2022 to initiate the NEPA process. The NOI included prompts to gather input from the public for the PEIS. Public comments for the Southern California AOA PEIS were accepted from May 23, 2022 to July 22, 2022 (60 days). Two webinar-based public listening sessions were held during scoping, in which comments could be submitted orally. A public scoping report was published that summarizes the process, participants, and the themes of scoping comments (NMFS 2023a). NOAA Fisheries announced public scoping through a variety of internet media, and also through direct outreach to members of the interested public. NOAA Fisheries reached out to tribal governments in the Southern California region to inform them about the AOA PEIS process and invited them to participate in the AOA planning process.

The Draft PEIS (DPEIS) was released to the public on November 15, 2024 (89 FR 92681). NOAA Fisheries undertook an extensive public engaging process including media engagement, email notifications, and digital and social media. NMFS took public comment on the DPEIS for 90 days, until February 20, 2025. Written submissions were accepted during the public comment period via the federal docket, by hard copy mail and email. NOAA Fisheries held two virtual public meetings via Webex to provide an overview on the PEIS and solicit verbal comments.

The FPEIS reflects consideration of public comments made on the DPEIS during the public comment period. Appendix 6 (Response to Public Comments) describes the public's participation and includes a list of the agencies and private entities that commented on the DPEIS and a comment matrix with NMFS' responses associated with the comments received. Appendix 7 (Public Comments) contains the full text of all comments received.

D. Alternatives

NMFS considered a reasonable range of alternatives during the PEIS development process that were identified through coordination with cooperating and participating agencies and through public comments received during the public scoping period for the PEIS. The PEIS evaluates the No Action Alternative and three action alternatives, each with sub-alternatives. Alternatives considered but dismissed from detailed analysis and the rationale for their dismissal are described in Chapter 2, Section B. Identification of AOAs and alternatives considered here that analyze potential impacts as a result of specific types of aquaculture

would not prohibit any type of aquaculture by identifying an AOA. Identifying AOAs does not create legal boundaries or restrict activities. NMFS has selected a preferred alternative.

The alternatives are as follows:

i. Alternative 1: No Action Alternative

In the No Action Alternative, NMFS would not identify any AOA in Federal waters offshore of Southern California, including not identifying any sub-alternatives. Aquaculture projects could still be sited in Federal waters of the SCB.

ii. Alternative 2: Santa Barbara Channel

NMFS would identify one or more AOAs within Federal waters offshore of Santa Barbara and Ventura Counties in the Santa Barbara Channel. The eight AOA options are located between 10.02 and 19.72 kilometers (5.41 and 10.65 nautical miles) offshore (Figure 1). Each area ranges from 1,500 to 2,000 acres (607 to 809 ha); the total combined acreage is 15,000 acres (6,070 ha), or 60.7 km^2 (23.4 mi^2).

- Sub-alternative 2a: macroalgae and shellfish aquaculture only
- Sub-alternative 2b: all types of commercial aquaculture

iii. Alternative 3: Santa Monica Channel

NMFS would identify one or more AOAs within Federal waters offshore of Los Angeles County in Santa Monica Bay. The two AOA options are located between 8.06 and 8.82 kilometers (4.35 and 4.76 nautical miles) offshore (Figure 2). The areas are 500 and 1,000 acres (202 and 405 ha); the combined total acreage is 1,500 acres (607 ha), or 6.1 km^2 (2.4 mi^2).

- Sub-alternative 3a: shellfish and macroalgae aquaculture only
- Sub-alternative 3b: all types of commercial aquaculture

iv. Alternative 4: Combination of Geographic Areas

NMFS would identify AOA(s) from within the boundaries of either Alternative area, up to a maximum area to be determined by NMFS with input from the public. The total 10 AOA options are depicted in (Figure 3).

- Sub-alternative 4a: shellfish and macroalgae Aquaculture only
- Sub-alternative 4b: all types of commercial Aquaculture (**Preferred Alternative**)

E. Environmental Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here to inform our assessment of the alternatives described above. The analysis may be used to inform such processes for individual projects proposed later in time. Any future aquaculture projects within AOAs would be separate in time from this PEIS.

Resource areas analyzed include the administrative environment, oceanography and climate, marine managed areas and special resource areas, seafloor characteristics, water quality, air quality and aesthetics, acoustic environment, federally-protected species and habitat, wild fish stocks, ecologically-important marine communities, potentially-farmed species, commercial fishing, recreational fishing, markets and regional food systems, ports and working waterfronts, tourism and other recreation, transportation and navigation, offshore energy and public services, public health and safety, tribal resources and cultural practices, non-tribal cultural and traditional practices, and archaeological resources. Table ES-1 provides a comparison of the potential environmental impacts reflected in Alternative 1, Alternative 2 (2a and 2b), Alternative 3 (3a and 3b) and Alternative 4 (4a and 4b) from the identification

of AOAs and potential impacts associated with future aquaculture operations that may be sited in an AOA. Aquaculture projects could still be sited in Federal waters of the SCB under Alternative 1. With the exception of the resource category of administrative environment, the summarized potential impacts are associated with future aquaculture operations that may be sited in an AOA as the action of identifying an AOA has no impacts on those other resource categories.

Table ES-1: Summary and Comparison of Potential Impacts among Alternatives

Resource Category	Summary and Comparison of Potential Impacts
Administrative Environment	Alternative 1 This alternative would likely provide the least amount of benefits to the administrative environment compared to other alternatives.
	Alternatives 2-4 Potential beneficial effect to permitting and environmental review processes.
Oceanography and Climate	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential adverse effects by disrupting hydrodynamic processes.
	Alternative 2b Potential adverse effects as discussed in Alternative 2a.
	Alternative 3a Potential adverse effects by disrupting hydrodynamic processes. Impacts to hydrodynamic processes may be lessened compared to Alternative 2 due to the smaller size and deeper depths.
	Alternative 3b Potential adverse effects as discussed in Alternative 3a.
	Alternative 4a Potential adverse effects as discussed in Alternatives 2-3. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.
	Alternative 4b Potential adverse effects as discussed in Alternative 4a.
Marine Managed Areas and Special Resource Areas	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Possible adverse or beneficial effects on marine resources connectivity due to new areas of wildlife aggregations and related sink-source dynamic effects or due to changes in hydrodynamic processes.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 2b Possible adverse effects on water quality within marine managed areas. Possible adverse or beneficial effects on marine resources connectivity due to Effects from new areas for wildlife aggregations or changes in hydrodynamic processes.
	Alternative 3a Possible adverse or beneficial effects on marine resources connectivity due to New areas for wildlife aggregations or changes in hydrodynamic processes. Potential for impacts is reduced compared to Alternative 2, due to distance from managed areas.
	Alternative 3b Possible adverse effects on water quality within marine managed areas. Possible adverse or beneficial effects on marine resources connectivity due to New areas for wildlife aggregations or changes in hydrodynamic processes. Potential for impacts is reduced compared to Alternative 2, due to distance from managed areas.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternative 4a.
Seafloor Characteristics	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential adverse effects due to physical damage could occur from, anchoring, scouring, fuel or chemical leak or changes in hydrodynamic processes.
	Alternative 2b Potential adverse effects due to physical damage could occur from anchoring, scouring, fuel or chemical leak or changes in hydrodynamic processes. Sediment enrichment could alter benthic communities.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 3a Potential adverse effects due to physical damage could occur from anchoring, scouring, fuel or chemical leak or changes in hydrodynamic processes. Mapped hard-bottom is relatively closer to the Alternative 3 area than Alternative 2, which could indicate higher potential for hard bottom to occur within an AOA.
	Alternative 3b Potential adverse effects due to physical damage could occur from anchoring, scouring, fuel or chemical leak or changes in hydrodynamic processes. Sediment enrichment could alter benthic communities. Sediment quality in and around Alternative 3 has higher historic impacts relative to Alternative 2. Mapped hard-bottom is relatively closer to the Alternative 3 area than Alternative 2, which could indicate higher potential for hard bottom to occur within an AOA.
	Alternative 4a Potential adverse effects as discussed in Alternatives 2a-3a. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.
	Alternative 4b Potential adverse effects as discussed in Alternatives 4a.
Water Quality	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential adverse effects due to accidental spills or leaching of hazardous materials or generation of marine debris, turbidity, or nutrient deficits if carrying capacity of the area is exceeded. Potential beneficial effects of farmed species taking up nutrients, organic matter and other particulates.
	Alternative 2b Potential adverse effects due to excess organic enrichment, accidental spills or leaching of hazardous materials or generation of marine debris, turbidity.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 3a Potential adverse effects due to accidental spills or leaching of hazardous materials or generation of marine debris, turbidity, or nutrient deficits if carrying capacity of the area is exceeded. Potential beneficial effects of farmed species taking up nutrients, organic matter and other particulates; potential improvements in water quality may serve more of an ecosystem service in Alternative 3 compared to Alternative 2, because of the historic and existing water quality concerns in the area.
	Alternative 3b Potential adverse effects due to excess organic enrichment, accidental spills or leaching of hazardous materials or generation of marine debris, turbidity. Potential beneficial effects of farmed species taking up nutrients, organic matter and other particulates; potential improvements in water quality may serve more of an ecosystem service in Alternative 3 compared to Alternative 2, because of the historic and existing water quality concerns in the area. A combination of different types of facilities could mitigate some nutrient related impacts, effectively serving as an IMTA type of system.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Theoretically, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified, however, it is unlikely potential adverse water quality impacts would be much different than Alternatives 2 and 3 given the low probability that future aquaculture projects would discharge large quantities and concentrations of water pollutants if they are sited and operated appropriately.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternatives 4a
Air Quality and Aesthetics	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential adverse effects due to operational emissions of air pollutants and night lighting. Potential beneficial effects of carbon sequestration. Alternative 2 is closer than Alternative 3 to existing offshore infrastructure, which may create a cumulative impact for light and glare.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 2b Potential adverse effects due to operational emissions of air pollutants and night lighting. Emissions per facility will be higher compared to shellfish and macroalgae operations. Alternative 2 is closer than Alternative 3 to existing offshore infrastructure, which may create a cumulative impact for light and glare.
	Alternative 3a Potential adverse effects due to operational emissions or air pollutants and night lighting. Potential beneficial effects of carbon sequestration. Emissions per trip in Alternative 3 may be lower than Alternative 2 given distance to shore, and emissions in total may be lower due to lower number of total facilities with potential to be sited given the smaller acreage.
	Alternative 3b Potential adverse effects due to operational emissions of air pollutants and night lighting. Emissions per facility will be higher compared to shellfish and macroalgae operations. Emissions per trip will be lower than Alternative 2 given distance to shore and emissions in total may be lower due to lower number of total facilities with potential to be sited.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Theoretically, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified, however it unlikely potential air impacts or aesthetics would be much different than Alternatives 2 and 3 given the low probability that future aquaculture projects would emit large quantities and concentrations of pollutants.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternative 4a.
Acoustic Environment	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential adverse effects to baseline soundscape due to generation of in-air and in-water noise. Alternative 2 is closer than Alternative 3 to existing offshore infrastructure, which may create a cumulative impact for noise.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 2b Potential adverse effects to baseline soundscape due to generation of in-air and in-water noise. Finfish aquaculture operations require additional vessel trips or vessels for feeding purposes or the addition of automated feeders that could generate more noise compared to shellfish and macroalgae only aquaculture. Alternative 2 is closer than Alternative 3 to existing offshore infrastructure, which may create a cumulative impact for noise.
	Alternative 3a Potential adverse effects to baseline soundscape due to generation of in-air and in-water noise. Baseline noise levels are relatively lower and the total number of potential facilities and footprint that may generate noise is lower compared to Alternative 2. Facilities in Alternative 3 may be less impactful on the overall acoustic environment, but may represent a larger proportional change relative to baseline.
	Alternative 3b Potential adverse effects to baseline soundscape due to generation of in-air and in-water noise. Finfish aquaculture operations could require additional vessel trips or vessels for feeding purposes or the addition of automated feeders that could generate more noise compared to shellfish and macroalgae only aquaculture. Baseline noise levels are relatively lower and the total number of potential facilities and footprint that may generate noise is lower compared to Alternative 2. Facilities in Alternative 3 may be less impactful on the overall acoustic environment, but may represent a larger proportional change relative to baseline.
	Alternative 4a Potential adverse effects as discussed in Alternatives 2-3. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified. Given the baseline condition in Southern CA, it is unlikely that aquaculture development would cause appreciable noise impacts.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternative 4a.
Federally-Protected Species and Habitat	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 2a Potential adverse effects due to entanglement, marine debris, vessel strike/human interaction, and noise/light pollution associated with fixed gear and other equipment placed in the water column, surface or bottom, and increased vessel/human activity. Adverse effects could include death, injury, displacement, and reduction in fitness or behavioral change. Effects from new areas for wildlife aggregations and changes in habitat characteristics and habitat use may be beneficial and/or adverse, potential beneficial effects include reproductive opportunity and opportunity to feed, shelter, shade. Changes in water quality may increase risk of disease. Longline aquaculture would have less of an aggregating effect than finfish aquaculture, but has a greater risk of entanglement. There is high potential aquaculture facilities in Alternative 2 would have geographic overlap with breeding, feeding, migrating areas for listed species, but the total amount of habitat overlap that could occur would be about 1.2% of the total habitat in Federal waters of the SCB, and less than one-tenth of a percent of the total area of the SCB. N1-C and N1-D are the only AOA options without nearby mapped coral and hard bottom.
	Alternative 2b Potential adverse effects due to entanglement, marine debris, vessel strike/human interaction, and noise/light pollution associated with fixed gear and other equipment placed in the water column, surface or bottom, and increased vessel/human activity. Adverse effects could include death, injury, displacement, and reduction in fitness or behavioral change. New areas for wildlife aggregations and changes in habitat characteristics and habitat use may be beneficial and/or adverse, potential beneficial effects include reproductive opportunity and opportunity to feed, shelter, shade. New areas for wildlife aggregations are more pronounced around finfish facilities than around other types of aquaculture. Changes in water quality may increase risk of disease.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 3a Potential adverse effects due to entanglement, marine debris, vessel strike/human interaction, and noise/light pollution associated with fixed gear and other equipment placed in the water column, surface and bottom, and increased vessel/human activity. Adverse effects could include death, injury, displacement, and reduction in fitness or behavioral change. New areas for wildlife aggregations and changes in habitat characteristics and habitat use may be beneficial and/or adverse, potential beneficial effects include reproductive opportunity and opportunity to feed, shelter, shade. Changes in water quality may increase risk of disease. There is high potential aquaculture facilities in an AOA within Alternative 3 would have geographic overlap with breeding, feeding, migrating areas for listed species, but the overlap and potential impact would be less than Alternative 2. Both AOA options within Alternative 3 are within close proximity to mapped coral and hard-bottom habitat. Longline aquaculture would have less of an aggregating effect than finfish aquaculture, but has a greater risk of entanglement.
	Alternative 3b Potential adverse effects due to entanglement, marine debris, vessel strike/human interaction, and noise/light pollution associated with fixed gear and other equipment in the water column, surface and bottom, and increased vessel/human activity. Adverse effects could include death, injury, displacement, and reduction in fitness or behavioral change. New areas for wildlife aggregations and changes in habitat characteristics and habitat use may be beneficial and/or adverse, potential beneficial effects include reproductive opportunity and opportunity to feed, shelter, shade. Changes in water quality may increase risk of disease. New areas for wildlife aggregations are more pronounced around finfish facilities than around other types of aquaculture.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. Identifying AOAs across a larger geographic area may increase the risk of interactions more because the impacts are dispersed over a higher range of protected species stocks. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternative 4a.
Wild Fish Stocks	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 2a Potential adverse effects due to marine debris, entanglement, human interaction, and noise/light pollution associated with fixed gear and other equipment in the water column/surface and increased vessel/human activity. Adverse effects could include death, injury, displacement, and reduction in fitness or behavioral change. Potential new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse; potential beneficial effects include potential improvements in water quality, increased structural complexity, productivity and connectivity of the pelagic environment, reproductive opportunity and opportunity to feed, shelter, shade, while potential adverse effects from new areas for wildlife aggregations include increased risk of entanglement, predation, targeted fishing, and exposure to other risks like disease. Longline aquaculture would have less of an aggregating effect than finfish aquaculture.
	Alternative 2b Potential adverse effects due to escapes, the use of antibiotics and other husbandry materials/therapeutics, marine debris, entanglement, disease, human interaction, and noise/light pollution associated with fixed gear and other equipment/target species in the water column/surface, increased vessel/human activity. Adverse effects could include death, injury, displacement, and reduction in fitness or behavioral change. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse; potential beneficial effects include increased structural complexity, productivity and connectivity of the pelagic environment, reproductive opportunity and opportunity to feed, shelter, shade, while potential adverse effects from new areas for wildlife aggregations include increased risk of entanglement, predation, targeted fishing, and exposure to other risks like disease. Adverse effects in water quality and new areas for wildlife aggregations may be higher in finfish aquaculture compared to shellfish/macroalgae.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 3a Potential adverse effects due to marine debris, entanglement, human interaction, and noise/light pollution associated with fixed gear and other equipment in the water column/surface and increased vessel/human activity. Adverse effects could include death, injury, displacement, and reduction in fitness or behavioral change. Potential Effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse; potential beneficial effects include potential improvements in water quality, increased structural complexity, productivity and connectivity of the pelagic environment, reproductive opportunity and opportunity to feed, shelter, shade, while potential adverse effects from new areas for wildlife aggregations include increased risk of entanglement, predation, targeted fishing, and exposure to other risks like disease. Longline aquaculture would have less of an aggregating effect than finfish aquaculture. Potential improvements in water quality may have more of a beneficial effect on wild fish stocks in Alternative 3 because the existing water quality is worse compared to Alternative 2.
	Alternative 3b Potential adverse effects due to escapes, the use of antibiotics and other husbandry materials/therapeutics, marine debris, entanglement, disease, human interaction, and noise/light pollution associated with fixed gear and other equipment/target species in the water column/surface, increased vessel/human activity. Adverse effects could include death, injury, displacement, and reduction in fitness or behavioral change. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse; potential beneficial effects include increased structural complexity, productivity and connectivity of the pelagic environment, reproductive opportunity and opportunity to feed, shelter, shade, while potential adverse effects from new areas for wildlife aggregations include increased risk of entanglement, predation, targeted fishing, and exposure to other risks like disease. Adverse effects in water quality and New areas for wildlife aggregations may be higher in finfish aquaculture compared to shellfish/macroalgae, but may be smaller compared to Alternative 2 given smaller number of potential facilities to be sited. Effects from new areas for wildlife aggregations are more pronounced around finfish facilities than around other types of aquaculture.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternative 4a.
Ecologically-Important Marine Communities	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential adverse effects due to escapes, disease, marine debris, entanglement, human interaction, and noise/light pollution associated with fixed gear and other equipment/target species in the water column/surface and increased vessel/human activity. Adverse effects could include death, injury, displacement, and reduction in fitness or behavioral change. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse; potential beneficial effects include potential improvements in water quality, increased structural complexity, productivity and connectivity of the pelagic environment, reproductive opportunity and opportunity to feed, shelter, shade, while potential adverse effects from new areas for wildlife aggregations include increased risk of entanglement, predation, targeted fishing, and exposure to other risks like disease. Longline aquaculture would have less of an aggregating effect than finfish aquaculture. Macroalgae farming could represent a large percent increase in the amount of comparable habitat in the SCB, enabling adverse impacts to fouling invertebrate and fish communities that will use facilities as habitat.
	Alternative 2b Potential adverse effects due to escapes, disease, marine debris, entanglement, human interaction, and noise/light pollution associated with fixed gear and other equipment/target species in the water column/surface and increased vessel/human activity. Adverse effects could include death, injury, displacement, and reduction in fitness or behavioral change. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse; potential beneficial effects include increased structural complexity, productivity and connectivity of the pelagic environment, reproductive opportunity and opportunity to feed, shelter, shade, while potential adverse effects from new areas for wildlife aggregations include increased risk of entanglement, predation, targeted fishing, and exposure to other risks like disease. New areas for wildlife aggregations are more pronounced around finfish facilities than around other types of aquaculture.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 3a Potential adverse effects due to escapes, disease, marine debris, entanglement, human interaction, and noise/light pollution associated with fixed gear and other equipment/target species in the water column/surface and increased vessel/human activity. Adverse effects could include death, injury, displacement, and reduction in fitness or behavioral change. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse; potential beneficial effects include potential improvements in water quality, increased structural complexity, productivity and connectivity of the pelagic environment, reproductive opportunity and opportunity to feed, shelter, shade, while potential adverse effects from new areas for wildlife aggregations include increased risk of entanglement, predation, targeted fishing, and exposure to other risks like disease. Longline aquaculture would have less of an aggregating effect than finfish aquaculture. Macroalgae farming could represent a large percent increase in the amount of comparable habitat in the SCB, enabling adverse impacts to fouling invertebrate and fish communities that will use facilities as habitat.
	Alternative 3b Potential adverse effects due to escapes, disease, marine debris, entanglement, human interaction, and noise/light pollution associated with fixed gear and other equipment/target species in the water column/surface and increased vessel/human activity. Adverse effects could include death, injury, displacement, and reduction in fitness or behavioral change. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse; potential beneficial effects include increased structural complexity, productivity and connectivity of the pelagic environment, reproductive opportunity and opportunity to feed, shelter, shade, while potential adverse effects from new areas for wildlife aggregations include increased risk of entanglement, predation, targeted fishing, and exposure to other risks like disease. New areas for wildlife aggregations are more pronounced around finfish facilities than around other types of aquaculture.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternative 4a.

Resource Category	Summary and Comparison of Potential Impacts
Potentially-Farmed Species	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potentially adverse and beneficial effects on potentially farmed species due to the use of native versus naturalized species, the use of genetically-modified stock in cultivated organisms, the use of antibiotics and/or other husbandry materials, the translation and adoption of surveillance and eradication programs, biosecurity guidance, import controls, and emergency response and planning from land-based and coastal systems to the offshore space; and animal welfare in artificial containments.
	Alternative 2b Potentially adverse and beneficial effects on potentially farmed species due to the use of native versus naturalized species, the use of genetically-modified stock in cultivated organisms, the use of antibiotics and/or other husbandry materials, the translation and adoption of surveillance and eradication programs, biosecurity guidance, import controls, and emergency response and planning from land-based and coastal systems to the offshore space; and animal welfare in artificial containments.
	Alternative 3a Potentially adverse and beneficial effects on potentially farmed species due to the use of native versus naturalized species, the use of genetically-modified stock in cultivated organisms, the use of antibiotics and/or other husbandry materials, the translation and adoption of surveillance and eradication programs, biosecurity guidance, import controls, and emergency response and planning from land-based and coastal systems to the offshore space; and animal welfare in artificial containments.
	Alternative 3b Potentially adverse and beneficial effects on potentially farmed species due to the use of native versus naturalized species, the use of genetically-modified stock in cultivated organisms, the use of antibiotics and/or other husbandry materials, the translation and adoption of surveillance and eradication programs, biosecurity guidance, import controls, and emergency response and planning from land-based and coastal systems to the offshore space; and animal welfare in artificial containments.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternative 4a.
Commercial Fishing	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential adverse effects due to displacement or disruption of commercial fishing associated with fixed gear and other equipment placement in the water column, surface and bottom, marine debris, increased vessel traffic in and out of coastal areas. Certain vessels could be excluded completely due to new operation costs. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse. Potential benefit to commercial fishery employees participating in offshore aquaculture operations through diversification of labor and revenue, while creating potential for resource competition between the industries.
	Alternative 2b Potential adverse effects due to displacement or disruption of commercial fishing associated with fixed gear and other equipment placement in the water column, surface and bottom, marine debris, increased vessel traffic in and out of coastal areas. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse. New areas for wildlife aggregations are more pronounced around finfish facilities than around other types of aquaculture. Potential benefit to commercial fishery employees participating in offshore aquaculture operations through diversification of labor and revenue, while creating potential for resource competition between the industries.
	Alternative 3a Potential adverse effects due to displacement or disruption of commercial fishing associated with fixed gear and other equipment placement in the water column, surface and bottom, marine debris, increased vessel traffic in and out of coastal areas. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse. Potential benefit to commercial fishery employees participating in offshore aquaculture operations through diversification of labor and revenue, while creating potential for resource competition between the industries. Minimal commercial fishing occurs in the Santa Monica Bay, so the impact is lower compared to Alternative 2. Within the bay, the impacts of finfish and non-finish options are similar.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 3b Potential adverse effects due to displacement or disruption of commercial fishing associated with fixed gear and other equipment placement in the water column, surface and bottom, marine debris, increased vessel traffic in and out of coastal areas. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse. New areas for wildlife aggregations are more pronounced around finfish facilities than around other types of aquaculture. Potential benefit to commercial fishery employees participating in offshore aquaculture operations through diversification of labor and revenue, while creating potential for resource competition between the industries. Minimal commercial fishing occurs in the Santa Monica Bay, so the impact is lower compared to Alternative 2. Within the bay, the impacts of finfish and non-finish options are similar.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternative 4a.
Recreational Fishing	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential adverse effects due to displacement or disruption of recreational fishing associated with fixed gear and other equipment placement in the water column, surface and bottom, marine debris, increased vessel traffic in and out of coastal areas. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse; recreational fishing opportunities may increase or improve when aquaculture activities act as new areas for wildlife aggregations.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 2b Potential adverse effects due to displacement or disruption of recreational fishing associated with fixed gear and other equipment placement in the water column and surface, marine debris, increased vessel traffic in and out of coastal areas. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse; recreational fishing opportunities may increase or improve when aquaculture activities act as new areas for wildlife aggregations. Aggregating effects are more pronounced around finfish facilities than around other types of aquaculture.
	Alternative 3a Potential adverse effects due to displacement or disruption of recreational fishing associated with fixed gear and other equipment placement in the water column and surface, marine debris, increased vessel traffic in and out of coastal areas. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse; recreational fishing opportunities may increase or improve when aquaculture activities act as new areas for wildlife aggregations. Aquaculture maybe more of a disruption in Alternative 3 compared to Alternative 2 because recreational fishers do not have existing competition for fishing grounds with commercial fishers due to existing regulatory closures, there are less artificial FADs already in the area, and depths in proposed areas of Alternative 3 may be more attractive to recreational fishers than Alternative 2. Beneficial effects from new areas for wildlife aggregations would be reduced compared to Alternative 2 due lower number of total facilities with potential to be sited.
	Alternative 3b Potential adverse effects due to displacement or disruption of recreational fishing associated with fixed gear and other equipment placement in the water column and surface, marine debris, increased vessel traffic in and out of coastal areas. Potential effects from new areas for wildlife aggregations, changes in habitat characteristics/habitat use, and the potential introduction of nonnative species may be beneficial and/or adverse; recreational fishing opportunities may increase or improve when aquaculture activities act as new areas for wildlife aggregations. Aggregating effects are more pronounced around finfish facilities than around other types of aquaculture, but beneficial Effects from new areas for wildlife aggregations would be reduced compared to Alternative 2 due lower number of total facilities with potential to be sited. Aquaculture may be more of a disruption in Alternative 3 compared to Alternative 2 because recreational fishers do not have existing competition for fishing grounds with commercial fishers due to existing regulatory closures, there are less artificial FADs already in the area, and depths in proposed areas may be more attractive to recreational fishers.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. Siting aquaculture in multiple Alternative areas may mitigate the advantage smaller, recreational vessels may gain over commercial fleets due to navigation safety and gear compatibility. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified**.**
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternatives 4a.
Markets and Regional Food Systems	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential beneficial and adverse effects due to introduction of new domestic products, increase in the supply of domestic products, new or increased interactions with wild-capture seafood products, new or increased interactions with existing interstate or international trade markets. The overall growth in a market may be considered an economic benefit, but local or regionally-scaled costs may occur simultaneously. Offshore aquaculture could adversely impact the current aquaculture and fisheries industries, which are made up of a small number of small businesses. High capital investment would likely be required for start-up, which may mean that large, established businesses (domestic or international) could have an advantage over local or regional stakeholders to benefit from the AOA planning process. Santa Barbara channel has existing interest, investment, infrastructure ready for aquaculture activities which may reduce conflicts.
	Alternative 2b Potential beneficial and adverse effects due to introduction of new domestic products, increase in the supply of domestic products, new or increased interactions with wild-capture seafood products, new or increased interactions with existing interstate or international trade markets. The overall growth in a market may be considered an economic benefit, but local or regionally-scaled costs may occur simultaneously. Offshore aquaculture could adversely impact the current aquaculture and fisheries industries, which are made up of a small number of small businesses. High capital investment would likely be required for start-up, which may mean that large, established businesses (domestic or international) could have an advantage over local or regional stakeholders to benefit from the AOA planning process. Santa Barbara channel has existing interest, investment, infrastructure ready for aquaculture activities which may reduce conflicts. Finfish offers more potential for competition at markets.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 3a Potential beneficial and adverse effects due to introduction of new domestic products, increase in the supply of domestic products, new or increased interactions with wild-capture seafood products, new or increased interactions with existing interstate or international trade markets. The overall growth in a market may be considered an economic benefit, but local or regionally-scaled costs may occur simultaneously. Offshore aquaculture could adversely impact the current aquaculture and fisheries industries, which are made up of a small number of small businesses. High capital investment would likely be required for start-up, which may mean that large, established businesses (domestic or international) could have an advantage over local or regional stakeholders to benefit from the AOA planning process.
	Alternative 3b Potential beneficial and adverse effects due to introduction of new domestic products, increase in the supply of domestic products, new or increased interactions with wild-capture seafood products, new or increased interactions with existing interstate or international trade markets. The overall growth in a market may be considered an economic benefit, but local or regionally-scaled costs may occur simultaneously. Offshore aquaculture could adversely impact the current aquaculture and fisheries industries, which are made up of a small number of small businesses. High capital investment would likely be required for start-up, which may mean that large, established businesses (domestic or international) could have an advantage over local or regional stakeholders to benefit from the AOA planning process. Finfish offers more potential for competition at markets.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOAs in both areas may distribute opportunities to more communities, which could reduce conflicts. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternatives 4a.
Ports and Working Waterfronts	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential beneficial and adverse effects due to increased vessel traffic in and out of coastal areas, increased vessel demand in and out of ports, harbors, and storage facilities, harvested product moving through coastal facilities, and the need for shore side industrial-use infrastructure (e.g. processing, storage).

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 2b Potential beneficial and adverse effects due to increased vessel traffic in and out of coastal areas, increased vessel demand in and out of ports, harbors, and storage facilities, harvested product moving through coastal facilities, and the need for shore side industrial-use infrastructure (e.g. processing, storage).
	Alternative 3a Potential beneficial and adverse effects due to increased vessel traffic in and out of coastal areas, increased vessel demand in and out of ports, harbors, and storage facilities, harvested product moving through coastal facilities, and the need for shore side industrial-use infrastructure (e.g. processing, storage).
	Alternative 3b Potential beneficial and adverse effects due to increased vessel traffic in and out of coastal areas, increased vessel demand in and out of ports, harbors, and storage facilities, harvested product moving through coastal facilities, and the need for shore side industrial-use infrastructure (e.g. processing, storage).
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOAs in both areas may distribute opportunities to more communities, which could reduce conflicts. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternatives 4a.
Tourism and Other Recreation	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential adverse effects due to displacement or disruption of the recreational experience associated with fixed gear and other equipment placement in the water column and surface, increased vessel traffic in and out of coastal areas, or changes in ecosystem services that support tourism and other recreational activities. Potential beneficial effect due to new areas where wildlife aggregations may occur.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 2b Potential adverse effects due to displacement or disruption of the recreational experience associated with fixed gear and other equipment placement in the water column and surface, increased vessel traffic in and out of coastal areas, or changes in ecosystem services that support tourism and other recreational activities. Potential beneficial effect due to new areas where wildlife aggregations may occur. There may be less seasonality and more frequent vessel operations associated with aquaculture operations targeting finfish that may displace or disrupt tourism and recreation compared to shellfish and macroalgae, but more effects from new areas for wildlife aggregations.
	Alternative 3a Potential adverse effects due to displacement or disruption of the recreational experience associated with fixed gear and other equipment placement in the water column and surface, increased vessel traffic in and out of coastal areas, or changes in ecosystem services that support tourism and other recreational activities. Potential beneficial effect due to new areas where wildlife aggregations may occur. Impacts to tourism and recreation may be reduced compared to Alternative 2 due to less existing recreational vessel traffic and lower number and smaller footprint of facilities that may be sited.
	Alternative 3b Potential adverse effects due to displacement or disruption of the recreational experience associated with fixed gear and other equipment placement in the water column and surface, increased vessel traffic in and out of coastal areas, or changes in ecosystem services that support tourism and other recreational activities. Potential beneficial effect due to new areas where wildlife aggregations may occur. There may be less seasonality and more frequent vessel operations associated with aquaculture operations targeting finfish that may displace or disrupt tourism and recreation compared to shellfish and macroalgae, but more effects from new areas for wildlife aggregations. Impacts to tourism and recreation may be reduced compared to Alternative 2 due to less existing recreational vessel traffic and lower number and smaller footprint of facilities that may be sited.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOAs in both areas may distribute opportunities to more communities, which could reduce conflicts. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternatives 4a.

Resource Category	Summary and Comparison of Potential Impacts
Transportation and Navigation	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential adverse effects due to introduction of new structures, obstructions, or hazards to navigation associated with fixed gear and other equipment in the water column/surface and disruption to established navigational patterns of marine vessels and increased vessel traffic volume, both offshore and near ports and harbors.
	Alternative 2b Potential adverse effects due to introduction of new structures, obstructions, or hazards to navigation associated with fixed gear and other equipment in the water column/surface and disruption to established navigational patterns of marine vessels and increased vessel traffic volume, both offshore and near ports and harbors. There may be less seasonality and more frequent vessel operations associated with aquaculture operations targeting finfish compared to shellfish and macroalgae.
	Alternative 3a Potential adverse effects due to introduction of new structures, obstructions, or hazards to navigation associated with fixed gear and other equipment in the water column/surface and disruption to established navigational patterns of marine vessels and increased vessel traffic volume, both offshore and near ports and harbors. Impacts may be reduced compared to Alternative 2 due to less existing vessel traffic, smaller number and size of facilities that could potentially be sited, and closer distance to shore.
	Alternative 3b Potential adverse effects due to introduction of new structures, obstructions, or hazards to navigation associated with fixed gear and other equipment in the water column/surface and disruption to established navigational patterns of marine vessels and increased vessel traffic volume, both offshore and near ports and harbors. There may be less seasonality and more frequent vessel operations associated with aquaculture operations targeting finfish compared to shellfish and macroalgae. Impacts may be reduced compared to Alternative 2 due to less existing vessel traffic, smaller number and size of facilities that could potentially be sited, and closer distance to shore.
	Alternative 4a Potential adverse effects as discussed in Alternatives 2-3. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternatives 4a.
Offshore Energy and Public Services	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Oil and gas operations, marine mineral operations, submarine utilities, and direct ocean-outfalls are not anticipated to be impacted by Alternatives 2 given the geographical distance to the structures and standard setbacks, however the growth of offshore aquaculture within an identified AOA could disrupt established navigational patterns of marine vessels and increase vessel traffic volume that may have indirect impacts on operations associated with on-going offshore activities. Alternative 2 overlaps with active BOEM lease blocks where leases could occur in the future.
	Alternative 2b Oil and gas operations, marine mineral operations, submarine utilities, and direct ocean-outfalls are not anticipated to be impacted by Alternatives 2 given the geographical distance to the structures and standard setbacks, however the growth of offshore aquaculture within an identified AOA could disrupt established navigational patterns of marine vessels and increase vessel traffic volume that may have indirect impacts on operations associated with on-going offshore activities. Alternative 2 overlaps with active BOEM lease blocks where leases could occur in the future.
	Alternative 3a Oil and gas operations, marine mineral operations, submarine utilities, and direct ocean-outfalls are not anticipated to be impacted by Alternatives 3 given the geographical distance to the structures and standard setbacks, however the growth of offshore aquaculture within an identified AOA could disrupt established navigational patterns of marine vessels and increase vessel traffic volume that may have indirect impacts on operations associated with on-going offshore activities.
	Alternative 3b Oil and gas operations, marine mineral operations, submarine utilities, and direct ocean-outfalls are not anticipated to be impacted by Alternatives 3 given the geographical distance to the structures and standard setbacks, however the growth of offshore aquaculture within an identified AOA could disrupt established navigational patterns of marine vessels and increase vessel traffic volume that may have indirect impacts on operations associated with on-going offshore activities.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternatives 4a.
Public Health and Safety	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential adverse effects due to fixed gear and other equipment in the water column and surface, more people working overwater in offshore environments, challenges for offshore monitoring and compliance, oversight and enforcement challenges for seafood safety oversight and changes to consumer trends and public health topics related to seafood. In addition to surface buoys or anchored lines that would be present for all types of aquaculture operations, growing vegetation/shellfish on longlines may create more hazards to navigation. Potential benefits if siting leads to a competitive domestic aquaculture industry, which may provide Americans' better access to affordable and nutritional protein options.
	Alternative 2b Potential adverse effects due to fixed gear and other equipment in the water column and surface, more people working overwater in offshore environments, challenges for offshore monitoring and compliance, oversight and enforcement challenges for seafood safety oversight and changes to consumer trends and public health topics related to seafood. In addition to surface buoys or anchored lines that would be present for all types of aquaculture operations, growing vegetation/shellfish on longlines may create more hazards to navigation. Finfish sub-alternatives have a higher aggregating effect, which is linked to potential higher risk of human/marine life interactions, concerns for worker safety. Finfish may require more engineering considerations for gear integrity due to dynamic loading of containment systems and feeding systems. Finfish raises public concerns about exposure pathways to chemicals of concern (husbandry materials and other therapeutents). Potential benefits if siting leads to a competitive domestic aquaculture industry, which may provide Americans' better access to affordable and nutritional protein options.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 3a Potential adverse effects due to fixed gear and other equipment in the water column and surface, more people working overwater in offshore environments, challenges for offshore monitoring and compliance, oversight and enforcement challenges for seafood safety oversight and changes to consumer trends and public health topics related to seafood. In addition to surface buoys or anchored lines that would be present for all types of aquaculture operations, growing vegetation/shellfish on longlines may create more hazards to navigation. In addition to surface buoys or anchored lines that would be present for all types of aquaculture operations, growing vegetation/shellfish on longlines could entangle vessels transiting through the area which could cause vessel damage and safety incidents. Santa Monica Bay often has seafood harvesting advisories in place, related to runoff from the greater LA area. Potential benefits if siting leads to a competitive domestic aquaculture industry, which may provide Americans' better access to affordable and nutritional protein options.
	Alternative 3b Potential adverse effects due to fixed gear and other equipment in the water column and surface, more people working overwater in offshore environments, challenges for offshore monitoring and compliance, oversight and enforcement challenges for seafood safety oversight and changes to consumer trends and public health topics related to seafood. In addition to surface buoys or anchored lines that would be present for all types of aquaculture operations, growing vegetation/shellfish on longlines may create more hazards to navigation. Finfish sub-alternatives have a higher aggregating effect, which is linked to potential higher risk of human/marine life interactions, concerns for worker safety. Finfish may require more engineering considerations for gear integrity due to dynamic loading of containment systems and feeding systems. Finfish raises public concerns about exposure pathways to chemicals of concern (husbandry materials and other therapeutents). Potential benefits if siting leads to a competitive domestic aquaculture industry, which may provide Americans' better access to affordable and nutritional protein options.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOAs in both areas may distribute risks to more communities. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternatives 4a.

Resource Category	Summary and Comparison of Potential Impacts
Tribal Resources and Cultural Practices	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.
	Alternative 2a Potential adverse effects due to increased demand on Tribal members for information and coordination, risk of disturbance and/or damage to artifacts, changes in artifact historic and/or cultural value, area disturbance on community practices, wellbeing, and access. Potential beneficial effects if socioeconomic benefits go to Tribes.
	Alternative 2b Potential adverse effects as discussed in Alternative 2a.
	Alternative 3a Potential adverse effects due to increased demand on Tribal members for information and coordination, risk of disturbance and/or damage to artifacts, changes in artifact historic and/or cultural value, area disturbance on community practices, wellbeing, and access. Potential beneficial effects if socioeconomic benefits go to Tribes. Alternative 3 is further away from Chumash lands and the Chumash Heritage National Marine Sanctuary and impacts may be reduced compared to Alternative 2.
	Alternative 3b Potential adverse effects as discussed in Alternative 3a.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOAs in both areas may distribute impacts to more communities. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternatives 4a.
Non-Tribal Cultural and Traditional Practices	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 2a Potential adverse and beneficial effects due to biological, socioeconomic, and cultural impacts of increased aquaculture operations. More interest, investment, infrastructure may increase baseline social license relative to Alternative 3. Shellfish and macroalgae is consistent with state policy and results in less competition with fisheries, which may further contribute to social license.
	Alternative 2b Potential adverse and beneficial effects due to biological, socioeconomic, and cultural impacts of increased aquaculture operations. More interest, investment, infrastructure may increase baseline social license relative to Alternative 3. Finfish is not consistent with current state policy and may have less social license compared to shellfish and macroalgae aquaculture.
	Alternative 3a Potential adverse and beneficial effects due to biological, socioeconomic, and cultural impacts of increased aquaculture operations. Less interest, investment, and infrastructure may decrease baseline social license relative to Alternative 2, and more fishing communities have lower resiliency scores in Alternative 3.
	Alternative 3b Potential adverse and beneficial effects due to biological, socioeconomic, and cultural impacts of increased aquaculture operations. Less interest, investment, and infrastructure may decrease baseline social license relative to Alternative 2, and more fishing communities have lower resiliency scores in Alternative 3. Finfish is not consistent with current state policy and may have less social license compared to shellfish and macroalgae aquaculture.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. AOAs in both areas may distribute impacts to more communities. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternatives 4a.
Archeological Resources	Alternative 1 If AOAs were not identified there would be no impact to the baseline conditions.

Resource Category	Summary and Comparison of Potential Impacts
	Alternative 2a Potential adverse effects to archeological resources due to seafloor disturbance. Known archaeological resources have been avoided, but anywhere in the SCB continental shelf has potential occurrence of archaeological resources.
	Alternative 2b Potential adverse effects as discussed in Alternative 2a.
	Alternative 3a Potential adverse effects to archeological resources due to seafloor disturbance. Known archaeological resources have been avoided, but anywhere in the SCB continental shelf has potential occurrence of archaeological resources. Overall probability of occurrence and overlap may be reduced compared to Alternative 2 due to lower number and smaller footprint of facilities that may be sited.
	Alternative 3b Potential adverse effects as discussed in Alternative 3a.
	Alternative 4a Potential adverse and/or beneficial effects as discussed in Alternatives 2-3. Risk could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.
	Alternative 4b Potential adverse and/or beneficial effects as discussed in Alternatives 4a.

i. Cumulative Impacts

Cumulative impacts were analyzed for each resource addressed in Chapter 3 (Affected Environment and Environmental Consequences) for all alternatives in combination with past, present, and reasonably foreseeable future actions. For past actions, the cumulative impacts analysis only considers those actions or activities that have had ongoing impacts that may be additive to impacts of the alternatives. Likewise, present and reasonably foreseeable future actions selected for inclusion in the analysis are those that may have effects additive to the effects of the alternatives as experienced by specific environmental receptors. The action alternatives would contribute incremental adverse and beneficial effects on the human environment, which is already experiencing and absorbing a multitude of stressors to a variety of receptors, if siting aquaculture in those locations. The potential for cumulative impacts and the increment of impact associated with the past, present, and reasonably foreseeable actions described for Alternative 2 are not meaningfully different for Alternative 3. The resolution of data and impact potential is generally not sufficient to identify fine-scale difference in potential for increment of cumulative impact between the two potential AOA alternative areas. Alternative 4 would have similar impacts to Alternatives 2 and 3, with an increased increment of impact on cumulative effects, but the scale of Alternative 4 is not large enough that a substantive increase in increment of effect would be anticipated. At the stage of individual project proposals, finer-scale consideration for local interactions may result in different localized cumulative effects in space or time.

Chapter 1: Introduction and Background

A. Introduction

Aquaculture is an important agricultural sector and the fastest-growing food production sector in the world. Aquaculture is generally defined as the propagation, rearing, and harvesting of aquatic species in controlled or selected environments. It is the cultivation of aquatic organisms for any commercial, recreational or public purpose. This includes production of finfish, shellfish, macroalgae, or multi-species aquaculture. Technological innovations have made it possible to culture marine species offshore in the open ocean. "Offshore" aquaculture here means the propagation, rearing, and harvesting of marine organisms in Federal waters (3 to 200 nautical miles (nm) from shore), in locations characterized by exposure to open ocean conditions with potential wave energy and strong currents, differing from coastal, nearshore waters (Rubino (ed.) 2008, Froehlich et al. 2017a, CEA 2018, CRS 2019, CDFW 2019, Fujita et al 2023, Bath et al. 2023, Buck et al. 2024, Sclodnick et al. 2024).

The National Oceanic and Atmospheric Administration (NOAA) has directives to facilitate domestic aquaculture and to preserve ocean sustainability in the United States (U.S.), consistent with the National Aquaculture Act of 1980 (16 U.S.C. 2801 et seq.) These directives have established promoting domestic aquaculture as a national policy priority for the U.S. on the basis of the growing demand for aquaculture products, along with an interest in providing domestic food security and jobs. The United Nations Food and Agriculture Organization (FAO) estimates that the U.S. is the world's largest importer of aquaculture products and seafood more generally, but ranks 20th in aquaculture production globally (FAO 2022a).

Seafood is becoming more integrated into global food systems, with growth and diversity in consumption, production, and competitive product pricing. Aquaculture has been the main source of fish consumed globally since 2016; and the proportion of overall seafood consumed that is from aquaculture is growing annually (CEA 2018, Clavelle et al. 2019, FAO 2020, and FAO 2024). In 2022, aquaculture surpassed capture fisheries for the first time as the main producer of aquatic animals. Global aquaculture production (both freshwater and marine) reached 130.9 metric tons, of which 94.4 metric tons were aquatic animals, or 51 percent of the total global aquatic animal production (FAO 2024). Aquaculture seafood products grown in the U.S. have historically supplied very little of the domestic demand (Rubino (ed.) 2008). Data for 2022 estimates that 70% to 90% of the seafood consumed in the U.S. is imported, and over half of the seafood imported into the U.S. is produced via aquaculture overseas (NMFS 2024a). In 2022, the U.S. seafood trade deficit was $24.2 billion, as reported in the 2022 Fisheries of the United States report. (NMFS 2024a). These key statistics imply that the economic potential of the commercial aquaculture industry in the U.S. is under-realized.

On May 7, 2020, the White House issued an Executive Order on *Promoting American Seafood Competitiveness and Economic Growth* (E.O. 13921) (85 FR 28471). E.O. 13921 requires the Secretary of Commerce to identify geographic areas in the U.S. Exclusive Economic Zone (EEZ) suitable for commercial aquaculture, and complete a National Environmental Policy Act (NEPA) Programmatic Environmental Impact Statement (PEIS) for each area identified as a result of the E.O. to assess the impact of siting aquaculture facilities there. These geographic areas would be referred to as Aquaculture Opportunity Areas (AOAs) once a final PEIS is completed, and a decision document is signed. An AOA is a defined geographic area that has been evaluated to determine its potential suitability for commercial aquaculture. Identifying AOAs may help support the development of domestic commercial aquaculture, consistent with sustaining and conserving marine resources and applicable laws, regulations and policies. Identifying AOAs does not create legal boundaries or restrict activities.

NOAA's National Marine Fisheries Service (NMFS) selected Federal waters in the Southern California Bight (SCB) as one of the first two geographic regions in which to identify AOAs. The SCB is considered as the marine space within the U.S. EEZ associated with the coastline between Point Conception and the U.S./Mexico border, and encompassing the Channel Islands. The geographic area is characterized by a

biodiverse ecosystem and a temperate ocean climate that has relatively calm seas and consistent ocean temperatures. In addition, California is one of the most populated coastal states in the U.S. and tops the state rankings with 26.8 million people living in coastal counties (U.S. Census Bureau 2022). The dense human population, along with the climate and ocean conditions, may create promising conditions for offshore aquaculture development in the SCB region. There are also complex existing ocean uses including high shipping traffic, commercial and recreational fishing, other recreational industries, sensitive habitat, protected species, and strategic national security assets that would require any aquaculture project to navigate the existing ocean user-space carefully.

The intent of this Final PEIS (FPEIS) is to support long-term planning for offshore aquaculture. The FPEIS identifies potential locations for one or more offshore AOAs in the SCB and analyzes the types of potential impacts that may be associated with potential aquaculture projects in those locations, if aquaculture projects were sited there in the future. It evaluates the beneficial and adverse impacts associated with offshore aquaculture that could occur through future proposals and project-level review, and compares the suitability of different geographic areas.

i. Proposed Action

The Federal action proposed in this PEIS is to identify one or more geographic locations (referred to as AOAs) that may be suitable for multiple future offshore aquaculture projects in Federal waters of the SCB (outside of state waters, within the U.S. EEZ), and to generally evaluate the impacts of siting aquaculture in those locations. AOAs identified through this process could be considered potentially suitable for finfish, shellfish, macroalgae, or multi-species aquaculture. The proposed action is a long-term planning effort. It is not a regulatory or permitting action and does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. The analysis may be used to inform such processes for individual projects proposed later in time.

ii. Purpose and Need

The purpose of the proposed action is to apply a science-based approach to identify AOAs in Federal waters. The goal of identifying AOAs is to promote American seafood competitiveness, food security, economic growth, and to support the development of domestic commercial aquaculture, consistent with sustaining and conserving marine resources and applicable laws, regulations and policies. The proposed action is needed to meet the directives of E.O. 13921 to address the increasing demand for seafood, facilitate long-term planning for marine aquaculture development, and address interests and concerns regarding offshore marine aquaculture siting.

B. Offshore Marine Aquaculture in the United States

The marine economy, also known as the Blue Economy, is defined in the Department of Commerce (DOC) 2022-2026 Strategic Plan by economic activities related to the U.S. oceans, seaports, and Great Lakes. It is estimated that this sector is growing at nearly twice the rate of the overall U.S. economy, including higher growth in employment (DOC 2022). Foods associated with marine systems are an important, sustainable way to meet rising population and income-driven demand for seafood and healthy protein (Naylor et al. 2021, Gephart et al. 2021, and Froehlich et al. 2020). Aquaculture is the fastest growing food production sector globally. In 2022, global aquaculture production reached 130.9 metric tons, and is expected to increase by another 10 percent by 2032 (FAO 2024). The most recent aquaculture census from the U.S. Department of Agriculture (USDA) estimated 1,282 saltwater aquaculture farms were in operation as of 2023, which accounts for both ocean-based and land-based farms that use saltwater (USDA 2024a). The NOAA 2022 Fisheries of the United States report estimated that in 2022 total U.S. marine aquaculture production was 80 million pounds, valued at about $441M U.S. dollars (NMFS 2024a). The most recent data for national totals of marine aquaculture production by species

group, product weight, and U.S. dollars is summarized in a NOAA Fisheries of the United States report that is updated every year.

The EEZ is an offshore area where the aquaculture industry could find opportunity to grow. It is estimated that less than 500 square kilometers (km²) (193 square miles [mi²]), which is less than 0.01% of the U.S. EEZ, may be enough to produce up to 600,000 mt or more of farmed seafood per year (Nash 2004). Improved technology to farm aquaculture species in open ocean sites provides the opportunity for marine aquaculture to expand offshore, where there are less user-conflict and environmental constraints (Kapetsky et al. 2013, Kite-Powell et al. 2013, Rust et al. 2014, Costello et al. 2016, Holm et al. 2017, CEA 2018, Lester et al. 2018a, and FAO 2020). In offshore Federal waters, there are currently no commercial projects in operation, although there are some projects that may pursue permits in the foreseeable future. There are a very limited number of small-scale commercial aquaculture projects in State waters. There is high regional variation in the number of aquaculture farms and the value of farmed aquatic products throughout the nation.

i. United States Aquaculture Policy

This FPEIS includes information on U.S. aquaculture policy. Federal governance of ocean uses within the U.S. EEZ can vary greatly based on geographic boundaries, specific activities, protection or conservation of living marine resources, and a federal agency's statutory responsibilities. NOAA is identifying AOAs as directed by E.O. 13921. Identifying AOAs under E.O. 13921 is also consistent with directives in the National Aquaculture Act of 1980 and the NOAA Marine Aquaculture Policy, for NOAA to promote sustainable aquaculture in the U.S. The proposed action does not create any new regulatory framework or change any existing statutory authority related to offshore marine aquaculture. Identifying AOAs is a planning effort not based on any authorities under the Magnuson–Stevens Fishery Conservation and Management Act (MSA). Identification of AOAs does not result in any authorization or permit. Any future aquaculture operations would need to comply with any applicable laws.

The National Aquaculture Act of 1980

In 1980, Congress enacted the National Aquaculture Act (16 U.S.C. § 2801 et seq.) to establish a national aquaculture policy, recognizing the need to reduce the U.S. fisheries product trade deficit, augment existing commercial and recreational fisheries, produce renewable resources, and therefore meet future domestic food needs and contribute to the global seafood supply. Under this law, the Secretary of Agriculture was designated to lead the coordinating committee, established by Executive Order in 1978 (E.O. 12039) as the Joint Subcommittee on Aquaculture within the Office of Science Technology Policy, and charged with creating an Aquaculture Development Plan.

U.S. Department of Commerce and NOAA Aquaculture Policies

After the National Aquaculture Act was authorized, several government initiatives and high-level reports promoted offshore aquaculture and coordinated marine spatial planning in U.S. waters; however, offshore aquaculture development in the U.S. was inhibited by scientific, economic, legal, and production factors (Cicin-Sain et al. 2004; Rubino 2008; and Lester et al. 2018a). To expedite aquaculture development, two corresponding federal policies were enacted. Consistent with the National Aquaculture Act, the U.S. Department of Commerce (DOC) developed an Aquaculture Policy (2011) to specify the goals, objectives, and priorities for all DOC Bureaus, including NOAA, in the context of the Department's overarching emphasis on jobs, the economy, innovation, and international competitiveness. Working in partnership with the U.S. Department of Agriculture, Food and Drug Administration, Department of the Interior, and the Joint Subcommittee on Aquaculture, the policy intent was "to make the U.S. a world leader in developing, demonstrating, and employing innovative and sustainable aquaculture technologies and in encouraging worldwide adoption of sustainable aquaculture practices and systems." Expanding upon the DOC Aquaculture Policy, NOAA's Marine Aquaculture Policy (2011) reaffirmed aquaculture as an important component of NOAA's marine stewardship mission and strategic goals for healthy oceans

and resilient coastal communities and economies. By statutory authority, NOAA's National Marine Fisheries Service (NMFS) is also responsible for protecting habitat, vulnerable species, and sustainable fisheries, and thus has responsibility for considering, preventing, and mitigating potential adverse environmental impacts of proposed and existing marine aquaculture development and operational plans.

Executive Order 13921 (*Promoting American Seafood Competitiveness and Economic Growth*)

Executive Order 13921 called for the expansion of sustainable seafood production in the U.S. to ensure food security; provide environmentally safe and sustainable seafood; support American workers; ensure coordinated, predictable, and transparent federal actions; and remove unnecessary regulatory burdens. Importantly, specific action items with defined deliverables are required for the purpose of increasing transparency and coordination among government agencies, reducing regulatory barriers, and facilitating environmentally responsible U.S. offshore aquaculture development. Section 7 of the E.O. directs the Secretary of Commerce to identify Aquaculture Opportunity Areas (AOAs) in consultation with the Secretary of Defense, the Secretary of the Interior, the Secretary of Agriculture, the Secretary of Homeland Security, the Administrator of the Environmental Protection Agency, other appropriate federal officials, appropriate Regional Fishery Management Councils, and in coordination with appropriate state and tribal governments.

Executive Order 14276 (*Restoring American Seafood Competitiveness*)

Executive Order 14276 builds upon the efforts instituted under Executive Order 13921 through additional measures to promote domestic seafood production, sale, and trade.

Additional information about aquaculture management is provided in Chapter 3. The laws, policies, and regulations that may apply to offshore aquaculture projects are compiled in Chapter 5 (Compliance with other Laws, Policies, and Regulations).

ii. Status of Marine Aquaculture in the Southern California Bight Ecosystem

California supports a robust ocean-based economy, as well as a growing aquaculture industry. USDA aquaculture census data for 2023 ranks California fifth in the nation for total aquaculture sales (from operations in State waters), worth $119 million in sales within the state, and $1.9 billion in distribution sales to the rest of the U.S. (USDA 2024a). An additional overview of marine aquaculture's contribution to the California economy is provided on p. 1-8 of CDFW (2019). The overall economic impact of aquaculture in the state (sales, employment, etc.) is estimated to be about $200 million (CDFW 2022). Saltwater species that are grown in the state for food include oysters, abalone, mussels, clams, seaweed, tilapia, sturgeon, and striped bass (Sea Grant 2024a). These existing operations occur on land in various types of aquarium systems, or very close to shore. As of the CDFW status report in 2020, a total of 5,740 acres (ac) (2,323 hectares [ha]) of nearshore public tidelands are leased for marine aquaculture, with an estimated 9% of the total acreage in active operation (CDFW 2020a). Additional aquaculture programs exist for certain species of macroalgae, invertebrates, and finfish for the purpose of research and wild population restoration.

C. AOA Planning Process

i. Overview of the PEIS

A programmatic approach to NEPA may be used when an agency plans new policies or programs that may include actions occurring in the same region; common subject matter and methods of implementation; or if a plan encompasses potential future NEPA assessments that may all have similar impacts but with a narrower scope, such as a project-specific, or site-specific, assessment. The programmatic analysis may be used to inform NEPA processes for individual projects proposed later in time. A PEIS may also help eliminate repetitive discussions of the same issues. Just like an EIS, a PEIS

considers a range of alternatives for the proposed action, including a No Action alternative. A PEIS is a broad, or high level, NEPA document that assesses the impacts of a proposed action.

This PEIS provides a programmatic-level NEPA assessment of the potential impacts on the human environment, should aquaculture facilities be sited, associated with proposed identification of an AOA or AOAs in Federal waters off the coast of Southern California. The programmatic approach takes a broad look at issues and geographic alternatives for offshore aquaculture in the SCB. Project-specific NEPA analysis, consultations, and permits may be needed in the future. The PEIS may be tiered from for future proposed aquaculture projects if the lead agency determines the PEIS is appropriate for its needs. The PEIS could assist regulatory authorities by providing information to support the agencies' permitting and environmental review processes for operations located within those locations. A lead agency might rely on the information in its project-specific NEPA analysis, such as a site-specific environmental assessment or an EIS for an individual project, for a potential project to be sited in an AOA. Its reliance could involve the project design, cultivated species, associated permits, or other considerations. A lead agency choosing to rely on the programmatic NEPA review may consider whether its tiered review requires additional analysis that adds to or builds on the programmatic review. Additionally, the tiered review may raise new issues that may need to be addressed through additional agency reviews, authorizations or consultations (e.g., ESA Section 7, NHPA Section 106). This PEIS considers a long-term planning effort that is not a regulatory or permitting action and does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. It is a planning initiative only.

No programmatic mitigation requirements are being established via this very complex proposed action. While this PEIS analyzes the impacts of siting aquaculture facilities in AOAs, it does not propose any avoidance, minimization, mitigation, and monitoring measures for siting aquaculture facilities. Any mitigation measures would be project specific. Possible mitigation that could be considered for aquaculture facility development are discussed in Appendix 1. The BMPs and mitigation and monitoring suggestions in the document are provided with cited literature and could be considered in future project specific evaluations on a case-by-case basis. Any siting, design, operational, or other implementation criteria pertaining to future aquaculture operations that may be sited in an AOA would be context and location-specific, and may be dependent on the proposed activity. NOAA Fisheries is not establishing siting, design, operational, or other implementation criteria at this programmatic level. Any relevant criteria are dependent on the project and type of operation. It is expected that siting considerations within any AOA may require additional analysis to determine the suitability for specific types of aquaculture and/or cultivation approaches.

Additional aquaculture-related topics were determined to be out of scope for this PEIS. The PEIS contains a reasonable range of alternatives to the proposed action. The current information is sufficient to inform the decision maker on the impacts of the proposed action and alternatives at the programmatic level. The level and scope of the analysis is commensurate with the potential impacts of the action, and its length is proportional to its scope and complexity. No aquaculture operations are authorized or permitted through the AOA identification process, and any future aquaculture operation proposed to be located in an AOA would need to comply with all applicable laws, including a project-specific evaluation under NEPA, as applicable. Topics that were determined to be out of scope for this PEIS may be considered in project-specific NEPA as appropriate, if and when projects are proposed.

These items include:

- natural disasters and other "force majeure" events;
- broodstock sourcing;
- fish-feed sourcing, except considerations of pressure on forage fish;
- aquaculture that includes the co-use of existing offshore infrastructure;
- land-based transport of harvests;
- environmental planning for coastal auxiliary facilities and coastal development; and

- potential impacts to terrestrial resources and habitat as a result of any coastal development.

ii. Public Involvement

NMFS consulted and coordinated with multiple Federal agencies and the Pacific Fishery Management Council, and coordinated with State government and tribal governments throughout development of the EIS. Following the publication of E.O. 13921 on May 7, 2020, NMFS began a public outreach effort that included stakeholder engagement, video and print informational products, and soliciting input from stakeholders, including the commercial and recreational fishing communities, academia, non-governmental organizations (NGOs), the general public, and coastal and ocean managers. Part of the initial public outreach effort included publication of a Request for Information (RFI) in the Federal Register (85 FR 67519, Oct. 23, 2020). The RFI solicited public input to help identify data needs, data sources, and project requirements for offshore aquaculture in the first two geographic regions in which NMFS has chosen to identify AOAs (Southern California and Gulf of America), as well as on a national level. At the same time, the National Center for Coastal Ocean Science (NCCOS) worked with the NMFS regional offices in Southern California to collect data for a spatial modeling analysis for the region. The work by NCCOS was published as a peer-reviewed technical memorandum entitled "An Aquaculture Opportunity Area Atlas for the Southern California Bight," referred to herein as "the Atlas" (Morris et al. 2021).

NMFS used the results in the Atlas, along with the public input gathered through the RFI, to develop the Notice of Intent (NOI) for the DPEIS. NMFS published an NOI on May 23, 2022, to initiate the NEPA process. The NOI included prompts to gather input from the public for the DPEIS (87 FR 31210). Two webinar-based public listening sessions were held during scoping, in which comments could be submitted orally. A public scoping report was published to the Southern California AOA website and to the Office of Aquaculture (OAQ) AOA website on March 29, 2023, that summarizes the process, participants, and the themes of scoping comments (NMFS 2023a). NOAA Fisheries announced public scoping through a variety of internet media, and also through direct outreach to members of the interested public. NOAA Fisheries reached out to tribal governments in the Southern California region to inform them about the AOA PEIS process and invited them to participate in the AOA planning process. NMFS gathered the information from pre-scoping outreach, the scoping period, best available science, and additional expertise from NOAA offices to write the DPEIS.

The DPEIS was released to the public on November 15, 2024 (89 FR 92681). NOAA Fisheries undertook an extensive public engagement process including media engagement, email notifications, and digital and social media. NMFS took public comment on the DPEIS for 90 days, until February 20, 2025. Written submissions were accepted during the public comment period via the federal docket with the identification number, NOAA-NMFS-2022-0051, and by hard copy mail and email. NOAA Fisheries held two virtual public meetings via Webex on January 23, 2025 and January 28, 2025 to provide an overview on the DPEIS, and solicit verbal comments.

NMFS made the following significant efforts to facilitate maximum public participation during the DPEIS public review and comment period:

- Notification emails were sent to federal agencies, state agencies, and some non-governmental organizations;
- Notification emails were sent to stakeholders via Listservs, Newsletters and Bulletins (e.g., FishWatch listserv, which has over 250,000 subscribers; NMFS aquaculture listserv, which has over 32,000 subscribers; recreational fisheries constituents/stakeholders listservs; etc.)
- Tribal notification emails were distributed to appropriate federally recognized tribes.
- Press releases to announce the availability of the Draft PEIS and public meetings were posted on NOAA websites and distributed to news media listservs;
- Postings were made to regional and national NMFS social media accounts;

- Website announcements were posted to regional AOA webpage, AOA national web page, and a web story was posted to the NOAA Fisheries website;
- Two virtual public meetings were held via Webex.

The FPEIS reflects consideration of public comments made on the DPEIS during the public comment period. Appendix 6 (Response to Public Comments) describes the public's participation and includes a list of the agencies and private entities that commented on the DPEIS and a comment matrix with NMFS' responses associated with the comments received and actions taken. Appendix 7 (Public Comments) contains the full text of all comments received. Comments were received from 1 federal agency, 5 state/local government agencies, 5 non-governmental organizations, 15 interest groups, 1 tribal government, 4 local businesses, and approximately 43 private individuals.

Project-specific NEPA analysis, consultations, and permits may be needed in the future, if and when projects are proposed within an AOA, and there may continue to be opportunities for future public involvement.

iii. Updates for the Final Programmatic Impact Statement

This subsection highlights changes made to the final PEIS based on public comments to the DPEIS, as well as comments provided by cooperating and participating agencies given the relationships outlined in E.O. 13921. Public comments are summarized, and their corresponding responses are provided in Appendix 6 (Response to Public Comments). The FPEIS also includes updated figures, updated best scientific information available, changes to terminology to enhance clarity, and corrections to minor formatting issues and typos. While most sections in the PEIS were changed in some manner between the draft and final versions, many of those changes entailed minor modifications to improve clarity. The FPEIS removes references to rescinded regulations and revoked Executive Orders and modifies where practicable those sections in the DPEIS which were developed in compliance with now-revoked Executive Orders.

The key changes between the DPEIS and FPEIS follow.

- Clarifications about the scope of the PEIS were added to Chapter 1.
- Information has been added in the narrative text throughout the document summarizing citations that had previously been incorporated by reference, to enhance clarity.
- Some terminology throughout the document has been changed based on public comment (e.g., limiting the use of the term "FAD" and replacing the term "FAD effect" with "areas of wildlife aggregations" as a potential impact of siting aquaculture to reduce confusion between natural vs manmade FADs, removing the terms "candidate" or "suitable" species in regards to potentially-farmed species to clarify that no particular species are being proposed or advocated for in this proposed action).
- More information on seaweed and IMTA has been added throughout the document.
- References to EOs and regulations that have been revoked since the publication of the DPEIS have been removed. Sections in the DPEIS which were developed in compliance with now-revoked Executive Orders have been modified where practicable; DPEIS Section 3.D.ix (Environmental Justice Considerations) has been removed. "Gulf of Mexico" has been changed to "Gulf of America."
- Additional information about the data and processes incorporated into the Atlas was added to Chapter 2 and throughout the document to better describe methods of analysis that fed into the NEPA alternatives.
- Figures throughout the EIS were updated for formatting consistency, to remove outdated Atlas terminology to reduce confusion, and to update or provide new information. Several new figures were added to provide additional spatial context based on public comment, notably new figures showing Phase II Cetacean Biologically Important Areas in relation to the AOA options and fishing data considered in the Atlas.

- Additional information provided by commenters and updated best available science has been added throughout Chapter 3 to enhance the description of the affected environment and the discussion of potential impacts associated with siting aquaculture.
- Appendix 1 (Possible Mitigation for Offshore Aquaculture Operations) has been significantly revised based on public comment to improve clarity and to remove unnecessary detail. While this PEIS analyzes the impacts of siting aquaculture facilities in AOAs, it does not propose any avoidance, minimization, mitigation, and monitoring measures for siting aquaculture facilities. Possible mitigation that could be considered for aquaculture facility development is discussed in Appendix 1.
- The addition of 3 new appendices, one with more information on protected resources data considered in the Atlas (Appendix 3), one with an index and summary of public comments received and NOAA Fisheries' responses (Appendix 6), and one with the full text of all public comments received (Appendix 7). The glossary provided in the DPEIS that was formerly Appendix 3 has been removed, as many of the definitions were based on regulations or executive orders that have since been rescinded. Appendix 3 now refers to the new Protected Resources Data Considered in the Atlas Appendix.

Chapter 2: Proposed Alternatives

A. Proposed Alternatives

Aquaculture planning and siting for marine aquaculture operations requires thorough synthesis and spatial analyses of critical environmental data and ocean space use conflicts (Kapetsky et al. 2013). The spatial modeling approach used in the Atlas was specific to the planning goal of identifying areas that have the highest potential to support three to five marine aquaculture operations and the least amount of conflict with other ocean uses. The AOA options identified in the Atlas were one source of information used by NMFS to inform the development of the PEIS. The parameters that were selected to conduct spatial modeling to identify AOAs in Federal waters included:

- depths between 10 to 150m (33 to 492ft);
- size range between 500 to 2,000 acres (202 to 809 hectares);
- maximum distance from shore 46.3km (25nm);
- polygon shape that maintained four corner points representative of the four cardinal directions (north, south, east, west); and
- located within Federal waters of the U.S. EEZ between Point Conception and the U.S. southern border offshore of San Diego (Morris et al. 2021).

The Atlas considered environments that align with the tolerances in offshore commercial-scale aquaculture farming practices worldwide, which have been observed by contributing authors of the Atlas as well as industry stakeholders. These parameters were high-level and meant to encompass all types of aquaculture, meeting basic industry requirements for generalized aquaculture, and the subsequent site suitability analysis identified the most suitable areas within those parameters that have low levels of conflict with other ocean users (Morris et al. 2021). The application of marine spatial planning (MSP) is central to an ecosystem approach to aquaculture (EAA) to ensure accountability and equitable shared use of resources (Stelzenmüller et al. 2017; Gimpel et al. 2018). EAA is a strategy for integration of aquaculture activities within the wider ecosystem that promotes sustainable development, equity, and resilience of interlinked social-ecological systems (Brugère et al. 2010). Spatial data for critical or potential environmental and ocean space/use conflicts that could constrain the siting of aquaculture were used to identify areas with the highest suitability for aquaculture development. Documented areas of offshore infrastructure, protected species habitat, historic and cultural resources, military use, and other ocean uses in the SCB that may not be compatible with aquaculture operations were considered in the site suitability analysis. Some types of physical environmental data presented in the Atlas are merely presented to characterize the areas in support of future planning, but were not used as site suitability screening criteria in the suitability analysis. For example, the average historical water quality conditions shown in the Atlas are provided for characterization of an area, and no particular measure of any water quality parameter was used as a screening criteria. Instead, suitability in regards to water quality was considered in the model via the setbacks that were applied to known water quality stressors (e.g., 3NM setbacks from wastewater outfall pipes and diffusers; this setback distance was determined in consultation with the California Department of Public Health).

The Atlas provided the most comprehensive marine spatial analyses ever developed for any U.S. ocean space. With over 200 data layers, new data sets, and novel modeling approaches for national security and NOAA protected species, the Atlas analyzed vast ocean areas to identify the most suitable AOA options for Southern California relative to the Atlas planning goals. NCCOS worked across all NOAA offices and staff participated in national and regional listening sessions. Data and information were gathered from hundreds of stakeholder meetings and listening sessions, including fishing communities. Fishing data were predominantly received from programs across NOAA and the California Department of Fish and

Wildlife. Data and maps within the Atlas and PEIS reflect the resolution at which data can be displayed to the public to ensure protection of confidential data components. Fishing data from 23 fisheries were included in suitability analyses. The analysis is based on the best available scientific information and most relevant information. The current information is sufficient to inform the decision maker on the impacts of the proposed action and alternatives at this time. NOAA Fisheries acknowledges the limitation of coverage of vessels equipped with Vessel Monitoring Systems (VMS) and that with some fisheries, a significant portion of the fleet remains unmonitored at the resolution afforded by VMS. The successful development of individual sites for commercial production is anticipated to require appropriate site-specific assessments and evaluations if and when a specific aquaculture project is proposed. These assessments could account for localized factors such as, but not limited to, wave climate, currents, updated fishing or navigational information, etc. It is anticipated that siting considerations within any AOA option may require additional analysis to assess local conditions to determine the suitability for specific types of aquaculture and/or cultivation approaches. More precise, localized data may be needed to ground-truth the high-level predictions in this PEIS.

The modeling results identified eight AOA options in the Santa Barbara Channel, and two AOA options in Santa Monica Bay. The AOA NEPA alternatives considered in this PEIS are based on the spatial analysis in the Atlas, the evaluation of available spatial data within the SCB, feedback received during scoping, as well as the best available science and literature on aquaculture and the region. The use of AOAs to create a predictable area for aquaculture development may have a beneficial impact on communities by creating predictability and focusing aquaculture in an area that has been evaluated and assessed to be the most suitable in Southern California (Morris et al. 2021), and future projects may be evaluated in the context of minimizing specific impacts (e.g., minimizing use conflict and impacts to wildlife and habitats that are culturally important to tribal and non-tribal communities).

NMFS West Coast Region (WCR) considered the four preliminary alternatives described in the NOI (87 FR 31210). In addition, the three action alternatives include two sub-alternatives (a) and (b) that were created as a direct response to public scoping comments and stakeholder requests, while still satisfying the directives of E.O. 13921. The sub-alternatives are based on the types of aquaculture for which an AOA may be identified, however offshore aquaculture development of any kind could still occur outside of or within the AOA options in Federal waters. NMFS has selected Alternative 4b as its preferred alternative.

i. Alternative 1: No Action

In Alternative 1, the no action alternative, NMFS would not identify any AOA in Federal waters offshore of Southern California, including not identifying any sub-alternatives. Aquaculture projects could still be sited in Federal waters of the SCB.

ii. Alternative 2: Santa Barbara Channel

In Alternative 2, NMFS would identify at least one and up to eight AOAs from within Federal waters offshore of Santa Barbara and Ventura Counties in the Santa Barbara Channel. The Alternative 2 AOA options are located between 10.02 and 19.72 km (5.41 and 10.65 nm) offshore (Figure 1).

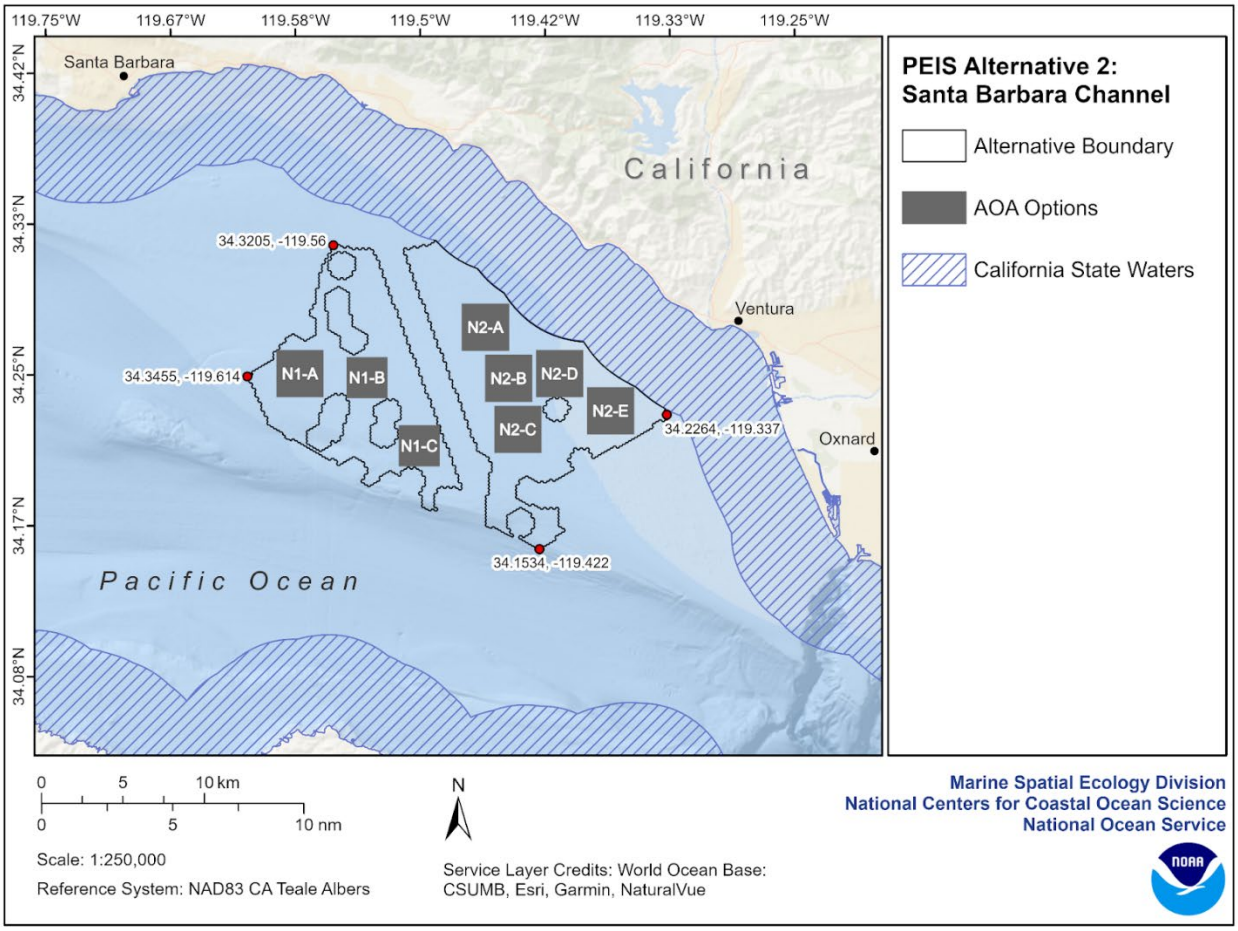


Figure 1: Map of Alternative 2: Santa Barbara Channel

The Santa Barbara Channel is considered to be the submerged portion of the Santa Barbara-Ventura Basin, a marine area of 5,179 km^2 (2,000 mi^2) and approximately 97 km (52 nm) in length, extending north from Point Conception south to Port Hueneme (NCCOS 2005, Heintz et al. 2008). Each AOA option within Alternative 2 ranges from 1,500 to 2,000 acres (607 to 809 ha). The total combined acreage in Alternative 2 is 15,000 acres (6070 ha), or 60.7 km^2 (23.4 mi^2).

The coordinates in Figure 1 represent the most north, east, south, and west points of the alternative boundary. More information about each AOA option within Alternative 2 is provided in Table 3.7 on p. 112 and in Table 3.11 on p. 138 of the Results section of Morris et al. (2021).

Shellfish and Macroalgae Aquaculture

In Sub-alternative (2a), NMFS would identify one or more AOAs in the Santa Barbara Channel in which macroalgae and shellfish aquaculture could be sited. Offshore shellfish and seaweed cultivation systems have many similarities (CDFW 2019). Figures and text describing the two cultivation methods, along with comparisons between the two, are provided in pp. 2-15 and 2-16 of the California Department of Fish and Wildlife (CDFW) Draft Programmatic Environmental Impact Report (PEIR) for a Coastal Marine Aquaculture Program (CDFW 2019).

Seaweed

Seaweed farming, also referred to as kelp or macroalgae cultivation, is a fast growing aquaculture sector. Seaweed has been grown globally for centuries, but more recently is being pursued as a food resource due to high nutritional value and low production costs (FAO 2018a). Seaweed refers to a number of green,

red, and brown macroalgae species. Seaweeds are different from vascular plants, like mangroves or seagrasses, in that they lack vascular stems, roots, and leaves. Seaweeds derive water, minerals, and nutrients from the water surrounding them. There are over 200 species of seaweed grown globally for commercial value (FAO 2018a). The potential macroalgae species that are thought likely to be pursued in the SCB for commercial production are described in Chapter 3, Section C.iv (Potentially-Farmed Species). Most current marine seaweed cultivation in California is conducted on a small-scale or research and development basis in the Monterey, Santa Barbara Channel, and San Diego areas, with the remaining production land-based in tanks (CDFW 2019).

Project designs in an AOA may vary depending on the cultivated species, the targeted products, and scale. Culture conditions throughout a lifecycle of cultured seaweed would need to account for temperature, light, salinity, nutrient levels, aeration levels, and biosecurity controls (Redmond et al. 2014a). Engineering considerations also depend on scale models to account for weight, buoyancy, and drag that change throughout growout phases and put different types of stress on the gear (Fredriksson et al. 2023). Some of the best large, commercial-scale models available for U.S. production have been developed for biofuels projects (DOE 2021), USACE 2021, and Kite-Powell et al. 2022).

Shellfish

Molluskan shellfish (oysters, clams, mussels) is the leading type of aquaculture production in the U.S. (Nelson et al. 2019). California is the third largest consumer of shellfish within the U.S., but the supply does not meet the demand (Wright 2020). Molluskan species are the only type of shellfish cultivated currently in California state waters or on land (mussels, oysters, scallops, clams, and abalone) (CDFW 2010, CDFW 2020a). Historic production and basic biological knowledge of these species in State waters is detailed in CDFW (2010). Data analyzed through 2018 showed a total of 4,960 acres of shellfish commercial aquaculture exist in State waters, and an additional 907 acres are reserved for aquaculture by CDFW (Wright 2020). The term shellfish in this PEIS refers to molluskan species only. The potential molluskan species that are thought likely to be pursued in the SCB for commercial production are described in Chapter 3, Section C.iv (Potentially-Farmed Species).

Farmed mussel culture operations employ different technologies depending on depth (Bath et al. 2023). The primary methods of oyster culture used by California growers are longline culture, rack-and-bag, and bottom containers (CDFW 2020a). Similar methods are common in the greater Atlantic region of the U.S. (Mori and Riley 2021). Abalone operations in California state waters use floating rafts and suspended cages (CDFW 2010, CDFW 2020a). In deep, offshore waters, the most likely types of shellfish culture may include submerged longline systems (Theuerkauf et al. 2019, CDFW 2020a, and Bath et al. 2023). Longline culture commonly consists of a long horizontal rope (mainline or backbone) supported by buoys (floats) and anchored individually to the sea bed at both ends or in arrays of several parallel ropes anchored by a grid of mooring lines. (Bath et al. 2023, Humboldt Bay District 2022, Gagnon 2024). Baskets can also be suspended from vertical longlines to grow shellfish to a harvestable size (Mori and Riley 2021, Humboldt Bay District 2022). Submerged systems are similar to surface systems, but are submerged 5 - 15 m (16 - 49 ft.) below the surface to mitigate against ocean surface conditions such as wind and waves (Young 2015, USACE 2021). Engineering considerations for shellfish production include the density of growth, the materials and geometry of how lines are kept in place, whether biodegradable materials are used, floaters to maintain buoyancy as shellfish grow, and environmental conditions (Gagnon 2024). Design plans and example configurations for a proposed 2,000 acre (809 ha) shellfish operation in the SCB can be found in Theuerkauf et al. (2019), which may indicate what may be proposed in an AOA.

All Types of Commercial Aquaculture

In Sub-alternative (2b), NMFS would identify one or more AOAs in the Santa Barbara Channel in which finfish or Integrated Multi-Trophic Aquaculture (IMTA) facilities in addition to macroalgae and shellfish aquaculture could be sited. IMTA aquaculture is system of one farm that grows more than one organism

in a facility (e.g. shellfish with finfish), or a cooperative group of facilities that grow different trophic levels of aquaculture near to one another. Under Sub-alternative (b), different types of aquaculture may be pursued at different facilities within one AOA; or, different types of aquaculture may be pursued at one facility in an IMTA system. The potential finfish species that are thought likely to be pursued in the SCB for commercial production are described in Chapter 3, Section C.iv (Potentially-Farmed Species). IMTA is described more below. Any system, species, or combination of systems and species could be possible to site in an AOA.

Common techniques to cultivate finfish are offshore ranching and net pen rearing. Submerged net-pens may be the method most likely utilized in an AOA. Net pens are cage-like structures enclosed by mesh screens and supported by floatation devices and rigid mooring devices and anchoring systems (Mori and Riley 2021). Typically, ocean-based finfish aquaculture requires feed and other husbandry materials as inputs to the system. Cultivated finfish are typically fed dry feed as early as possible. The feed type, characterized by the protein and fat content, may also be adjusted to reduce costs and improve fillet quality (CDFW 2010). Fish feed in aquaculture is a topic that is being researched and improved as the industry develops (Rust et al. 2014). Feed manufacturing undergoes its own regulatory review; and feed sourcing is considered out of the scope of this PEIS. However, the type of feed used in a finfish farm has implications for economics, benthic habitat impacts, and water quality impacts that are discussed broadly as nutrients and aquaculture system inputs in Chapter 3 of this PEIS. Net pen facilities may use young fish produced in hatcheries, which are then placed into pens where they are fed until grown to market size (CDFW 2010). Hatcheries undergo their own regulatory review and permitting process; and it is assumed that any operation sited in an AOA would work with an approved source in compliance with all U.S. regulations. Therefore, hatcheries and broodstock sourcing are also considered out of scope for this PEIS.

Globally, finfish aquaculture exists in open-pen designs or closed containment (Fujita et al. 2023). Mobile fish farms that have a ship-like configuration, allowing them to rotate and move to different locations have been proposed for use. (Mori and Riley 2021). Ropeless gear mimicking the pot gear fishery is also a potential technology that could be used for finfish aquaculture (Mori and Riley 2021). The most common method being pursued in U.S. offshore finfish aquaculture is stationary, semi-rigid, enclosed, submergible pens designed to withstand storms and other environmental stressors (Buck et al. 2018, Fredriksson and Beck-Stimpert 2019, Morris et al. 2021, Fujita et al. 2023, Bath et al. 2023). Engineering considerations include the rigidity of the pen structures, rigidity of anti-predator nets, mooring lines, anchors, associated mechanical structures for feeding and cleaning, buoys, and other navigation aids (Fredriksson and Beck-Stimpert 2019, Fujita et al. 2023, Bath et al. 2023). Basis of design technical documents have been developed to provide ocean engineering guidance for developing an aquaculture system in the offshore environment in other regions of the U.S., though no such guidance has been developed yet specifically for the SCB, see Fredriksson and Beck-Stimpert (2019).

Existing finfish aquaculture operations in California include public hatcheries or temporary research projects that operate in California state waters as part of native finfish stock enhancement programs to support commercial and recreational fisheries (California Fish and Game Code (CFGC) §6590 et seq.; California Department of Fish and Game (CDFG) 2010. The artificial propagation, rearing or stocking of finfish in state waters is limited to the purpose of recovery, restoration, or enhancement of native fish stocks, and is carried out under either a scientific collecting permit, research permit, or other enhancement programs established under State legislature (CFGC § 15400(b)(10) and (c), CDFG 2010, CDFW 2019, and CDFW 2020a). These types of activities are addressed through a regulatory program separate from commercial aquaculture (CDFW 2020a). The State-run Ocean Resources Enhancement and Hatchery Program (OREHP) in the SCB uses nearshore cages up to 790,000 gallons (gal) (3000 kiloliters [kl]) (CDFW 2010). More material and structural components of net pens and submerged raceways that are used in the OREHP are described in (CDFG 2010). Configurations for a theoretical example of 200 acres (81 ha) of finfish operations are provided in CDFW (2019). The RWQCB, responsible for NPDES permits for the State's OREHP, considers a small versus large facility as less than versus greater than 45

mt fish per year, respectively (CDFG 2010). Examples from other countries show that salmon farms commonly produce 1,000 mt of fish per production cycle (Fujita et al. 2023). Limiting variables and processes that may be considered in modeling a finfish farm operation include feed type, feeding process, enclosure designs to plan for energetic costs of the cultivated organisms, any necessary water and/or effluent treatment, maintaining proper aeration and temperatures depending on cultivation density (Chary et al. 2022).

For all types of aquaculture, life history patterns are often used to help guide culture methods, and may be especially important to consider in the offshore environment where operations may be exposed to natural oceanic conditions. Nutrient fluxes and the carrying capacity of the systems, in relation to the surrounding water column, are especially important considerations for IMTA aquaculture (whether within one farm or among farms sited closely to one another) (Buck et al. 2018). IMTA may also be used for co-use of existing offshore infrastructure, such as wind turbines or oil and gas platforms (Buck et al. 2018). However, the spatial analysis in the AOA planning process excluded existing offshore infrastructure; therefore, IMTA co-use is out of scope for this PEIS. In other commercial operations, IMTA may be pursued to achieve positive economic outcomes, such as dual profitability and diversification, or for sustainability purposes, including mitigating environmental impacts, offsetting costs from system inputs and outputs, or making use of otherwise wasted byproducts (Buck et al. 2018, Mori and Riley 2021). Examples of reasons to use IMTA for improved sustainability include:

- utilizing uneaten feed or waste, or stabilizing water quality in net pen systems through the use of filter feeders (shellfish or certain species of finfish) (Alexander et al. 2016);
- accelerating seaweed growth from ammonia excreted by fish (Troell et al. 1997);
- increasing profitability of finfish farms by seaweed production or other types of nutrient biofilters (Chopin et al. 2011);
- supplementing naturally occurring food in the water with cultured algae (CDFW 2010);
- reducing labor associated with biofouling removal by developing practices to harvest both the biofouling organisms and the cultured species (Peabody and Toft 2021);
- co-culturing species in proximity to cultured food sources; e.g., culturing abalone offshore in cages/barrels/etc. on long-lines or suspended systems near or within macroalgal lines or fish cages (and algal fouling) to supply the abalone with food (Purcell et al. 2025a).

IMTA systems are variable due to the detailed, integrated economic frameworks, hydrodynamic conditions, pelagic primary productivity, water concentrations, waste characteristics, and other environmental externalities or farm system components that can optimize the co-cultivation of multiple species. Due to this high level of variability, IMTA may not be accurately generalized in a programmatic approach. Therefore, the consideration of IMTA in this PEIS is limited, but included in certain sections, as information was available.

iii. Alternative 3: Santa Monica Bay

In Alternative 3, NMFS would identify at least one and up to two AOAs from within Federal waters offshore of Los Angeles County in Santa Monica Bay. The Alternative 3 AOA options are located between 8.06 and 8.82 km (4.35 and 4.76 nm) offshore (Figure 2).

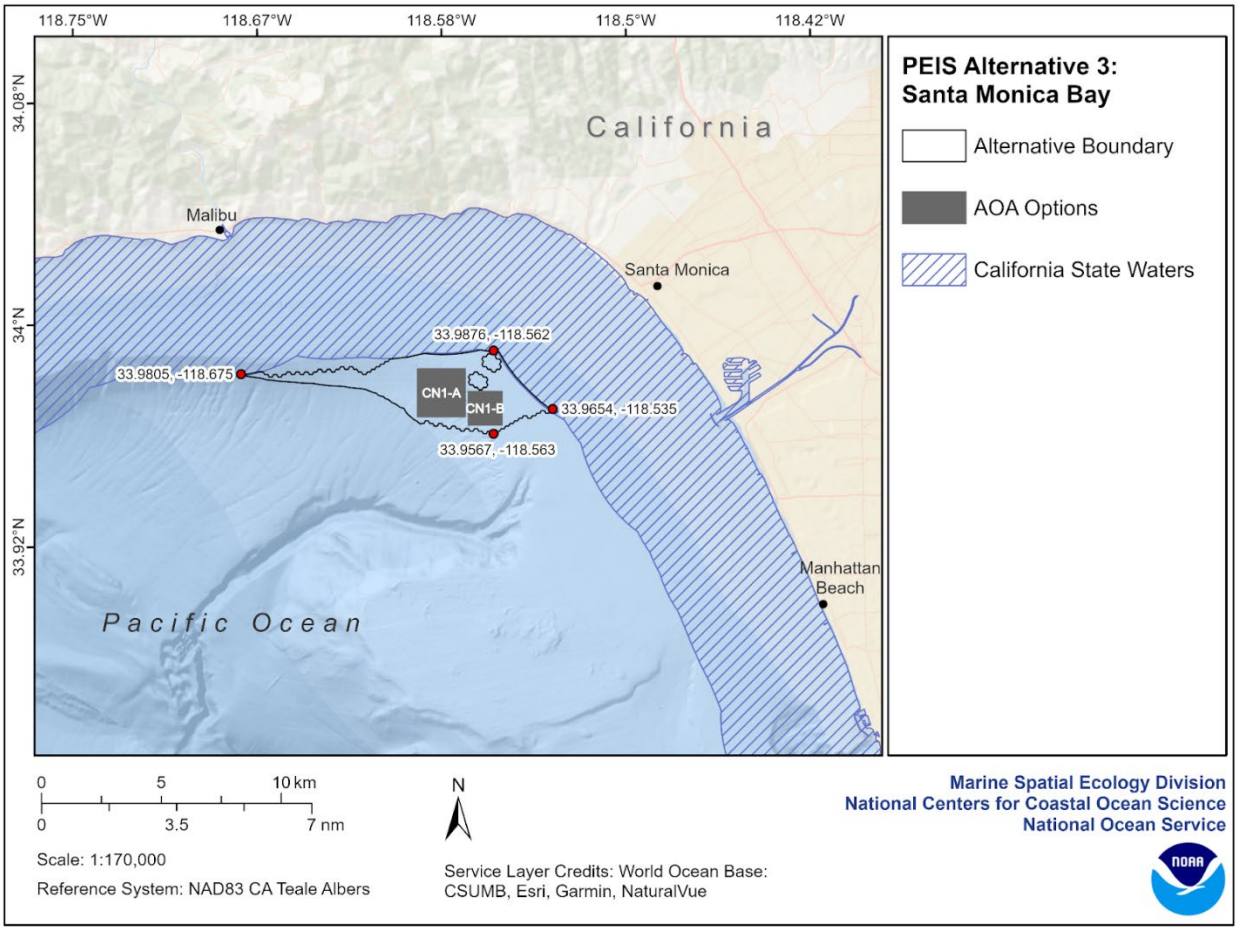


Figure 2: Map of Alternative 3: Santa Monica Bay

Santa Monica Bay is within the Santa Monica-San Pedro Basin, considered to be submerged lands trending northwest-southeast extending northwest from the Los Angeles/Ventura County line south to Point Fermin on the Palos Verdes Peninsula to the southeast (NCCOS 2005, Heintz et al. 2008, LARWQCB 2011). The two AOA options within Alternative 3 are 500 and 1,000 acres (202 and 405 ha), for a combined total of 1,500 acres (607 ha), or 6.1 km^2 (2.4 mi^2).

The coordinates in Figure 2 represent the most north, east, south, and west points of the alternative boundary. More information about each Alternative 3 AOA option is provided in Table 3.17 on p. 170 of the Results section of Morris et al. (2021).

Shellfish and Macroalgae Aquaculture

In Sub-alternative (3a), NMFS would identify at least one and up to two AOAs in the Santa Monica Bay in which macroalgae and shellfish aquaculture facilities could be sited. Information about the aquaculture type for the shellfish and macroalgae aquaculture sub-alternative within Alternative 3 is the same as described in Alternative 2.

All Types of Commercial Aquaculture

In Sub-alternative (3b), NMFS would identify at least one and up to two AOAs in the Santa Monica Bay in which finfish or Integrated Multi-Trophic Aquaculture (IMTA) facilities in addition to macroalgae and shellfish aquaculture could be sited. Information about the aquaculture type for the all types of commercial aquaculture sub-alternative within Alternative 3 is the same as described in Alternative 2.

iv. Alternative 4: Combination of Geographic Areas

In Alternative 4, NMFS would identify the up to 10 AOA(s) from within the boundaries of either Alternative area, up to a maximum area to be determined by NMFS with input from the public. The total 10 AOA options are shown in Figure 3.

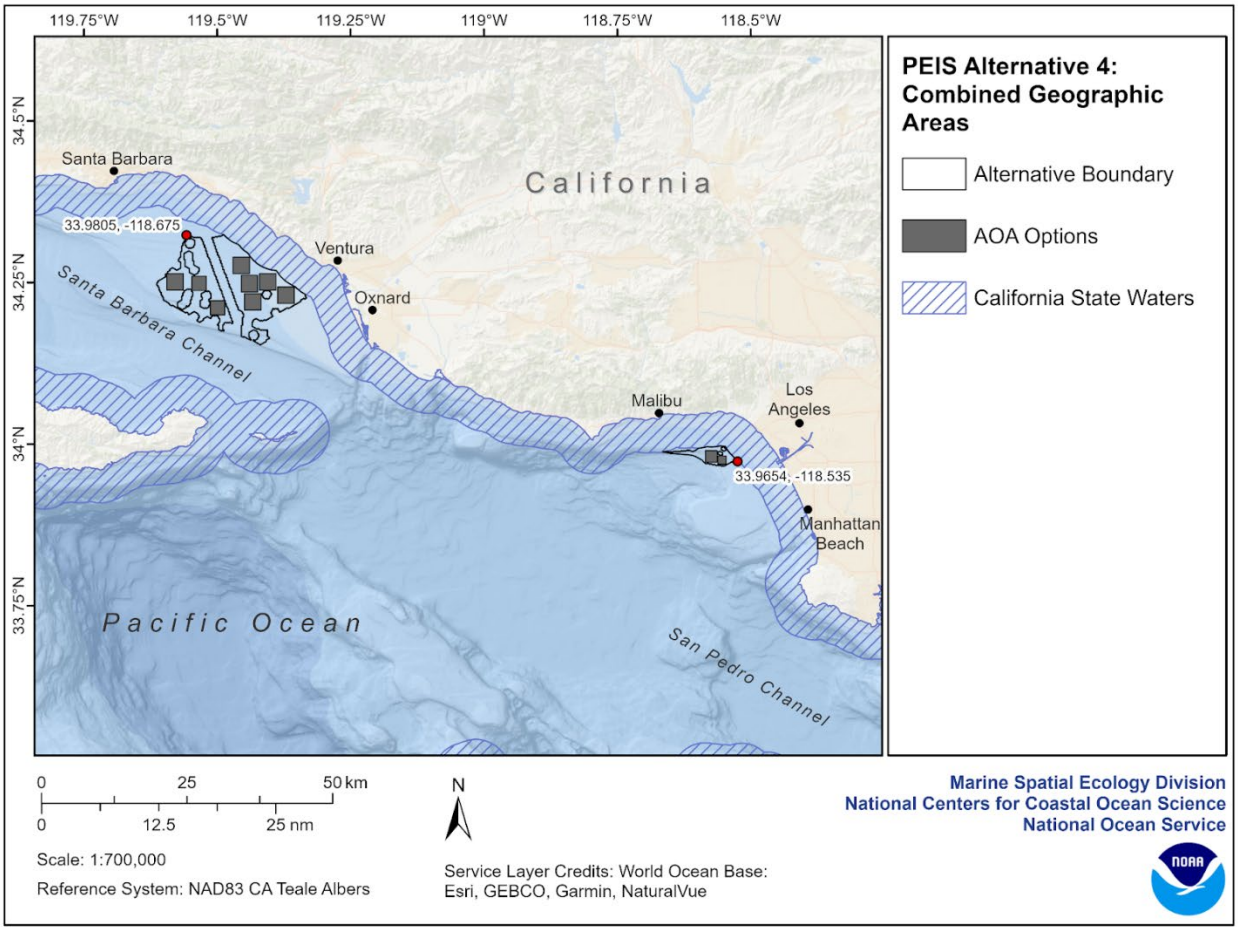


Figure 3: Map of Alternative 4: Combined Geographic Areas

The solid line boundary surrounding all AOA options is the total boundary of analysis for Alternative 4. The north-most coordinate of the Alternative in Santa Barbara Channel is about 100 km (54 nm) from the south-most coordinate of the Alternative in Santa Monica Bay. The nearest distance of marine space between the two areas is about 70 km (38 nm). The total marine space in Federal waters that was analyzed for the combined geographic spaces in Alternative 4 is the sum of Alternative 2 and Alternative 3, about 873 km² (337 mi²).

Shellfish and Macroalgae Aquaculture

In Sub-alternative (4a), NMFS would identify one or more AOAs in the Santa Barbara Channel and the Santa Monica Bay in which macroalgae and shellfish aquaculture facilities could be sited. Information about the aquaculture type for the shellfish and macroalgae aquaculture sub-alternative within Alternative 4 is the same as described in Alternative 2.

All Types of Commercial Aquaculture (Preferred Alternative)

In Sub-alternative (4b), NMFS would identify one or more AOAs in the Santa Barbara Channel and the Santa Monica Bay in which finfish or Integrated Multi-Trophic Aquaculture (IMTA) facilities in addition

to macroalgae and shellfish aquaculture facilities could be sited. Information about the all types of commercial aquaculture sub-alternative within Alternative 4 is the same as described in Alternative 2. This alternative is identified as the preferred alternative. This alternative best meets the directives of E.O. 13921 and the Purpose and Need of this PEIS.

B. Alternatives Considered but Not Further Analyzed

Federal waters of the SCB region were considered in the pre-scoping outreach by NCCOS and NMFS, in the NMFS Request for Information (85 FR 67519), and in the spatial analysis of the Atlas (Morris et al. 2021). Spatial modeling parameters used in the Atlas are described in Section A, above, and concluded with four distinct areas that could be considered for AOAs: North, Central North, South, and Central South (Morris et al. 2021). The South and Central South areas were not further analyzed in the NEPA process because it was determined that there were numerous logistical and environmental constraints that may not make those areas suitable for aquaculture, or, may not be suitable to include in a programmatic NEPA approach (e.g., military activity, offshore marine shipping contingency anchorages). The South and South Central areas were offshore from Long Beach and from San Diego (Morris et al. 2021).

The AOA options considered in this document do not represent the only potential suitable sites for aquaculture in Federal waters of the SCB. Rather, the sites considered are those with the highest suitability ranking given the overlap with ocean-users and biological resources (Morris et al. 2021). Morris et al. (2021) includes more sites that are potentially suitable for aquaculture operations given their low and moderate suitability rankings. As described in Morris et al. (2021) and above, NOAA used marine spatial planning (MSP) to identify the most suitable AOAs within distinct regions of the SCB that had the highest potential to support three to five offshore aquaculture developments and the least amount of conflict with other ocean uses. As part of the MSP, NOAA Fisheries' planning goal was to identify sites in Federal waters (50-150m) of the SCB that could support between three and five commercial-scale aquaculture operations (500-2000 acres). Given the planning goal, from 296 possibilities of the highest scoring ocean spaces in the North and Central North Atlas areas, ten of the highest-ranking AOA options were identified and are carried forward in this PEIS. However, based on the scoring of categorical and numerical data, and the constraints sub-model layers, Morris et al. (2021) identified many additional potentially suitable sites for aquaculture operations (See Morris et al. 2021; Appendix F). These options represent areas that may be similar in suitability to the AOA options considered here, with potentially low levels of conflict with other ocean users and conditions that meet basic industry requirements for generalized aquaculture operations, albeit with some constraints resulting in slightly lower scores. Also, there are likely many other potentially suitable locations for single aquaculture operations that could occupy spaces less than 500 acres.

There is also currently considerable interest in the possibility of using microalgae for producing sustainable biofuel and other industrial uses, and for carbon sequestration potential. Microalgae cultivation primarily occurs on land in contained vessels, tanks, or ponds (CDFW 2020a). Hughes et al. (2014) describes a microalgae research project that occurred in the marine environment in central California; but it occurred in nearshore waters, associated with coastal facilities by design. Because typical cultivation methods and locations are often land-based or nearshore, microalgae aquaculture was not considered in the Action alternatives of this PEIS.

NMFS considered work with the permitting, cooperating agencies (e.g., USACE and EPA) to develop programmatic permits or programmatic consultations, but concluded that the action was not appropriate at this time.

Chapter 3: Affected Environment and Environmental Consequences

Each section in this chapter first describes the sensitive resources, cultural resources, and trends in human activities for the SCB region. The distance between the north-most coordinates of Alternative 2 in the Santa Barbara Channel, and the south-most coordinates of Alternative 3 in Santa Monica Bay are only approximately eight nm apart. There is extensive connectivity between these areas for natural resources, cultural connections, and socioeconomic systems that create the baseline conditions for the analysis. As information was found available, the most specific context and geographic scope has been provided around or within each alternative area. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors. Impacts are described in the alternative areas (Figures 1-3) and in the context of the two sub-alternatives that describe types of aquaculture (see Chapter 2, Section A). For the purposes of this PEIS, "impacts" is synonymous with "effects." Possible mitigation that may be considered by Federal agencies for project-specific NEPA analyses is included in Appendix 1.

This PEIS analyzes potential impacts to the human environment that may occur from the identification of AOAs and potential impacts associated with future aquaculture operations should aquaculture projects be sited in one or more AOAs, if identified, in order to assist the long-term planning effort. Without identification of AOAs, aquaculture projects could still be sited in Federal waters of the SCB. Potential impacts are discussed here and would depend on the project if sited. With the exception of potential impacts to the administrative environment identified below, there are no reasonably foreseeable impacts to the human environment that may occur from the identification of AOAs.

The PEIS addresses environmental effects at a programmatic level. The analysis includes the appropriate scope and level of evaluation for the proposed action and alternatives. Any future aquaculture projects within AOAs would be separate in time from this PEIS. The analysis may be used to inform processes for individual projects proposed later in time. Potential stressors associated with site assessments, construction, operations and maintenance, and decommissioning of aquaculture activities are included. Impacts reflected in the alternatives include potential modifications to the baseline conditions and trends that exist today, including unavoidable adverse effects as well as benefits.

A. Administrative Environment

This section considers the administrative (federal and state regulations) environment relevant to permitting, authorizing, reviewing, and consulting on offshore aquaculture operations in Federal waters of the SCB.

i. Federal and State Regulatory Frameworks

Jurisdictional Waters

The Submerged Lands Act (SLA) (43 U.S.C. §§ 1301) grants coastal states title to natural resources located within their coastal submerged lands and navigable waters out to 3 nm from their coastlines. Federal waters extend from the seaward boundary of state waters (3 nm from shore) to the seaward boundary of the U.S. EEZ (200 nm from shore), as well as including the extended continental shelf (continental shelf beyond 200 nm). The U.S. EEZ was established by Presidential Proclamation No. 5030 (March 10, 1983).

Aquaculture Permits in Federal Waters

There are certain primary Federal permits required for aquaculture operations. The USACE has permit authority under Section 10 of the Rivers and Harbors Act (33 U.S.C. § 403) for structures affecting navigable waters. All structures located in, on, or over waters of the U.S. require a permit issued by the USACE under the authority of Section 10, which prohibits creation of structures that obstruct navigable waters of the U.S. without authorization. The permitting process (33 C.F.R. 322 and 325) is designed to assess the environmental effects of a structure and operations associated with the structure, including effects on navigable waters of the United States. NMFS may provide comments to USACE regarding impacts to marine resources of proposed activities and can recommend methods for avoiding such impacts.

The U.S. Coast Guard conducts and coordinates port, waterways, and coastal security operations in the maritime realm. The USCG has authority over the marking and lighting of any structures for navigational safety (described in Chapter 3, Section D.vi). USCG has statutory responsibility in Federal waters under the Ports and Waterways Safety Act (PWSA) (33 USC § 1221) and aid to navigation (PATON) regulations (33 C.F.R. § 66; 14 U.S.C. § 542, 543, 544 and 43 U.S.C § 1333).

Under the authority of the Clean Water Act (CWA), EPA may issue permits for aquaculture-associated activities that may create discharges into the surrounding waters. The EPA is authorized to permit the discharge of specific pollutants associated with an approved aquaculture project pursuant to Section 318 and Sections 402 and 403 of the CWA (33 U.S.C. §§ 1328, 1342, and 1343). The USACE's CWA section 404 authority does not extend into Federal waters. The EPA also has NEPA review authority under Section 309 of the Clean Air Act (CAA) (42 U.S.C. 7609) with regards to air emissions. NMFS and USFWS have review and commenting responsibilities under the Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA) (further described in Chapter 3, Section C.i). The ESA requires consultations on federal actions that may affect listed species and critical habitat and the MMPA requires authorizations when actions are expected to result in the take of marine mammals (16 U.S.C. § 1531 et seq. and 16 U.S.C. § 1361 et seq.). If aquaculture activities adversely affect fish resources and Essential Fish Habitat (EFH) under the Magnuson Stevens Act (MSA), NMFS has review authority and may provide conservation recommendations (further described in Chapter 3, Section C.ii).

Chapter 5 further describes Compliance with other Laws, Policies, and Regulations. The federal Guide to Permitting Marine Aquaculture (NMFS 2022a) includes lists of federal permits (Table 1 in the guide), federal authorizations (Table 2A in the guide), and federal consultations (Table 3 in the guide) that apply to aquaculture operations.

State Involvement under Federal Statutes

The permitting and authorization requirements for aquaculture development within AOAs are the same as other projects in Federal waters. The federal government and coastal states each have roles in the permitting process.

The Coastal Zone Management Act (CZMA) was enacted to preserve, protect, develop, and where possible, to restore or enhance, the resources of the U.S. coastal zone for present and succeeding generations 16 U.S.C. § 1452. Section 307 of the CZMA requires Federal actions which affect any land or water use or natural resource of the coastal zone to be conducted in a manner consistent to the maximum extent practicable with the enforceable policies of a state's approved coastal zone management program (CZMP) (16 U.S.C. § 1456, 15 CFR § 930). The review identifies activities with reasonably foreseeable direct and indirect effects on coastal use or resources.

NOAA's Office of Coastal Resource Management (OCM) administers compliance components of the CZMA, and manages the partnership between Federal and coastal state governments. NMFS WCR conferred with NOAA OCM on the AOA planning process for the purposes of this PEIS. Because the AOA PEIS is not an exercise of statutory responsibilities but instead a planning document that does not

result in permitting or funding of any activities; and because the impact analysis in this PEIS is at a programmatic, planning level, a Federal consistency review was not prepared. Specific aquaculture projects sited in an AOA may be subject to a CZMA Federal consistency review during the permitting process, with specific project designs and goals to analyze.

The California Coastal Commission (CCC) is the designated coastal management agency responsible for reviewing actions that have potential to impact land, water, and resources in the coastal zone and implementing enforceable policies in the CZMP. The California Ocean Protection Act (COPA) encourages cooperative management with federal agencies, to protect and conserve representative coastal and ocean habitats and the ecological processes that support those habitats (26.5 California P.R.C. §35515). The California Department of Fish and Wildlife (CDFW), operating under the authority of the California Fish and Game Code (FGC), is the principal state management agency responsible for the protection and conservation of the state's fish and wildlife resources, including oversight of certain aspects of commercial aquaculture within State waters (CDFW 2020a). CDFW also provides biological data and expert consultation on fisheries to PFMC for sustainability determinations (PFMC 2013).

Permission and approvals to land, process, or store aquaculture products on shore and in working waterfronts may involve State agencies, described above, and in Sections 3.1 through 3.3 of the Draft EIR for a Coastal Marine Aquaculture Program (CDFW 2019). The required coordination may vary based on the location, vessels, and product. In addition, the National Shellfish Sanitation Program (NSSP) is a cooperative program between the Federal and state governments, where a state is the primary authority. Through the NSSP, the FDA evaluates state plans, and NOAA provides oversight on FDA evaluations (FDA and NOAA pers. comm. February 2021).

Although all potential AOA sites considered in the action alternatives are in Federal waters, it is likely that any project sited in an AOA would require navigation through state waters and product offloads at a coastal port. The Los Angeles/Long Beach Harbor Safety Committee is responsible for planning and providing for the safe navigation and operation of all vessels operating within San Pedro Bay, Santa Monica Bay, the Los Angeles/Long Beach port complex (and the approaches thereto). The Committee also works to address potential pollution of harbors, channels and coastal waters. The Harbor Safety Plan (MESC 2023) provides best practices and implementation measures under local, State, or Federal laws within regulated navigation areas that include State and Federal waters (e.g. 25 nm for vessel traffic; 40 nm for air quality compliance) (MESC 2023). When Federal authority or action is required to implement the Harbor Safety Plan, or the recommendations therein, the appropriate agency is petitioned as necessary (MESC 2023).

CWA Section 402 National Pollutant Discharge Elimination System (NPDES) regulatory program water quality standards are incorporated into permits issued to individual projects. In Federal waters, the EPA issues NPDES permits, while implementation of the NPDES program in California waters is handled by the State. The Clean Air Act requires EPA to establish requirements to control air pollution from outer continental shelf sources in order to attain and maintain Federal and State ambient air quality standards, for the sources located within 25 miles of the seaward boundary, the requirements are the same as applicable if the source were located in the corresponding onshore area. The authority to implement and enforce these requirements has been delegated to the State (42 U.S.C. § 7627; 40 C.F.R. 55).

Section 106 of the National Historic Preservation Act (NHPA) requires review of any project funded, licensed, permitted, or assisted by the federal government for impact on historic properties. Federal agencies must allow the State Historic Preservation Officer (SHPO) to comment on a project along with other consulting parties including but not limited to Tribal Historic Preservation Officer (THPO), certified local governments, and members of the general public with an economic, social or cultural interest in the project (GSA 2023). Site-specific aquaculture projects may be required to initiate SHPO/THPO consultation.

ii. Aquaculture Management Guidance

Any offshore aquaculture operation is required to obtain necessary permits, and to fulfill additional consultation and review requirements from appropriate authorities. An aquaculture facility sited in an AOA would be required to do the same. Future aquaculture operations proposed within an AOA would need to comply with applicable laws. The Federal permitting framework for aquaculture is complex, and efforts to develop a more comprehensive system through legislation are ongoing. The recent Federal publications listed below were developed as references for stakeholders to improve the efficiency, predictability, and timeliness, and reduce the costs of reviewing, approving, monitoring, and enforcing permits and other regulatory requirements for marine commercial aquaculture ventures. These documents describe regulatory, science and technology needs for aquaculture management, and provide information to assist individuals navigate the federal permitting process for marine aquaculture (applicable to finfish, shellfish, invertebrates, seaweed):

- FAO Fisheries National Aquaculture Legislation Overview (web page, available at www.fao.org/fishery/nalo/search/en);
- FAO's Aquaculture Planning: Policy formulation and implementation for sustainable development (Brugère et al. 2010);
- NOAA Fisheries Office of Aquaculture (OAQ) Permitting Guide (NMFS 2022a);
- Technical Guide to Marine Aquaculture Gear (Feldman 2025);
- Guide to Leasing, Permitting, and Authorizing Commercial Aquaculture Operations off the California Coast (Southern California Offshore Aquaculture Interagency Working Group 2025);
- National Centers for Coastal Ocean Science (NCCOS) Coastal Aquaculture Planning Portal (website, available at https://coastalscience.noaa.gov/science-areas/aquaculture/coastal-aquaculture-planning-portal-capp);
- NOAA Fisheries Aquaculture Strategic Plan 2023 – 2028 (NMFS 2022b);
- National Aquaculture Development Plan: Overview (NSTC 2024a)
- Strategic Plan For Aquaculture Economic Development (NSTC 2024b)
- A National Strategic Plan for Federal Aquaculture Research (NSTC 2022a);
- A Strategic Plan to Enhance Regulatory Efficiency (NSTC 2022b); and
- Code of conduct for responsible aquaculture development in the U.S. exclusive economic zone (NMFS 2002).

In addition to Federal resources, state-level insight, regional expertise, and services are valuable to support the potential development and sustainability of U.S. marine aquaculture. California has existing experience with marine aquaculture in State waters, and may have important lessons learned that could assist in Federal waters. Beyond the AOA NEPA process, NMFS WCR is exploring alignment of Federal aquaculture objectives with the developing State's Aquaculture Action Plan, and associated OPC aquaculture principles (see below), to the extent practicable. The OPC's 2020-2025 strategic plan includes "promoting sustainable aquaculture" as an explicit objective. Much of the research and funding for State coordination is handled through NOAA's Sea Grant program, and with public-private-academic partnerships (CDFW 2022). This reciprocal science and services to support the expansion of aquaculture into Federal waters could help support sustainable goals for growth of the industry. Documents and web-based resources including data, educational materials, legal and policy discussions, news and other information for stakeholder awareness for the development of aquaculture management include:

- California Ocean Protection Council (OPC) Aquaculture Principles (OPC 2021);
- Permit Guide to Aquaculture in California (website, available at https://permits.aquaculturematters.ca.gov/Permit-Guide);
- Aquaculture Permit Counter – Improving Permitting Efficiency (website, available at https://permits.aquaculturematters.ca.gov/);
- In development, Draft California State Aquaculture Action Plan, when available (anticipated as Objective 4.2 of California Ocean Protection Council's (Cal-OPC) 2020 - 2025 Strategic Plan to Protect California's Coast and Ocean) (OPC 2020), which will focus on marine algae and

shellfish in state marine waters and land-based/recirculating tank operations for marine algae, shellfish, and finfish (OPC 2025); and

- Draft Program EIR for Coastal Marine Aquaculture Program (CDFW 2019).

The License and Revenue Branch within CDFW issues licenses and permits for recreational and commercial fishing activities, aquaculture, and scientific collection in support of educational and research projects (CDFW 2024) in State waters (up to 3 nm from shore). All forms of aquatic plants, fish, and shellfish in State waters are subject to approval by CDFW and the Fish and Game Commission (CFGC) working together within California's Natural Resources Agency (PFMC 2013, CDFW 2024). FGC Sections 15000 through 15703 provide the regulatory framework for aquaculture operations in State waters. Additional efforts in California state legislature to plan for ocean-based aquaculture include the Aquaculture Development Act (Public Resources Code §826-828) which called for the establishment of a policy and program toward improving the science and practice of aquaculture as a means of expanding aquaculture industry and related economic activity in the state, and the Sustainable Oceans Act (State Bill (201)), which provided that the CFGC may lease state water bottoms or the water column to any person for aquaculture, including, but not limited to, marine finfish aquaculture, and require the development of programmatic environmental impact reports to provide a framework for managing marine finfish aquaculture in an environmentally sustainable manner before marine finfish aquaculture in state waters would be permitted (CDFW 2019).

iii. Potential Impacts

Alternative 1: No Action

Under the no action alternative, no AOAs would be identified and there would be no changes or impacts to baseline conditions. Aquaculture projects could still be sited in Federal waters of the SCB, but may not benefit from the analyses in this PEIS, and the potential for more efficient permitting and environmental reviews. Operations sited outside of the areas discussed in this PEIS would not benefit from these analyses of potentially suitable sites that could inform permitting and environmental review processes for future aquaculture operations proposed in an AOA. As a result, this alternative is likely to provide the least amount of benefits to the administrative environment compared to the other alternatives.

Alternatives 2 (Santa Barbara Channel), 3 (Santa Monica Bay), and 4 (Combination of Geographic Areas)

The effort to identify AOAs in Federal waters of the SCB is an administrative planning effort intended to identify potentially suitable locations for offshore aquaculture development and assess the potential impacts associated with siting aquaculture in those areas. This work supports the long-term planning for marine aquaculture development in U.S. Federal waters. It provides information to help inform the aquaculture industry when considering locations to site future operations, and assists regulatory authorities by providing information to support the permitting and environmental review processes for operations located within those locations. While the identification of AOAs does not change existing regulatory authorities or processes related to permitting offshore aquaculture, there may be a potential beneficial impact facilitating efficiencies in permitting and environmental review processes for future aquaculture through the information provided in this PEIS.

The impacts to the administrative environment reflected in the Action Alternatives would be consistent across the action Alternatives 2 through 4, as offshore aquaculture operations would fall under the same (or very similar) permitting or environmental review processes across the Federal waters off of Southern California. With all potential AOA Alternatives analyzed in this PEIS, a similar level of information to support the permitting and environmental review processes would exist, except in instances where there are data and information gaps. Any additional considerations that could result in additional permits, authorizations or consultations are discussed in this PEIS to the extent these considerations are known.

B. Physical Environment and Potential Impacts

i. Oceanography and Climate

Affected Environment

The SCB is within the southern portion of the California Coastal Ecosystem (CCE), in which surface ocean currents flow predominantly from north to south (Schiff et al. 2000, NCCOS 2005, Huff et al. 2013, and Kramer et al. 2015). As the coastline cuts southeast in the SCB, it changes how upwelling and ocean currents influence the area in contrast to the rest of the CCE. The SCB has relatively calm seas, low storm frequency, and a temperate climate (Morris et al. 2021). The Davidson Current, also known as the Southern California Countercurrent (SCC), flows north into the SCB carrying warmer, less productive waters (Kramer et al. 2015) and creating an exchange of nearshore and offshore waters (Schiff et al. 2000, NCCOS 2005, and CDFW 2022). Figure 4 shows all of the major ocean currents that influence the SCB and the west coast EEZ. A more detailed description of ocean currents and upwelling in the SCB is provided on pp. 19 through 21 of the NCCOS Biogeographical Assessment (BGA) of the Channel Islands National Marine Sanctuary (NCCOS 2005). Nishimoto et al. (2019) provides further details about current and eddy systems in the SCB.



Figure 4: The California Current System and the Southern California Bight

The waters of the SCB are generally warmer and less nutrient-rich compared to other portions of the CCE which are influenced by deep ocean water (CDFG 2001a, CDFW 2022). Ocean surface temperatures in the SCB range from 11 to 23°C (51.8 to 73.9°F) (Schiff et al. 2000, CDFW 2010, and Morris et al. 2021).

In general, temperatures in Alternative 2 are slightly lower than Alternative 3. Alternative 3 is further south than Alternative 2, and more influenced by subtropical waters (Morris et al. 2021).

Bathymetric and depth features of the SCB can be found in Morris et al. 2021. The SCB has complex bathymetry that includes 11 deep-water basins, three major banks and seamounts, and 13 major submarine canyons (see Chapter 3, Section B.iii Seafloor Characteristics), including the Santa Barbara Basin and Santa Barbara Channel (Alternative 2) and Santa Monica-San Pedro Basin (Alternative 3).

Waters 0 to 50 m (164 ft.) are considered surface waters; waters greater than 50m (164 ft.) deep are considered subsurface. All areas of analysis in the PEIS are less than 150 m (492 ft.) deep in accordance with the planning goals of the MSP process used to develop the AOA options (Morris et al. 2021). Alternative 2 includes both surface and subsurface waters, except in AOA options N2-D and N2-E, on the easternmost side of Alternative 2, where measured depths are all less than 50 m (Morris et al. 2021). The measured depths in Alternative 3 are all greater than 50m (164 ft.) (Morris et al. 2021). Surface salinity in all areas analyzed is consistent throughout the year at an average of 33.6 psu (Morris et al. 2021).

Low oxygen, or hypoxic, conditions may occur over the continental shelf following spring upwelling, and continue into the summer and early fall months (Harvey et al. 2023, Chan et al. 2008). Data from 1993 through 2023 show lower spring and summertime dissolved oxygen in surface waters, close to a hypoxic threshold, while subsurface waters 50 to 150 m (164 to 492 ft.) usually stay at least two times higher than the hypoxic threshold except for in localized areas (Harvey et al. 2023).

Surface waters of the SCB form a counterclockwise eddy due to surface winds and the mixing of warm surface waters from the Southern California Countercurrent with colder waters of the California Current (Schiff et al. 2000, NCCOS 2005, and Whitmire and Clarke 2007). Localized currents form smaller eddies and island wakes (Mitarai et al. 2009, Morris et al. 2021, and CDFW 2022). Ocean currents affect invertebrate density, larval distribution mechanisms, organic matter and other nutrient and sediment flows (Schiff et al. 2000, Huff et al. 2013). Surface flows are complex and produced by forces acting over broad time and spatial scales and shifting seasonally.

Winds in the SCB are generally weaker compared to the rest of the California coast. During fall and winter months, the Santa Ana winds blow northeasterly from inland desert basins and out to sea with unusually high speeds and gusts that can exceed 96 km/h (26 m/s) (NCCOS 2005). Data analyzed from 2016-2020 show the prevailing wind direction in Alternative 2 is from the west, with slightly stronger winds on the western side of Alternative 2 (in the N-1 AOA options) than on the eastern side of Alternative 2 (in the N-2 AOA options)). In Alternative 3, the prevailing wind direction is from the west-southwest, with lower velocities compared to Alternative 2 (Morris et al. (2021)). Wind currents and ocean surface currents could influence water quality and marine debris assessments in aquaculture planning.

Fine-scale mixing and circulation patterns in the Santa Barbara Basin have been studied extensively, showing a persistent counterclockwise gyre, due to the mixing of the southbound California Current and the northbound California Countercurrent, or Davidson Current, see Figure 4 (Vetter et al. 2003, NPS 2017a). Winds in the Santa Barbara Channel (Alternative 2) are predominantly from the northwest, and when combined with the predominant surface ocean currents of the California Current southward, influences the movement of debris in a south or southeast direction (Spykra 2017, Morris et al. 2021, Steele and Miller 2022). The Santa Barbara Channel is a transition zone where cold waters north of Point Conception mix with the warmer waters of southern California, creating a biodiverse mixture of northern and southern marine life (CDFW 2016a). In addition, upwelling frequently occurs off Point Conception, typically from March through September. This upwelling provides nutrient-rich waters that extend eastward through the channel. Gyre circulation patterns exist year-round with seasonal variations in intensity – strongest in summer, weakest in winter (Hendershott and Winant 1996, Lagerloef and Bernstein 1988). These processes may be observed in the variations in surface currents within the alternative areas, as modeled in Morris et al. (2021). On the western side of Alternative 2 (in the N-1

AOA options), the prevailing surface currents flow west-northwest, and were modeled to be slightly lower velocities compared to the eastern side of Alternative 2 (0.53m/s). Prevailing currents on the eastern side of Alternative 2 (in the N-2 AOA options) flow southeast, with higher maximum current velocities modeled in shallower depths closer to shore (0.58m/s). Mean current velocities are estimated to be generally the same throughout the N-1 and N-2 options in Alternative 2 (0.14m/s) (Figures 3.50, 3.51, 3.52, 3.68, 3.69, 3.70 Morris et al. 2021).

In contrast to waters further north, Alternative 3 is in closer proximity to subtropical waters, which adds to its biodiversity and productivity. Given the coastal geography and wind patterns, upwelling is more limited in the region; however, several submarine canyons provide nutrient-rich waters enhancing local production (CDFW 2016a). The surface currents in Alternative 3 flow generally southeast, with lower mean and maximum velocities compared to Alternative 2 (mean 0.11m/s and maximum 0.48m/s) (Figures 3.88, 3.89, 3.90 Morris et al. 2021).

Wave heights are affected by complex processes within the SCB (Guza and O'Reilly 2001, NCCOS 2005). The curve in the coastline shelters the SCB from prevailing swell, resulting in lower wave heights and energy compared to the rest of the west coast (Dailey et al. 1993, Hickey and Banas 2003, and CDFW 2022). The prevailing swell direction in both Alternatives is from the west or southwest. As water moves from west to east and closer to shore, the modeled mean significant height decreases, while period increases. There is a difference again between the western and eastern sides of Alternative 2, and the trend continues comparing Alternative 3 to Alternative 2. In general, wave heights vary from 0.6 to 1m (2.0 to 3.3ft) within Alternative 2, and from 0.5 to 0.68 m (1.6 to 2.2 ft.) within Alternative 3 (Figure 3.54, 3.72, 3.92 Morris et al. 2021).

Stressors

Potential impacts of environmental variation on overall oceanography and climate of the SCB are discussed in Chapter 4, Section A.i. The naturally-occurring variability of the SCB ecosystem is an existing stressor to baseline conditions on annual and decadal scales and on marine life, discussed in Chapter 3, Section C (Biological Resources). Variation in climate and oceanographic conditions across the SCB act as a stressor on financial costs, structural requirements, and the viability of cultured species and should be considered at the project level, particularly with respect to engineering evaluations and operations plans. Variation in climate and oceanographic conditions further influences potential impacts to water quality, sediments, disease potential and biosecurity (Rhodes et al. 2023a).

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- changes in hydrodynamic processes.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Marine aquaculture facilities, like any fixed structure in the water column, can disrupt localized hydrology, potentially impacting circulation patterns, flow, current speeds, upwelling, eddy effects, and sedimentation and/or erosion rate (Lin et al. 2016). Research is ongoing to understand how offshore wind structures affect hydrodynamic processes and cascading biological impacts (Chen et al. 2016, Johnston et

al. 2022; and van Berkel et al. 2020), particularly with respect to larval transport of commercially important species. Oil and gas platforms can affect hydrodynamic processes and larval connectivity, with some positive effects noted (McLean et al. 2022). It is noted that the literature from other types of infrastructure may not be directly transferable to the impacts of offshore aquaculture given that aquaculture facilities differ in both above and below surface structures. Siting aquaculture in the offshore environment at a relatively low density could lessen impacts to hydrodynamic processes compared to siting aquaculture in nearshore coastal environments. Offshore environments generally can have relatively few fixed structures, and oceanographic processes on temporal and spatial scales tend to be larger and are unlikely to be impacted by fixed structures.

Individual aquaculture facility characteristics as well as local conditions need to be considered to assess impacts. Hulolt et al. (2020) suggests that effects vary with structure type and water permeability as well as spatial organization. Impacts to carrying capacity are influenced by facility dimensions, extent, and shape and layout, including orientation to prevailing currents and waves and culture density. Bathymetry and structural features of the facility (e.g., density of lines and canopy, proportion of water depth occupied, proximity to other aquaculture facilities or structure) can interact with and influence potential impacts (Mascorda Cabre et al. 2021). Small facilities in high energy offshore environments are likely to have a smaller impact compared to natural variability and overall system dynamics. Larger structures may have more of an impact on flow and energy dissipation and local hydrodynamics. Larger structures can act as physical obstacles to water flow, affecting current velocities and the velocity profile of the water column, which could result in an increase in seabed scour and biodeposit resuspension, drag and formation of a wake, or water column stratification and nutrient and carrying capacity impacts. Mascorda-Cabre et al. (2024) suggests that aquaculture siting and positioning should consider current direction to minimize drag effect.

Local changes to current velocities were observed around mussel facilities between 3 and 10 km (1.6 and 5.4 nm) offshore in depths between 20 and 30 m (66 and 98 ft.) (Mascorda-Cabre et al. 2024). Mascorda-Cabre et al. (2021) provides an overview of potential impacts of offshore mussel aquaculture on water flow, wake formation, wave attenuation, and water column processes (e.g., vertical mixing), which can ultimately impact the carrying capacity in and around aquaculture facility sites. Frieder et al. (2022) developed the Macroalgal Cultivation Modeling System (MACMODS) to explore within-facility modifications to light, seawater flow, and nutrients, finding that regional ocean conditions influence overall yield, longlines affect flow, circulation and turbulence, and effects extend beyond the aquaculture facility. MACMODS could be used in facility design and project level analysis.

We consider the general impacts of aquaculture gear to hydrological conditions. Project-level NEPA would need to consider site location relative to oceanographic conditions and other aquaculture facilities and offshore infrastructure to further assess potential impacts to hydrodynamic processes.

Siting aquaculture in AOA options could limit impacts to oceanographic conditions because the areas have relatively few fixed structures, by design. With site-specific planning, monitoring and gradual expansion, it is expected that siting aquaculture facilities in AOAs may not impact larger oceanographic processes. Modeling approaches used for other industries (e.g., wind) could be incorporated into analyses of individual projects and can include other stressors such as hypoxia, ocean acidification, marine heat wave events, and ocean warming. Potential impacts may be examined for individual aquaculture facilities as well as those sited within close proximity within the specific environmental context.

Siting aquaculture in higher energy offshore environments could result in higher rates of infrastructure loss or damage (Fujita et al. 2023). Aquaculture facilities may need to be engineered to withstand the associated operating environments. There are no engineering design standards in the U.S. currently; however, designs and engineering recommendations usually take into account typical as well as extreme conditions (Stevens et al. 2008; Fredriksson and Beck-Stimpert 2019), see also Chapter 3, Section D.vii (Public Health and Safety). Practices need to be compatible with changing ocean conditions, with species

selected for culture resilient to storms and environmental shifts accompanying El Niño and La Niña conditions (e.g., Buck et al. 2018 for IMTA) or aquaculture practices including gear removal at certain times. Operational windows may be needed to accommodate weather conditions. New, innovative designs that are currently being tested could allow systems to adjust to changes in circulation and nutrient flows.

Alternative 1: No Action

Under the no action alternative, no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

The mean depth for all eight AOA options in Alternative 2 range from 25 to 95 m (82 to 312 ft.) deep. The shallowest depths in Alternative 2 are in the N2 cluster, AOA option N2-E (25.4 m [83.3 ft.]), N2-D (31.5 m [103.3 ft.]), and N2-C (48.1 m [157.8 ft.]). Predominant currents are from the east-southeast with mean velocities ranging from 0.3 m/sec to upwards of 1.3 m/sec. On average, the area consists of a mild wave climate with wave heights averaging 0.6 to 1 m [2.0 to 3.3 ft.] with 7 to 10 second wave periods predominantly from the west or west-southwest (Morris et al. 2021), however the localized wind and wave conditions in the Santa Barbara Channel are complicated and variable. Local seas are often highly variable, reflecting complicated local windfields associated with coastal/island topography, while ocean swells are sheltered by Pt. Conception and the Channel Islands. The energy and direction of local seas vs. ocean swells can vary throughout the Santa Barbara Channel daily. Waves propagating into the Santa Barbara Channel from the W-WNW hit the northern coasts of San Miguel, Santa Rosa, Santa Cruz, and Anacapa Islands, and a significant amount of the incident wave energy reflects back into Channel, though the amount of wave energy reflected from all the Channel Islands is frequency dependent. In both high and low wave energy conditions, reflection from the Channel Islands can contribute significantly to the wave energy at the east end of the Channel and along the Santa Barbara County coastline (Guza and O'Reilly 2001).

The Alternative 2 area has a higher concentration of fixed structures already present in the region compared to Alternative 3, (Kramer et al. 2015, Nishimoto et al. 2019, USACE 2021, and Morris et al. 2021), which contribute to baseline hydrodynamic conditions. This includes offshore oil platforms and associated platforms and the Santa Barbara mariculture facility. Sites N2-A, N2-B and N2-D are farthest from oil and gas platforms. A number of boreholes can be found near all of the sites in this alternative. These factors influence the baseline hydrodynamics of the area. Alternative 2 includes more AOA options than Alternative 3 and siting aquaculture may have relatively more impacts if all 8 AOA options have aquaculture facilities developed in them.

a) Shellfish and Macroalgae

Macroalgae cultivation can reduce current speeds, deflect wave energy and alter sedimentation patterns (USACE 2021). MACMODS (Frieder et al. 2022) was developed to model kelp aquaculture within the Santa Barbara Channel and could be used to model specific impacts. Shellfish aquaculture can also impact flow.

b) All Types of Commercial Aquaculture

Without specific information about the individual aquaculture facility, it is not possible to conclude the relative impact reflected in this alternative on hydrodynamic processes. Impacts are likely to be similar to those summarized above under potential impacts. Finfish aquaculture has been shown to create a drag effect (Jiang et al. 2022). Hydrodynamic impacts for siting all types of commercial aquaculture are expected to be more than those for macroalgae and shellfish, as finfish aquaculture has been shown to create drag effect.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

The mean depth for the AOA options in Alternative 3 range from 66.6 m (218.5 ft.) to 98.9 m (324.5 ft.) deep. The shallowest depths in Alternative 3 are in 55.4m (181.8 ft.). Current speed and direction vary by month and depth with a southeasterly direction on the surface. Average current velocity at the surface was 0.11 m/s, with a minimum of 0 m/s and maximum of 0.48 m/s, respectively. Current speed decreased with depth, with average current speeds of 0.07 m/s at 10 m depth and 0.05 m/s at 40 m (131 ft.) depth. The current speed did not exceed 1 m/s over the 5-year period. Wind velocity at the site averaged 4.5 m/s, with a minimum of 0 m/s and a maximum of 16.8 m/s, predominantly from the west-southwest (Morris et al. 2021)). The average significant wave height from 1979 to 2010 was 0.91 m (3.0 ft.) with a period of 13.8 seconds, with waves predominantly from the west (Morris et al. 2021).

Overall, AOA options reflected in Alternative 3 have deeper maximum depths and fewer fixed structures nearby potentially affecting the baseline hydrodynamic conditions as compared to Alternative 2. The two Alternative 3 AOA options are two of the smaller options, with the largest being 1,000 acres (405 ha). Impacts to hydrodynamic processes may be lessened due to the smaller size and deeper depths, depending upon specific aquaculture facility characteristics (e.g., depth of facility in relation to the water column). Current speeds are also slower, so any impacts from the facilities could be more pronounced.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from shellfish and macroalgae reflected under Alternative 2a is the same as reflected under Alternative 3a. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

b) All Types of Commercial Aquaculture

The impacts under Alternative 3 may be the same as Alternative 2b, except they would take place in the Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3b. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

Alternative 4: Combination of Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Impacts to hydrodynamic processes may depend upon aquaculture facility scale and proximity to other facilities and fixed structures. Several facilities spread across a large area could result in less impact than concentrated aquaculture in a localized area. Siting aquaculture in more shallow areas could result in more of an impact compared to deeper depths, but this is highly dependent upon the number and density of other structures in the area. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available

information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

ii. Marine Managed Areas and Special Resource Areas

Affected Environment

Managed Marine areas and Special Resource Areas, for the purposes of this PEIS, are considered to include areas identified within those boundaries of a National Marine Sanctuary (NMS) defined under the National Marine Sanctuaries Act (NMSA) (1972), Marine National Monument under the Antiquities Act, National Estuarine Research Reserve under the Coastal Zone Management Act or Coastal and Estuarine Land Conservation Program (CELCP), NMFS gear restricted areas, National Parks and National Wildlife Refuge under the Administration Act and National Wildlife Refuge System Improvement Act, as well as state or local-level protected areas. Some of these areas can be considered Marine Protected Areas (MPAs). A de facto MPA is a broad term for a park or other protected area that includes marine areas where access or activities for reasons other than conservation or natural resource management are restricted (National Marine Protected Areas Center 2008). They do not include areas managed for sustainable production. E.O.13158 (2000) called for the US to develop and support a national system of MPAs. Each type of protected area has a unique regulatory structure that may prohibit activities associated with aquaculture or regulate for the potential impacts. Cetacean Biologically Important Areas, which are not regulatory, are discussed in Chapter 3, Section C.i (Federally-Protected Species and Habitat).

Natural and cultural resources considerations were included in the relative suitability analysis for the Atlas (Morris et al.2021). Figure 5 illustrates the alternative areas with respect to Federal and State managed marine and special resource areas occurring within each basin.

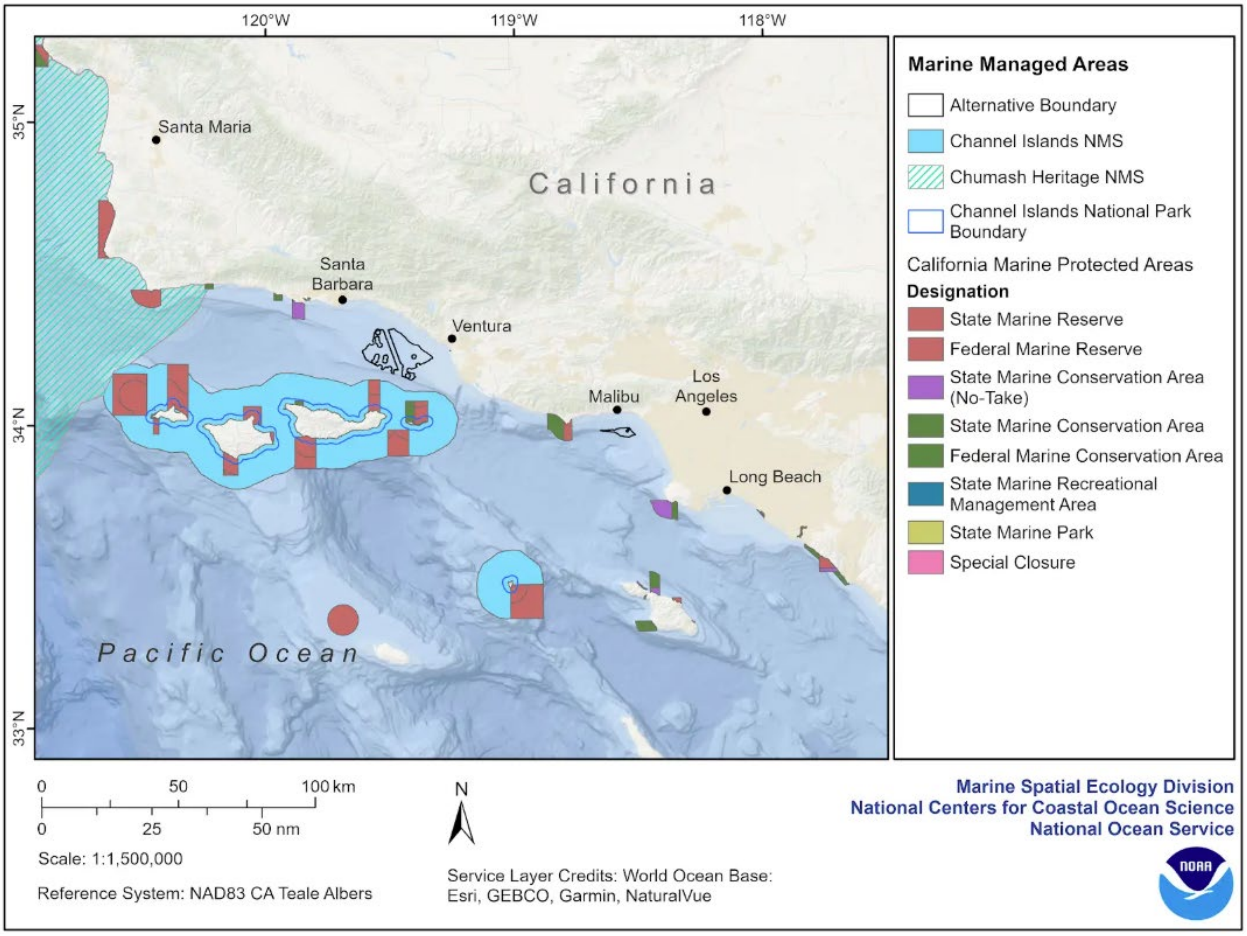


Figure 5: Marine Managed Areas in Proximity to Alternative Areas

While our action of identifying AOAs may not impact these areas, areas outside the boundaries of the AOAs considered here could be impacted if an aquaculture facility is sited within an AOA in the future. Proximity, currents, facility type, and boat traffic patterns need to be considered. None of the areas listed below overlap with any AOA options, but may still be impacted indirectly by an aquaculture facility, if one is sited within an AOA.

- The California Coastal National Monument is located along the entire coastline of California and ensures the protection of all islets, reefs and rock outcroppings along the coast of California within 22 km (12 nm) of shore.
- The 2001 Cowcod Conservation Areas (CCAs) have been repealed in federal regulations as of January 1, 2024.
- The Channel Islands NMS protects 1,470 mi² of ocean waters around the Northern Channel Islands: Anacapa, Santa Cruz, Santa Rosa, San Miguel, and Santa Barbara Islands (https://channelislands.noaa.gov/). This NMS provides protection for endangered species, sensitive habitat, historic shipwrecks, and cultural resources. This Sanctuary is closest to Alternative 2, 3.04nm from N1-C and 4.96nm from N1-B. The submerged lands and waters within 1 nm of each island are also part of the Channel Islands National Park.
- The Chumash Heritage National Marine Sanctuary (CHNMS) area comprises the coastline and waters offshore San Luis Obispo and northern Santa Barbara counties and includes the Santa Lucia Bank, its escarpment, Rodriguez Seamount, Arguello Canyon, and other offshore features and resources to approximately 78 miles offshore (NOAA ONMS 2023). The area is over 20nm north of Alternative 2.

- California MPAs, designated under the California Marine Life Protection Act (CMLPA), as amended, (Fish and Game Code Sections 2850-2863) and Marine Life Management Act (MLMA), make a network of protection along the entire California coast in state waters (CDFW 2022). Several State Marine Conservation Areas (SMCA) and State Marine Reserves (SMR) (no-take) occur near both Alternatives (https://wildlife.ca.gov/Conservation/Marine/MPAs/Network). The Scorpion State Marine Reserve is the closest, 5.87nm from N1-C (Morris et al. 2021). Alternate 2 locations have no-take SMCA to northwest and both SMCA and SMR to southwest on the Channel Islands that protect rocky shorelines, eelgrass beds, and kelp forests. Alternative 3 locations have coastal SMCA and SMR to northwest and SMCA's to the southeast. The Point Dume SMR 9.50nm from Alternative 3 supports the resources noted above plus garibaldi, rockfish, spiny lobster, and other species.
- The Santa Barbara Channel Ecological Preserve and buffer is reserved for scientific, recreational, and other similar uses pursuant to Public Land Order 4587 (34 FR 5655). The area is exempt from exploratory drilling and operations for oil, gas, and minerals (BOEM 1971). Commercial and recreational fishing and other related activities are allowed (34 FR 5655). The preserve occurs near Alternative 2 between three to five miles from shore (BLM 1979). The preserve was incorporated into the Atlas as part of the site characterization for natural and cultural resources, but was not considered incompatible with aquaculture (Morris et al. 2021).
- The nearshore area between Ventura County line and Latigo Point is an Area of Special Biological Significance (ASBS). ASBs are designated by the State Water Resources Control Board and monitored and maintained for water quality (LARWQCB 2011). The same area and the nearshore area between Palos Verdes Point and Flat Rock Point is also designated a significant ecological area by the County of Los Angeles. There are a series of ASBSs along the nearshore of Laguna Beach. These areas are closest to Alternative 3, see Figure 8 in Section 3.B.iv (Water Quality) for additional information. There are additional ASBS around the nearshore areas of the Channel Islands.

See Chapter 3, Section B.iv for Water Quality discussions and modeling. See Chapter 3, Sections C.i and C.ii for Critical Habitat, Essential Fish Habitat (EFH), and USFWS Wildlife Refuges discussions. See Chapter 3, Sections E.i and E.iii for Tribal and Archeological discussions.

Stressors

None of the AOA options within Alternative 2 or 3 are within a marine managed area. Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- changes in water quality;
- changes in hydrodynamic processes; and
- increased vessel traffic in and out of coastal areas.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Water quality impacts could occur within marine managed areas due to siting and operation of aquaculture within an AOA. Increases in turbidity from placement and decommissioning may depend on

prevailing currents and winds. Water quality impacts are considered in Chapter 3, Section B.iv (Water Quality). Given baseline conditions of considerable vessel activity in the region and vessel traffic patterns, no meaningful change from baseline conditions is expected with respect to vessel traffic in or within close proximity to marine managed areas due to placement, operation, or decommissioning (see Chapter 3, Section D.vi (Transportation and Navigation)). For impacts to biological resources that are supported by marine managed areas (e.g., as population sources or refugia) see Chapter 3, Section C.

Impacts to marine resources connectivity are considered below. As indicated above, marine managed areas around Alternative 2 and 3 have been identified for mobile resources. The CA MPA Network was designed to ecologically connect populations and habitats and promote ecosystem integrity and resilience to environmental change. The network can also provide for transport of non-living material among locations and seascape connectivity linking habitats of differing types, useful for species that use diverse habitats across their life history. Many marine managed areas act as sinks or sources for marine processes. Work is ongoing to model levels and patterns of connectivity across the CA MPA network using Regional Ocean Models (ROMs) (CDFW 2022). Such models could consider impacts on connectivity from the placement and operation of aquaculture structures.

Active (migratory) connectivity is the purposeful, self-directed movement of organisms from place to place. Installation and operation of offshore aquaculture facilities could result in placement of structures and vessel traffic within important migratory corridors or in the vicinity of nursery sites, which could disrupt normal movement, breeding, and foraging behavior of marine organisms. Impacts to actively migrating animals are considered in Chapter 3, Section C. Passive (oceanographic) connectivity is the movement of organisms, nutrients, and materials through physical processes like currents, sinking, or upwelling, such as the transport of larvae via ocean currents, and is considered below.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

If aquaculture sited in Alternative 2 disrupts hydrodynamic processes, passive connectivity between and among marine managed areas could be impacted. Facilities could have benefits if they provide habitat by acting as a larval source Alternative 2 includes more AOA options than Alternative 3 and may have relatively more impacts if all 8 AOA options have aquaculture facilities sited in them.

a) Shellfish and Macroalgae

If sited, shellfish and macroalgae facilities could change marine connectivity among marine managed areas if they impact hydrodynamic processes. The areas could alter patterns of connectivity while also serving as sinks for passively dispersing resources, effectively blocking flow of resources, or acting as sources if the facility serves a habitat function. There would be no impacts in identifying AOAs.

b) All Types of Commercial Aquaculture

Effects could be similar to those above with the added potential effect of effluent discharge into marine managed areas. The geographic extent of water quality impacts from operation of a finfish facility, and the potential to impact marine managed areas would be quantified through water quality and depositional modeling. There would be no impacts in identifying AOAs.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Siting aquaculture in Alternative 3 could have relatively similar impacts to Alternative 2, although this area is farther from marine managed areas and could therefore have fewer impacts depending upon prevailing currents and winds.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from shellfish and macroalgae reflected under Alternative 2a is the same as reflected under Alternative 3a. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3b. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

Alternative 4: Combination of Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified. If multiple AOAs were identified, then more aquaculture may develop in the identified areas. There is a greater potential for impacts with more facilities sited but modeling is needed to understand the impacts.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as those described under Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4b.

iii. Seafloor Characteristics

Affected Environment

The USACE, under section 10 of the Rivers and Harbors Act of 1899 [RHA (33 U.S.C. §403)], including the extension of the RHA to the limits of the outer continental shelf by the Outer Continental Shelf Lands Act {OCSLA [43 U.S.C. §1333(a)(1)]}[2] is responsible for regulating structures affecting navigable waters. Section 10 authority prohibits the unauthorized obstruction or alteration of any navigable water of the U.S. The construction of any structure in or over any navigable water of the U.S., excavating from or depositing of material in such waters, or the accomplishment of any other work affecting the course,

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The Outer Continental Shelf Lands Act (OCSLA) established Federal jurisdiction over submerged lands on the OCS seaward and outside of those under State jurisdiction pursuant to the SLA (described in Section A.ii (Federal and State Regulatory Frameworks) (43 U.S.C. § 1331(a) and (e)).

location, condition, or capacity of such waters is unlawful unless the work has been authorized by USACE through a permit (33 CFR 320.2(b)).

The California coast represents a tectonically active area with a continental shelf that is only a few miles wide and coast that drops quickly into deep water. The SCB as a geologic region is called the Continental Borderland, which is characterized by the large-scale interactions of the North American Plate and the Pacific Plate within the San Andreas Fault System (Dailey et al. 1993, NCCOS 2005). Bathymetric features of southern California include the continental shelf, steep and eroded continental slope, continental rise, and deep-sea floor (Whitmire and Clarke 2007, Heintz et al. 2008, Kramer et al. 2015, Morris et al. 2021). High ridges between the basins can influence circulation and upwelling patterns (Hickey 2000, NCCOS 2005).

Geological activity in the SCB, particularly in the Santa Barbara Channel, has influenced the design and construction of oil and gas facilities as well as wind in other areas of CA (Tajalli Bakhsh et al. 2023). Offshore oil wells have been damaged by subsurface faulting during earthquakes. Natural oil seeps in the Santa Barbara Channel are estimated to discharge approximately 150-170 barrels (6,300-7,140 gallons) of oil per day.

The Santa Barbara Basin is bounded by the California coast, Channel Islands, and narrow sills to the west. A detailed map of the Basin can be found in Eichhubl et al. (2002). The maximum depth is 550m (1,804 ft.) (Bograd et al. 2002). The Santa Monica Basin is open to the San Diego Trough to the southeast, the Santa Barbara Channel to the northwest, and the Santa Cruz basin to the west. It is bounded by the Palos Verdes Peninsula to the South, and Point Dume to the North. Tabau et al. (2015) detail the bathymetry of the region from shallow nearshore to depths of 1,000 m (3,281 ft.) in the basin. Seafloor characteristics include submarine canyons such as Dume, Santa Monica and Redondo canyons (Tabau et al. 2015, Morris et. al 2021). Submarine canyons impact local and regional circulation (CDFW 2016a, CDFW 2022).

Seafloor substrates are important when siting aquaculture and modeling potential water quality and depositional impacts. Morris et al. (2021) included data layers for known deep sea corals, hard bottom and rocky reefs to constrain the model with respect to these resources. The Atlas applied setbacks from certain habitats or management areas (rocky reef EFH HAPCs with a 152 m (500 ft.) setback, deep sea coral and sponge observations with a 500 m (1,640 ft.) setback, hard bottom habitat with a 152 m (500 ft.) setback, (Morris et al. 2021)) in the development of the proposed AOA options. A more detailed and site-specific Baseline Environmental Survey (BES) may be needed for siting and permitting individual projects, providing archaeological, hydrographic, and geophysical descriptions and high-resolution maps of the seafloor, cultural resources, and surrounding sensitive habitats for consideration in NEPA and project-specific planning. The BES informs environmental models, siting, and project design (e.g., anchoring and mooring systems). Local members of fishing fleets may have site-specific knowledge of seafloor features that may not be evident from existing mapping or survey data (PFMC 2025). Sediments of the SCB consist of sand and mud (McDermott et al. 1974, Dailey et al. 1993, and Schiff et al. 2000). Sediments with high percentages of sand generally dominate the shelf, whereas sediments with high percentages of silt generally dominate the slope and basins. Rocky bottom is more common along the shelf of the onshore islands and banks where the supply of sand and silt is minimal. The Santa Monica Bay bottom habitat includes sandy soft sediments inshore and silts along slopes and canyons. Sediment resuspension can be caused by natural and anthropogenic forces. One of the existing impacts to marine habitats in the SCB is sediment contamination, which may occur through natural sediment dynamics, or through disturbance of the sediment, e.g., following vigorous winter storms, but also has historically been associated with anthropogenic sources like wastewater treatment, ocean disposal, etc. Areas with high levels of sediment contamination (from DDT, PCBs, and lead) in concentrations that are harmful to marine organisms still exist in parts of the SCB, but the top layer of sediment is now much cleaner than it was in the 1970s due to the banning the use of the most toxic chemicals (DDT and PCBs in the 1970s), initiation of wastewater pretreatment programs (in the 1970s), and improved treatment technology have

all contributed to this improvement and since the early 1980s, contaminant concentrations both in sediment and in the tissues of organisms has continued to decrease (LARWQCB 2011).

See Chapter 3, Section C.ii (Wild Fish Stocks) for more information on EFH, and Chapter 3, Section C.iii (Ecologically-Important Marine Communities) for more information on benthic communities.

Stressors

Existing stressors include baseline seismic activity, anoxic sediments (Hickey 2000, Yousavich et al. 2024), sediment contamination with PCBs, DDT and PAHs, copper, zinc, and chlordane (Mearns et al. 1991, Fairey et al. 1998, Schiff et al. 2000, and Morris et al. 2021), oil and gas infrastructure and activity, shipping and port activity, and coastal population pressures. Sediment toxicity across the SCB is low, with 98% considered unimpacted, and chemical exposure categories generally greater in embayments than offshore (SCB 2018 Regional Monitoring Program Sediment Quality Assessment Planning Committee 2022, Du et al. 2020).

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- benthic impacts due to anchors, deposition, site surveys, and monitoring; and
- changes in hydrodynamic processes that could result in changes in erosion or siltation.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors. Impacts to seafloor characteristics may be influenced by factors including type of aquaculture, mooring system, and sediment type. The seafloor footprint of a facility may be larger than the surface area covered by cages or longlines.

Setbacks from sensitive seafloor habitats were used during the Atlas spatial modeling process ((rocky reef EFH HAPCs with a 152 m (500 ft.) setback, deep sea coral and sponge observations with a 500 m (1,640 ft.) setback, hard bottom habitat with a 152 m setback) (Morris et al. 2021). These setbacks allow distance between the aquaculture operation and the habitat, minimizing potential impacts from anchoring, sediment deposition, or water quality changes. Analyses in the Atlas used a 10-acre grid size, however direct seafloor impacts from anchoring to sensitive habitats are not expected to occur because more detailed site-specific BES's could be conducted before siting projects and placing anchors. Modeling may be conducted to examine depositional impacts beyond the facility site footprint.

Seafloor damage (i.e., breaking, scraping or crushing) associated with installation of anchors or permanent moorings, or the swing of a mooring line during operations could occur. The extent of the impact may depend on the number of moorings and the specific type of substrate. For instance, a single-point mooring swings in a radius around an anchor, which could potentially scour the seafloor within the mooring's footprint. This activity could flatten an area that previously contained elevated, breakable habitat (e.g., relic reef, rock pinnacles). Multiple-point moorings sway back and forth and have much less slack that could make contact with the seafloor, thus reducing the potential impacts to elevated benthic structures. There may be little to no effect from these types of impacts on soft sediment or sandy substrate (Helsley 2000, as cited in NMFS 2021a).

Deposition from all types of facilities can result in changes to seafloor sediments (e.g., Sun et al. 2023). Particulate and dissolved organic matter depositing on the seafloor could provide substrate for fouling

organisms, impact sedimentation rates and sediment sulfide or organic enrichment levels, modifying the benthic environment (LaCoste et al. 2018, Tan et al. 2024). Depositional models can be used to understand the potential impacts for specific projects (e.g., Cromey et al. 2002; Weise et al. 2009; and Cromey et al. 2012).

Numerous studies have shown that organic enrichment of the seabed is the most widely encountered environmental effect of culturing fish (Karakassis et al. 2000, Karakassis et al. 2002, and Price and Morris 2013). Deposition of feces and uneaten food from finfish facilities can increase organic matter within sediments, particularly in nearshore, shallow systems, and impact physio-chemical processes, oxygen availability, and benthic communities (Brooks et al. 2003, Price and Morris 2013, Legrand et al. 2024, and Ocean Era 2021). Indicators of potential environmental impacts include total organic carbon, redox potential, free sulfides, abundance and diversity of marine organisms (Porrello et al. 2005, Price and Morris 2013, and Rust et al. 2014). The U.S. EPA 2020 evaluation of the Ocean Era Final Ocean Discharge Criteria Evaluation provides an extensive review of potential impacts (EPA 2020).

Sediment quality around finfish aquaculture operations may be determined, in part, by the composition and size (i.e. pelleted feed) of the feed used on-site. Feed settling rates vary by feed type, with slower sinking feeds resulting in greater dispersion. Feed quality and feed management are important considerations with respect to the potential environmental effects of finfish net pen aquaculture. Inappropriate feeding practices can result in overfeeding, increased feed wastage, excess nutrients released from the facility, and increased risk for environmental impacts (Hasan and New 2013).

The spatial patterns of organic enrichment from fish aquaculture varies with physical conditions at the sites and facility specifics (Mangion et al. 2014). An environmental monitoring study of offshore finfish culture of mutton snapper (*Lutjanus analis*) and cobia (*Rachycentron canadum*) in waters of Puerto Rico reported no evidence of anaerobic sediments beneath the fish cages, and inorganic nitrogen levels near the cages similar to background levels (Alston et al. 2005). Alston et al. (2005) noted that effects to sediments were observed directly beneath the cages, just prior to harvest (a period when feeding rates are at their highest). A benthic monitoring study near a Pacific threadfin (*Polydactylis sexfilis*) aquaculture operation in the waters of Hawaii reported the impacts of a gradual buildup of organic material beneath the fish cages and shift toward anaerobic conditions at sites near the fish culture cages (Lee et al. 2006). A 2006 report by New Hampshire Sea Grant indicated no measurable environmental impacts associated with its offshore aquaculture demonstration project (Barnaby 2006). Benthic impacts can occur when the decomposition rate is insufficient to keep up with the supply of uneaten fish feed and fish waste, resulting in an accumulation of solids and nutrient enrichment to sediments. The settlement rate of particulate waste is a function of current speed, with lower-velocity currents resulting in greater localized waste accumulation and high-velocity currents resulting in a greater spatial distribution of material. Depositional sites tend to accumulate organic matter, while particulate accumulation is unlikely to occur on erosional seafloors due to greater material dispersion and subsequent decomposition and assimilation by benthic organisms (Rust et al. 2014).

Siting in deep, well-flushed areas over erosional seafloor limits effects seen in nearshore environments (Hartstein and Stevens 2005, Price and Morris 2013, and Rust et al. 2014). Net movement of organic matter away from the site disperses nutrients over a broader area for decomposition and assimilation. Depositional modeling as well as monitoring can predict and track the extent of impact. Accumulation of some organic matter below facilities may occur toward the end of a grow-out period when aquaculture biomass is at its peak. Fujita et al. (2023) note that while metabolic waste products have on occasion resulted in eutrophication and low oxygen conditions at some nearshore aquaculture facilities, similar impacts are not expected to occur at offshore facilities given the assumption that increased flushing rates may aid dispersion. However, Fujita et al. (2023) caution that such impacts are still possible, especially when considering cumulative impacts, given the dynamic nature of nutrient fate and transport in the ocean environment. Fallowing may be needed to mitigate impacts and allow for sedimentary chemical recovery

(Brooks et al. 2003, Rust et al. 2014, Keeley et al. 2019, and Sim et al. 2024). Site-specific characteristics may interact to determine the need for fallowing and length of time.

IMTA may increase on-site retention of some aquaculture waste products by using waste as food for species of different trophic levels grown at the same site. For example, IMTA can reduce accumulation of bivalve biological deposits and total organic carbon in sediments (Ning et al. 2016; Tan et al. 2024). Estimated bioremediation efficiencies of 40-50% could be realistic for open aquaculture systems (Nederlof et al. 2021). It is noted that these studies were performed in more shallow waters than the alternatives, in which deeper waters may also help to reduce seafloor impacts from biological waste.

Materials used in offshore aquaculture can include plastics, steel, and copper alloy mesh or copper treated nets (Fujita et al. 2023). Some of these materials could degrade over time and settle to the seafloor. Aquaculture operations can be a source of plastic pollution (Skirtun et al. 2022, Lin et al. 2022). Copper and zinc are also sometimes used in fish feed and could deposit on the seafloor (Brooks and Mahnken 2003, Brooks and Drawbridge 2005). Kalantzi et al. (2016) found no copper in sediments after one year of use of copper alloy mesh and net with copper antifouling paint. Brooks et al. (2003) and Fujita et al. (2023) recommended BMPs that include washing copper-treated nets or using net cleaning robots and copper alloy nets that do not require these treatments. Other reports indicate zinc returns to baseline over time (Brooks et al. 2003; CDFG 2010). Published sediment benchmarks for zinc and copper are summarized in CDFG (2010). Changes in free sediment sulfide concentrations, copper, and zinc are sometimes used as benchmarks for when fallowing is needed (Brooks and Mahnken 2003, Brooks and Drawbridge 2005, and CDFG 2010).

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Substrate types in Alternative 2 options include mud-like silt and sand, with an average slope of 1 degree or less Morris et al. (2021). Options N1-C, and N2-C may also include sediment the size of gravel. Morris et al. (2021) noted that deep sea coral observations in this area warrant comprehensive site review and survey to characterize benthic habitat. Sites N1-A, N1-B, and N1-C are within 5 km (2.7 nm) of deep sea coral, but not within 5 km of hard bottom or rocky reef habitat (Table 3.7 p. 112 in Morris et al. 2021). None of the N2 sites are within 5 km of deep sea coral or rocky reefs. Sites N2-A, N2-B, and N2-E are within 5 km of hard bottom (Table 23.11 pg. 178 in Morris et al. 2021). Overall, N2-C and N2-D are farthest from seafloor characteristics of concern and siting aquaculture in these areas could have relatively less adverse impacts. Sediment quality across the Santa Barbara Channel is reported as unimpacted (SCB 2018 Regional Monitoring Program Sediment Quality Assessment Planning Committee 2022). Sites differ in depths and currents which could be taken into account when modeling for potential depositional impacts. Impacts from anchoring may be localized, and sensitive habitats could be avoided with proper siting considerations. Depositional impacts are less likely given the offshore environment. Additional modeling could be needed to predict impacts to nearby seafloor characteristics of concern.

a) Shellfish and Macroalgae

As described above, shellfish and macroalgae aquaculture can impact seafloor characteristics through deposition of solids. Potential impacts to hard bottom or deep sea coral are unlikely given limited extensive depositional impacts from these types of aquaculture. MACMODS (Frieder et al. 2022) was developed to model kelp aquaculture within the Santa Barbara Channel and may be useful in examining depositional impacts. As compared to activities reflected in Alternative 2b, activities reflected in this alternative may have relatively less impact on seafloor characteristics.

b) All Types of Commercial Aquaculture

Seafloor impacts are more likely with finfish aquaculture due to deposition of feces and uneaten feed and potential deposition of elements within feed. Residues from the use of antibiotics and other husbandry materials/therapeutics could also accumulate in sediments near/under farms (EPA 2020, Swam et al. 2023, Rust et al 2014, Price and Morris 2013), for more discussion on the potential impacts of antibiotics and other husbandry materials/therapeutics, see Sections 3.C.ii and iii (Wild Fish Stocks and Ecologically Important Communities). Depositional modeling may be needed to understand potential impacts to hard bottom or deep sea coral in the area. As compared to activities reflected in Alternative 2a, activities reflected in this alternative may have relatively more impact on seafloor characteristics.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Substrate types in Alternative 3 options include mud and sand, with average slopes of 2.3 and 1.6 degrees, and no indication of gravel (Morris et al. 2021). Morris et al. (2021) noted that further consideration of this may be needed in the permitting stage. The two AOA options are within 5 km (2.7 nm) of hard bottom substrate, deep sea corals, and rocky reefs as noted in Table 3.17 and Figure 3.86 of the Atlas (Morris et al. 2021). Sites are in general closer to these types of habitats compared to Alternative 2.

The major historic sources of sediment contamination in this area have been wastewater treatment facilities. While areas with high levels of contamination from DDT, PCBs, and lead in concentrations that are harmful to marine organisms and may biologically affect the food web still remain, the top layer of sediment over most of the Santa Monica Bay is now much cleaner than it was in the 1970s and most of the soft bottom habitat can now be considered in fair to excellent condition and the open ocean, seafloor habitat is considered fair to good based on limited data (LARWQCB 2011). One site within the vicinity of the alternative area was found to have “possibly impacted" sediment quality while other sites were considered unimpacted according to the Southern California Bight 2018 Regional Monitoring Program Sediment Quality Assessment Planning Committee (2022).

a) Shellfish and Macroalgae

The best available information to describe potential impacts from shellfish and macroalgae reflected under Alternative 2a is the same as reflected under Alternative 3a. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

As described above, shellfish and macroalgae aquaculture can impact seafloor characteristics through deposition of solids. Potential impacts to hard bottom or deep sea coral are unlikely given limited widespread depositional impacts from these types of aquaculture, however sites in Alternative 3 are in closer proximity to these habitats as compared to Alternative 2.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from shellfish and macroalgae reflected under Alternative 2b is the same as reflected under Alternative 3b. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

Seafloor impacts are more likely with finfish aquaculture due to deposition of feces and uneaten feed and potential deposition of elements within feed. Depositional modeling may be needed to understand potential impacts to sensitive habitats in the area. As compared to activities reflected in Alternative 2a, 2b, and 3a, activities reflected in this alternative may have relatively more impact on seafloor characteristics.

Alternative 4: Combination of Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified. Sites that would be within Alternative 2 are generally farther away from sensitive seafloor characteristics compared to sites that would be within Alternative 3, particularly N2-C and N2-D. Impacts to the seafloor resulting from siting selection of multiple areas could result in a greater area impacted by anchoring. Depositional impacts may be greater with more area selected for all types of aquaculture; however dispersed spaces could result in less concentrated depositional impact.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

iv. Water Quality

Affected Environment

Water quality is determined by complex interactions among physical, chemical, and biological processes. Physical processes include region-wide currents and tidal flows, seasonal weather patterns and temperature, sediment characteristics, and unique local conditions, such as the volume of fresh water delivered by large rivers. Chemical processes involve salinity, pH, dissolved minerals and gasses, particulates, nutrients, and pollutants. Biological processes involve the influence of living things on the physical and chemical environment. The Clean Water Act (CWA) addresses the chemical, physical, and biological integrity of U.S. waters (33 U.S.C. § 1251(a)). The EPA administers the CWA in Federal waters and may delegate the responsibility to a state government for implementation in state waters. Discharges from aquaculture operations are primarily governed by the implementing regulations of CWA Sections 402 and 403. The CWA Section 402 authorizes the EPA to issue National Pollutant Discharge Elimination System (NPDES) permits for the discharge of pollutants from point sources in compliance with CWA Section 403, and ocean discharges may not result in "unreasonable degradation of the marine environment." Potential pollutant discharges from aquaculture operations include solids, nutrients, ammonia, fish waste, feed waste, pharmaceuticals, and chemicals; most finfish operations require a NPDES permit. Shellfish and macroalgae operations that do not discharge pollutants at any time during operations may not need NPDES permits. The Oil Pollution Act of 1990 (OPA) replaced many CWA legal provisions, but Section 311 continues to provide the framework for civil and criminal enforcement for oil spills and for notification to EPA or the USCG when a spill of oil or a hazardous substance occurs (33 U.S.C. §§ 2701, 42 U.S.C. §§ 9601-9675).

Other statutes have water quality elements. Standards set under the Act to Prevent Pollution from Ships (APPS) are the responsibility of EPA and USCG, and enforced by the USCG (33 U.S.C. § 1905-1915). Title I of the Marine Protection, Research, and Sanctuaries Act, known as the Ocean Dumping Act (ODA), regulates ocean disposal of wastes by persons or vessels within the U.S. EEZ (33 U.S.C. §§ 1401). The USACE, EPA, USCG, and NOAA all have responsibilities under the ODA permitting program. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42

U.S.C. §9601 et seq. (1980)) authorizes the President to respond to releases or threatened releases of hazardous substances into the environment. Executive Order No. 12580 (1987) delegates response authorities to EPA and USCG. The Resource Conservation and Recovery Act (RCRA) (42 U.S.C. §6901 et seq. (1976)) gives EPA the authority to control hazardous waste from cradle to grave.

The Food and Drug Administration's (FDA) Center for Veterinary Medicine (CVM) regulates the manufacture and distribution of food additives and drugs that may be given to aquatic animals. In the U.S., the use of antibiotics in aquaculture production is highly regulated and there are currently no antibiotics approved for use in the open ocean environment for warm water marine species. All FDA approved antibiotics for use in animals require a veterinary feed directive (VFD) if administered in feed or a veterinary prescription if administered by other routes (e.g., immersion or injection). Additional information about the regulatory environment for drug use and approval can be found in the Rhodes et al. (2023a) and NMFS (2022a). The National Shellfish Sanitation Program (NSSP) is the federal/state cooperative program for the sanitary control of shellfish produced and sold for human consumption. NSSP promotes and improves the sanitation of shellfish moving in interstate commerce through federal/state cooperation and uniformity of State shellfish programs. The Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA 1998; embedded in Public Law 105-383), Harmful Algal Bloom and Hypoxia Research and Control Amendments Act of 2004 (HABHRCA 2004, Public Law 108–456), and 2014 (HABHRCA 2014, Public Law 113–124) mandate that NOAA advance the scientific understanding of and detect, monitor, assess, and predict HAB and hypoxia events. Congress reauthorized HABHRCA through the National Integrated Drought Information System (HABHRCA 2017, Public Law 115-423).

Persistent organic pollutants (POPs) of concern in the Pacific Ocean include pesticides, dioxins, polychlorinated biphenyls (PCBs), DDT, and poly-aromatic hydrocarbons (PAHs). Heavy metals of concern include mercury, lead, arsenic, cadmium, chromium, copper, trace selenium, and other trace metals (USFWS 2005). Mercury and total PCBs have exceeded thresholds in fish tissue in the SCB, but have generally decreased over time (McLaughlin et al. 2020). The Palos Verdes Shelf, located south and down-current of Alternative 3, is a designated Superfund site by the EPA. Due to the distance, persistent currents, and bathymetric features of the region, the sediments in the Shelf are not thought to have any impact on the AOA alternatives.

Marine debris is a problem in the SCB (McLaughlin et al. 2023). The prevalence of marine debris is affected by natural forces (e.g. currents) and anthropogenic drivers (e.g. coastal development, vessel traffic). Projected increases in vessel traffic, increased commercial and recreational fisheries effort, population growth and associated development, are expected to continue to increase marine debris (Miller et al. 2018, ONMS 2019, and Steele and Miller 2022). Plastic makes up most marine debris globally and marine debris is composed of multiple chemical compounds, some classified as POPs (Barnes et al. 2009). Compounds from marine debris can leach into ocean waters and organismal tissues (Talsness et al. 2009; Barnes et al. 2009; and Spykra 2017).

Another factor that can influence and degrade water quality are large concentrations of algae. Harmful algae are unicellular phytoplankton, or microalgae, that produce biotoxins, which often cause adverse effects on animals and humans when populations expand (Rhodes et al. 2023a, b). Populations can expand to large numbers in a short-period, creating a harmful algal bloom (HAB) event, which can impact local marine life. For example, *Alexandrium* spp., a dinoflagellate, can cause paralytic shellfish poisoning; *Pseudo-nitzschia* spp., a diatom, can cause amnesic shellfish poisoning (ASP) and produce the neurotoxin domoic acid; and *Dinophysis* spp., a dinoflagellate, can cause diarrhetic shellfish poisoning (DSP). HABs can cause sub-lethal and lethal impacts to marine organisms, which usually leads to shellfish harvest closures. HABs occur periodically in the SCB (Lewitus et al. 2012,), and toxic algal blooms have become more common in nearshore waters off California in recent years (USFWS 2005, CDFW 2010). Some recent HABs have caused fisheries and shellfish harvest closures and marine mammal and seabird mass mortality events (Lewitus et al. 2012; Smith et al. 2018). Warming waters could enhance *Pseudo-*

nitzschia blooms and environmental variation, and acidification could affect HAB dynamics (Tirado et al. 2010; Bialonski et al. 2016; and Jardine et al. 2020). HABs may increase over time given the increasing frequency of anomalously warm ocean conditions and elevated domoic acid along the West Coast is related to the warm phases of the PDO and the Oceanic Niño Index (Cavole et al. 2016, and McKibben et al. 2017). EPA has regulatory responsibilities for marine waters affected by HABs under the CWA. HABs and mortality events related to water quality can impact biological resources (see Chapter 3, Section C) and public health and local economies (see Chapter 3, Section D).

As discussed in section 3.B.i, the SCB is an upwelling system. Low oxygen, or hypoxic, conditions may occur over the continental shelf following spring upwelling, and continue into the summer and early fall months (Harvey et al. 2023, Chan et al. 2008). There is lower spring and summertime dissolved oxygen in surface waters, close to a hypoxic threshold, while subsurface waters 50 to 150 m (164 to 492 ft.) usually stay at least two times higher than the hypoxic threshold except for in localized areas (Harvey et al. 2023). Eutrophication from land-based nutrient inputs has been modeled to have pervasive sublethal, ecologically relevant changes in this region, potentially reducing potential pelagic habitat for some species during late summer, when viable habitat is at its seasonal minimum (Frieder et al. 2024). Ocean acidification and low pH conditions associated with air pollution and environmental variation are ongoing stressors for marine ecosystems off the coast of California and projected to increase (Marshall et al. 2017) Increasing ocean acidification adds to naturally high levels of carbon dioxide in upwelled waters along the California coast (OEHHA 2022).

Ocean acidification is caused by the ocean absorbing anthropogenic carbon dioxide from the atmosphere, which lowers the pH and leads to low dissolved oxygen (Stallinga 2018). Eutrophication can increase the susceptibility of coastal waters to ocean acidification (Cai et al. 2011). Ocean acidification can impede larval development in shellfish by causing the outer shell to become soft; this has been reported in Pacific and Eastern oysters and blue mussels (Gazeau et al. 2014). Greenhouse gasses trap energy in the atmosphere from the sun and the energy is absorbed by the ocean, causing the water temperature to rise, which can impact marine species (Friedland et al. 2019; Wang 2022; and Gevondyan et al. 2024).

The Atlas characterized baseline water quality conditions (chlorophyll-a, water clarity, mean nutrient concentration for nitrate, phosphate, and dissolved oxygen at depth) using data satellite data from the National Aeronautics and Space Administration (NASA) and the Southern California Coastal Water Research Project (SCCWRP) (Morris et al. 2021). Concentrations were generally similar across the Alternative areas of analysis; data sources can be found in Appendix A of the Atlas. Surface salinity in all areas analyzed is consistent throughout the year and among sites at an average of 33.6 psu (Morris et al. 2021). Current speed and direction vary by month and depth, and water temperatures fluctuate seasonally with episodic storm events and shifting current patterns. Chlorophyll-a concentration, which is an indicator of phytoplankton abundance, also fluctuates seasonally). Water quality indicators for each Alternative area are provided below, under potential impacts.

Stressors

A variety of ongoing stressors impact water quality in the SCB. Twenty-four major watersheds drain into the SCB (McGinnis 2006). Currents can transport water from heavily urbanized and industrialized waters of Los Angeles and Orange Counties into the Alternative areas and eddy systems can entrain and trap waters carrying contaminants. In the past, oil, sewage, chemical spills, and dumping of DDT occurred in the SCB, which is still impacting some sections of the region (Morris et al. 2021; Rhodes et al. 2023b, Almada et al. 2023, Schmidt et al. 2024, EPA 2025), but primarily off Los Angeles away from the proposed AOAs; chemical substances were dumped in the ocean near Catalina Island, including DDT after it was banned in the 1970s. All known disposal sites are located south and southwest of the proposed AOAs. Other stressors impacting water quality include natural oil seeps and coastal runoff; natural seeps are the primary source of oil pollutants. Figure 6 shows the proximity of coastal river outlets to the Alternative areas. Kessouri et al. (2021) indicated nitrogen inputs from anthropogenic activities increase

photosynthesis and biomass of phytoplankton, which can in turn increase oxygen loss and acidification of the water column. Seasonal shifts in ocean currents also create natural cycles in oxygen levels that affect water quality in the SCB (Yousavich et al. 2024). Sea surface temperature and episodic warm water anomalies, periodic decreased DO, and ocean acidification have also been noted (ONMS 2009, CINMS 2010). The Santa Barbara Channel AOA options are within 5 km (2.7 nm) of inactive and active oil platforms and oil wells, and Santa Monica AOA options are within 5 km of inactive oil wells, and a wastewater outfall. Sewage treatment plant effluent has declined over time, but surface water runoff is still a primary source of pollution impacting water quality. Figures 7 and 8 show locations of existing NPDES monitoring stations. More on oil and other offshore infrastructure is provided in Section D.vii (Offshore Energy and Public Services).

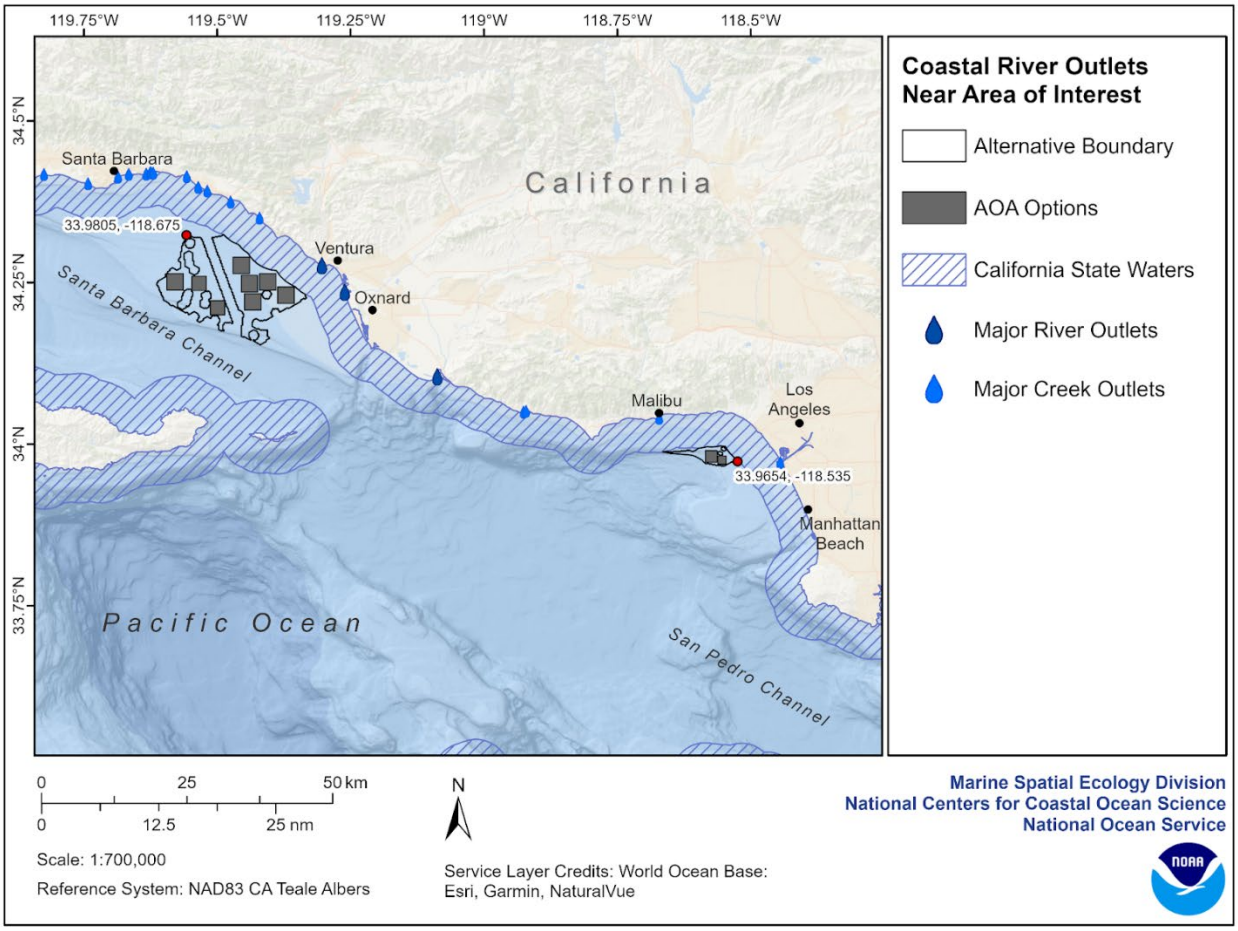


Figure 6: Coastal River Outlets in Proximity to Alternatives

Environmental variation can affect overall water quality and cause changes in marine ecosystems. Ocean temperatures have increased over the last two decades (UNESCO 2024) and episodic warm water anomalies have been documented in California, which is altering and stressing the local marine community. Decreased DO and ocean acidification have also been documented, which is adding to stress (CINMS 2010). Water quality can potentially interact with pathogens and disease, which could be a concern for future aquaculture operations (Rhodes et al. 2023a). Aquaculture could result in stressors to existing NPDES discharge monitoring programs by potentially affecting the baseline conditions.

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- excess feed, metabolic waste, other particulates or suspended organic matter;
- nutrient enrichment;
- nutrient deficits;
- HAB interactions;
- vessel fuel emissions into water, fuel and chemical spills, other pollutants from mechanical operations;
- changes in turbidity;
- sediment disturbance due to vessels and equipment placement
- risk of marine debris; and
- chemical leaching.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Potential impacts to water quality could vary in severity and magnitude depending on various factors, such as the average current speed and direction and project design, if aquaculture facilities are sited in these areas. Physical changes to water quality are considered in this section, while water quality nexus issues are discussed in various other sections, including potential adverse impacts on biological resources (Chapter 3, Section C), and socioeconomic resources, including potential impacts on public health and safety (Chapter 3, Section D).

Aquaculture operations could impact water quality through effluent discharge (e.g., ammonium, nitrate, phosphate, and organic carbon compounds). This is primarily a concern for finfish operations. Feed accounts for most of the environmental impact from fed aquaculture (Naylor et al. 2021) and feed quality is an important factor with respect to potential water quality impacts (Kong et al. 2020). Nutrients, feed and feces are soluble (Fernandes et al. 2007). Waste can change the DO and other water quality parameters or have compounding effects with existing threats, such as acidification and HABs (Price and Morris 2013, Kessouri et al. 2021). Impacts can extend beyond the aquaculture operation's footprint. Research indicates that siting facilities in well-flushed water, like offshore, can usually mitigate many of the potential adverse water quality impacts associated with finfish cage culture operations and enrichment to the water column is generally not detectable (Alston et al. 2005; Price et al. 2015, Tlusty et al. 2005, and Welch et al. 2019). Price et al. (2015) reported no significant differences in dissolved nitrogen concentrations between the aquaculture and control sites in many offshore cage culture operations; concentrations of phosphorus, DO, turbidity, and lipids were sometimes elevated at or near the offshore cages, but declined with distance. Primary production (chlorophyll a) can be elevated with distance (e.g., 1,000 m [3,280 ft.]) from operations (Price et al. 2015). The impacts of particulate discharges relative to marine finfish aquaculture are reviewed on pp. 23 through 25 of Rhodes et al. (2023a). The open ocean environment, in addition to depths and circulation patterns across all AOA options should minimize adverse impacts. In oligotrophic environments, any added nutrients from finfish operations could prove beneficial, but more research is needed (Ticina et al. 2020).

Despite the concerns associated with aquaculture nutrient effluents' potential to increase primary production, there is not a clear link to show aquaculture discharge would cause HABs (Price et al. 2015). The nutrient fluxes that influence HAB population dynamics are complex and vary for different species,

and environmental factors other than nutrient loading also contribute to the formation of HABs. Price et al (2015) conducted a meta-analysis considering worldwide results from marine fish farm research and monitoring projects and noted that siting was crucial, recommending that to avoid any potential negative interactions (both harm to fish due to exposure or stimulation of HABs from aquaculture discharge) farms should not be sited in areas with historically recurring HABs, low water exchange rates or high nutrient loads required for toxic algal bloom formation. Price et al (2015) concluded that modern farm management practices have minimized potential environmental effects of marine finfish cage aquaculture on water quality at an individual fish farm level, though the potential for additive impacts of discharge from multiple farms to lead to increased primary production and eutrophication is unknown. In general, eutrophication (nutrient pollution) or hypoxia (low oxygen concentration) are expected to be less of a concern offshore compared to the nearshore environment given the dynamic oceanographic conditions because siting fish farms in deep waters with sufficient current can disperse nutrients and prevent water quality impacts (Fujita et al. 2023, Price et al. 2015).

Other potential water quality impacts associated with offshore aquaculture operations are vessel fuel, chemicals, and other pollutants from mechanical operations that can accidentally spill into the water. This is a concern across all phases of a project and with different types of aquaculture. Another factor that could adversely influence water quality is the installation of the anchor system. Installation and general daily use has the potential to disturb seafloor sediment and cause localized turbidity.

Aquaculture operations can further impact water quality through marine debris. Accidentally-discarded, lost gear, and degraded materials from facilities could become marine debris. Materials used in offshore aquaculture can include plastics, steel, and copper alloy mesh or copper treated nets (Fujita et al. 2023). Some of these materials could degrade over time and be a source of pollution (Skirtun et al. 2022, Lin et al. 2022). Copper from fish feed or nets could leach (Brooks et al. 2003, Kalantzi et al. 2016). When ingested, marine debris can increase tissue contamination, cellular damage (e.g. tissue erosion or tumors), and reproductive issues, an existing conservation concern for fishes in the SCB (Schiff et al. 2000, USFWS 2005, Komoroske et al. 2011, LARWQCB 2011, and Spyrka 2017, Kiffney et al. 2022). Longer-living species are at higher risk to exposure to pollutants due to bioaccumulation of hard metals and tissue contamination over time and through the food web. The existing trend in this baseline condition, however, is that contaminant levels detected in the tissues of fishes and benthic species are going down (Schiff et al. 2000, LARWQCB 2011, and McLaughlin et al. 2021). However, pressures from plastic pollution and marine debris are increasing, with their own array of persistent organic pollutants within the manmade materials that are harmful to wildlife (Spykra 2017). The spatial relationships on contamination are not clear, especially for highly-mobile predators, but the magnitude of bioaccumulation is generally consistent with the magnitude of sediment contamination, and observed in higher levels in animals that live or forage at the seafloor (Schiff et al. 2000, Deheyn and Latz 2006).

Projects sited in an AOA would likely have BMPs or other permitting requirements that would be designed to manage water quality stressors; prevent spills, fires, or other sources of hazardous materials; conduct monitoring; and identify procedures to manage and clean up and report incidents. See Appendix 1 for more information on potential mitigation. It is expected that most potential adverse water quality impacts would be mediated and monitored through BMPs in permits, in accordance with the rules and regulation described in the beginning of this section, if and when projects are proposed or sited.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

According to the spatial modeling in Morris et al. (2021), the water quality characteristics are as follows for Alternative 2:

- Nitrate ranged from 0.98 mmol/m3 at 10-m depth to 7.85 mmol/m3 at 50-m depth (Figure 3.55 and 3.73 Morris et al. 2021).
- Phosphate ranged from 0.51 mmol/m3 at 10-m depth to 0.95 mmol/m3 at 50-m depth.
- Dissolved oxygen decreased from 262 mmol/m3 at 10-m depth to 225 mmol/m3 at 50-m depth.
- Chlorophyll-*a* concentration was highest in April (2.70 mg/m3) on the western side (N1 options), highest in May on the eastern side (N2 options) and lowest in October throughout the Alternative (0.96 mg/m3) (Figure 3.56 and 3.74 Morris et al. 2021).
- The diffuse light coefficient at 490 nm, Kd(490), an indicator of water turbidity, was highest in April/May (Kd(490) = 0.24 m-1) and lowest for the month of October (Kd(490) = 0.09 m-1) (Figure 3.57 and 3.75 Morris et al. 2021).
- Percent light transmissivity was highest in October at 87.8% and lowest in May at 74.8% (Figure 3.58 and 3.76 Morris et al. 2021).

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Alternative 2 straddles RWCB areas 4 (Los Angeles) and 3 (Central Coast). In general, less literature about water quality is available compared to Alternative 3. Overall, the EPA classifies water quality in the Santa Barbara Channel between fair and good (ONMS 2019). Eight watersheds drain into the Santa Barbara Channel, and marine debris and pollutants are attributed mostly to land-based sources, especially from the Ventura and Santa Clara Rivers (Spykra 2017, ONMS 2019). Based on surveys of northern Channel Islands beaches, there is a seasonal increase in trash during fall and winter months (Steele and Miller 2022). Channel Islands beaches also seem to accumulate heavier debris than mainland beaches, mostly fisheries gear (Miller et al. 2018, Steele and Miller 2022). Winds in the Santa Barbara Channel are predominantly from the northwest, and the predominant currents are southbound, which influences the movement of debris and effluents in a south or southeast direction (Spykra 2017, Morris et al. 2021, Steele and Miller 2022). Thus, future aquaculture projects would need to consider site location relative to other aquaculture facilities and offshore infrastructure to minimize risk of marine debris and effluent from other ocean-based sources; this is discussed more in Chapter 4, Section A.ii (Other Ocean Uses) and Section B (Cumulative Impacts). Potential marine debris impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity.

Discharge facilities and marine-based NPDES monitoring stations are shown in Figure 7. Besides input from rivers, water quality is impacted by the shipping industry, oil infrastructure, and past oil spills (Morris et al. 2021). Fine-scale mixing and eddy circulation in the Santa Barbara Basin has shown oil slicks from spills in the Santa Barbara Channel generally follow surface currents and counterclockwise gyres in the Channel; but wind conditions dominate movement and persistence (Pacific Northwest Laboratories 1969). Oil plumes can move up to 4.6 km (2.5 nm) per day (Pacific Northwest Laboratories 1969). The Alternative 2 AOA options are located downstream of natural hydrocarbon seeps along the coast. It is unlikely these seeps would impact offshore aquaculture. At least 38 oil seeps are located in the Santa Barbara Channel (ONMS 2019). Research showed there was no significant population change in kelp, mussel beds, abalone, urchins, and kelp bed fishes from exposure to natural petroleum seeps in the area (Straughan et al. 1982). There were some ecological differences in the intertidal areas near the seeps, but those differences decreased with distance and depth along the shelf (Straughan et al. 1982). The area may act as a sink for fixed nitrogen and a net source of N2O to the water column (Peng et al. 2024).

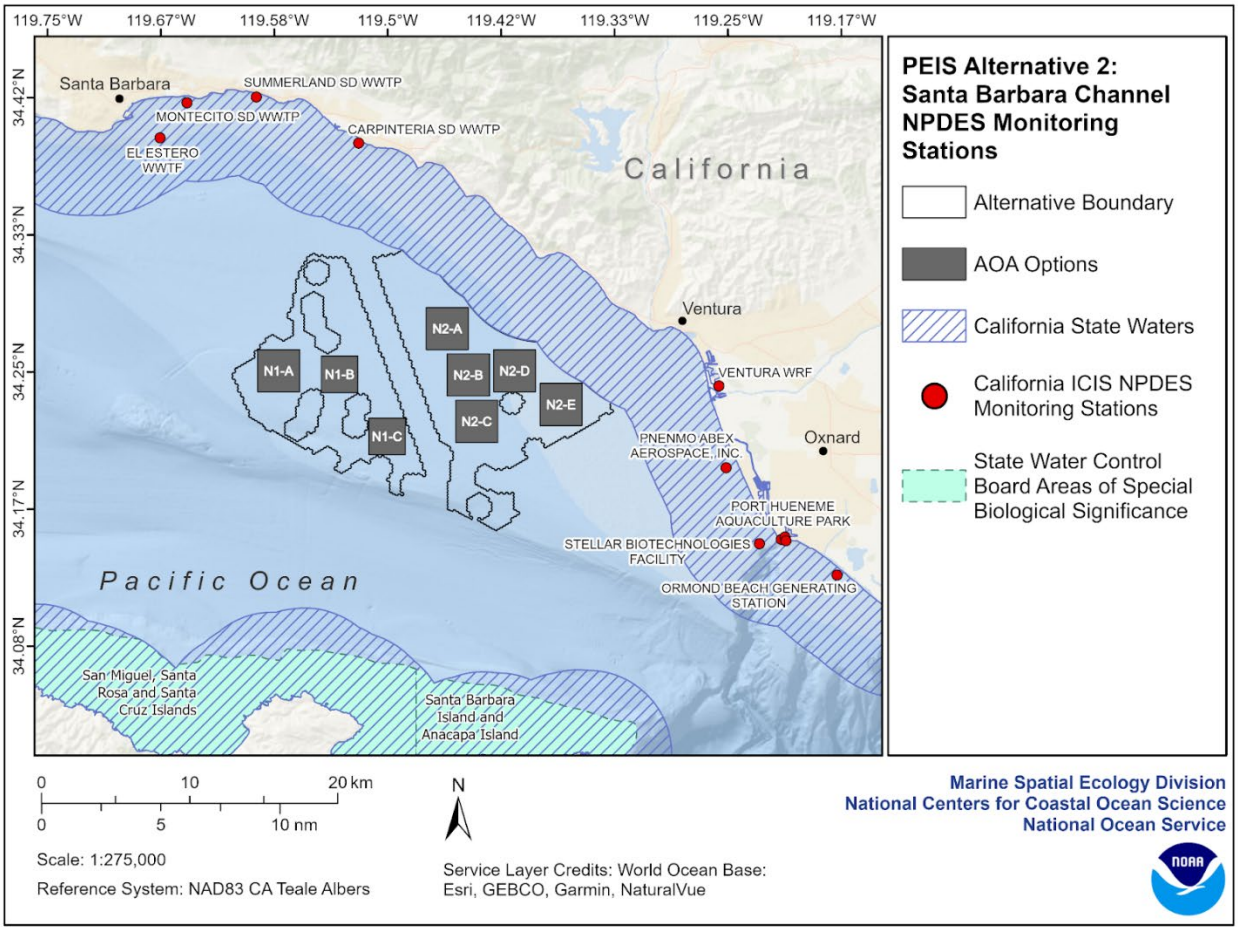


Figure 7: NPDES Monitoring Stations in Proximity to Alternative 2

The Santa Barbara Channel has been a hotspot for seasonal *Pseudonitzschia* blooms and other HAB activity in the Southern California Bight in recent decades; HABs have increased in frequency, spatial distribution, and toxicity (Anderson et al. 2009, Anderson et al. 2011, and Sekula-Wood et al. 2011). Population blooms usually occur in spring and fall during the upwelling (cold water, high nutrients) periods.

Baseline water quality conditions (chlorophyll-a, water clarity, mean nutrient concentration for nitrate, phosphate, and dissolved oxygen at depth) in the Santa Barbara Channel were examined by Morris et al. (2021). Findings showed nitrate, phosphate, and DO concentrations varied slightly by depth. In the N1 cluster, chlorophyll-a concentration (mg/m^3) was highest in April (2.70 mg/m^3) and lowest in October (0.96 mg/m^3). Surface salinity was consistent throughout the year with an average of 33.6 psu (Morris et al. 2021). The surface water temperature varied between 11°C and 22.9°C, and the average was 16.4°C (see Figure 3.49 in Morris et al. (2021)). Current speed and direction vary by month and depth with a west-northwest direction at the surface. The annual average current velocity was 0.14 m/s. The current speed was 0.12 m/s at 10 m depth and slightly slower at 75 m (0.09 m/s). The water temperature decreased to 15.8°C at 10 m depth and was the lowest at 75 m depth (11.2°C). Percent light transmissivity was lowest in May at 74.8% and highest in October at 87.8% (see Figure 3.58 in Morris et al. (2021)). In the N2 cluster, the water temperature and other key parameters were similar in the N1 cluster.

a) Shellfish and Macroalgae

Adverse water quality impacts through nutrient enrichment are not expected from bivalve or macroalgae aquaculture operations because they use no feed. However, adverse water quality impacts can occur with

shellfish aquaculture if carrying capacity of the area is exceeded and changes in water chemistry and primary production results (Liang et al. 2019). Shellfish aquaculture can alter nutrient cycling and result in changes in primary production and possible alteration of planktonic communities (Hulolt et al. 2020; CDFW 2019).

Beneficial impacts to water quality from shellfish and seaweed have also been widely noted (CDFW 2019; Gentry et al. 2020; Theuerkauf et al. 2021; and Barrett et al. 2022). Shellfish aquaculture provides positive benefit through assimilation of nutrients like nitrogen and phosphorus and can improve water quality (Naylor et al. 2021; Garlock et al. 2024). Seaweed aquaculture can enhance water quality by reducing nitrogen and can help control phytoplankton blooms and toxic algal blooms (Naylor et al. 2021). Both shellfish and macroalgae take up nutrients (e.g., nitrogen, phosphate, carbon), remove organic matter and other particulates, thereby reducing excess anthropogenic nutrients and combating eutrophication (Alleway et al. 2019, Jagtap and Meena 2022). Cultivation of macroalgae and bivalves may be important in carbon sequestration and storage and protection from ocean acidification, although more research is needed (Alleway et al. 2019). Macroalgae cultivation can also be useful for toxic metal pollution remediation (Bigelow Laboratory for Ocean Sciences 2024).

There would be no impacts in identifying AOAs, however if shellfish and macroalgae operations are sited in an AOA they could beneficially impact and even improve water quality because they may filter out pollutants. Additional benefits could be seen with respect to carbon sequestration and ocean acidification mitigation. Adverse impacts could be avoided with proper siting and aquaculture density management that recognizes carrying capacity of the system.

b) All Types of Commercial Aquaculture

There would be no impacts in identifying AOAs, however, if finfish operations are sited in an AOA they have the potential to impact water quality through discharge of uneaten feed, effluent, and associated waste products and result in nutrient enrichment. Researchers have documented that the amount of nitrogen released from marine fish cages varies among species, but it can be significant for some aquaculture species (Price et al. 2015). For instance, Alston et al. (2005) reported that 79% of the nitrogen fed to mutton snapper (*Lutjanus analis*) and cobia (*Rachycentron canadum*) was released into the water. In European aquaculture operations, nitrogen loss associated with Atlantic salmon ranged from 52 to 95% (Price et al. 2015). However, in recent decades, studies have indicated that better feed formulations and improved feeding efficiency have caused decreased nutrient loading (Price and Morris 2013) and substantially reduced water quality impacts (Rust et al. 2014). Solid waste (fecal matter and uneaten feed) can also impact water quality because it can remain suspended in the water column and become fragmented by turbulence, which can then increase turbidity and reduce water clarity (Stenton-Dozey et al. 2013). Degraded water quality has been observed at farms in nearshore areas with limited water exchange. However, when aquaculture farms are sited in well-flushed environments, water quality effects are typically not observed at distances greater than 30 m (98 ft.) from the cages (Price and Morris 2013). While nutrient spikes and dissolved oxygen decreases have been observed after feedings, monitoring data collected from marine fish operations (Alston et al. 2005; Lee et al. 2006; Langan 2007) usually show few significant or persistent water quality issues (Price and Morris 2013; Rust et al. 2014).

As discussed above, the risk can be minimized by properly siting the operations and using best management practices. It could be important for cage systems to be secured at a depth with adequate current flow. An increased number of finfish operations could increase demands on EPA resources in terms of permitting and could also impact baseline water quality monitoring in the region associated with existing water quality permit requirements. While potential impacts to EPA permitting and/or monitoring resources are not physical changes to the environment, they would occur incidentally and directly related to the water quality stressors and impacts that would occur under sub-alternative b. Therefore, they point out an important contrast between sub-alternatives. Water quality impacts may increase due to the concentration of finfish facilities, related to the production size of each facility and the distance between

facilities. Anticipated impacts from each individual farm on water quality from waste would likely be localized and small in magnitude, assuming projects are sited at an appropriate depth with current flow. A combination of different types of aquaculture facilities at a single site could mitigate some nutrient related impacts, effectively serving as an IMTA type of system. IMTA could be used within an individual site, or by coordinating among farms within a single AOA to decrease potential adverse effects to water quality.

Alternative 3: Santa Monica Bay

According to the spatial modeling in Morris et al. (2021), the water quality characteristics are as follows for Alternative 3:

- Nitrate ranged from 1.03 mmol/m3 at 10-m depth to 7.85 mmol/m3 at 100-m depth (Figure 3.93 Morris et al. 2021).
- Phosphate ranged from 0.50 mmol/m3 at 10-m depth to 1.47 mmol/m3 at 100-m depth.
- Dissolved oxygen decreased from 265 mmol/m3 at 10-m depth to 165 mmol/m3 at 100-m depth.
- Chlorophyll-*a* concentration (mg/m3), an indicator of phytoplankton abundance, was highest in April (2.64 mg/m3) and lowest in November (0.42 mg/m3) (Figure 3.94 Morris et al. 2021).
- The diffuse light coefficient at 490 nm, Kd(490), was highest in April (Kd(490) = 0.19 m-1) and lowest for the month of November (Kd(490) = 0.08 m-1) and was (Figure 3.95 Morris et al. 2021).
- Percent light transmissivity was calculated at 1-m depth, providing the percent of light that reaches that depth. Percent light transmissivity was highest in November at 88.1% and lowest in April at 79.5% (Figure 3.96 Morris et al. 2021).

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Water quality in the Santa Monica Bay is classified by the EPA as poor and is worse than in the Santa Barbara Channel. It is designated as an impaired water body under CWA section 303(d) based on the concentrations of arsenic, mercury, and trash (SWRCB 2024). Besides the waters in Santa Monica Bay, impaired waters have been documented in San Pedro Bay because of pesticides, industrial chemicals, heavy metals, and toxicity, which could also have implications for Santa Monica Bay (OEHHA 2022). The 2010 list of impaired waters indicates there are 30 mi^2 (out of 226 mi^2 total) of impairments in the Santa Monica Bay nearshore and offshore waters, which is impacting aquatic life, fish consumption, and shellfish harvesting (LARWQCB 2011). Previous oil spills have also impacted water quality in Santa Monica Bay (Morris et al. 2021). Water quality is influenced mostly by the runoff from Malibu Creek and Ballona Creek; Ballona Creek is runoff from the greater Los Angeles area (USGS 2003). Ballona Creek is recognized as a water quality Critical Coastal Area by the CCC. In addition, the Hyperion Treatment Plant Outfall could affect the water quality in Santa Monica Bay. Beside Malibu and Ballona creeks, Big Sycamore Canyon, Garapito Canyon, Dominguez Channel, and San Pedro Bay can influence the local water quality conditions in the Santa Monica Bay watershed. The Santa Monica watershed has over 180 NPDES discharges, including two direct ocean discharges (LARWQCB 2011). Discharge facilities and marine-based NPDES monitoring stations are shown in Figure 8. Since the publication of the DPEIS, NOAA Fisheries received additional information on NPDES monitoring stations near Alternative 3 that were not included in the Atlas. Potential spatial conflicts with these new NPDES stations and impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity, and may be considered in site-specific NEPA (e.g., potential water quality impacts on or spatial conflicts with on-going monitoring operations). Information on each of the NPDES discharges can be found in the LARWQCB State of the Watershed Report (2011). The release of untreated wastewater is also a problem that occurs occasionally in the area. In July 2021, 17 million gallons of untreated wastewater was released into Santa Monica Bay through the 1 mile outfall and discharge pipe (EPA 2024). That year, 89 sewage spills in LA County sent 20,322,566 gallons into

bodies of water (Heal the Bay 2022). Smaller releases have occurred because of maintenance, overflow, blockages, or human error. According to the 2021 Water Quality Report Card, trash conditions are improving in Santa Monica Bay. Alternative 2 may have more baseline trash compared to Alternative 3 (McLaughlin et al. 2023). Potential marine debris impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity.

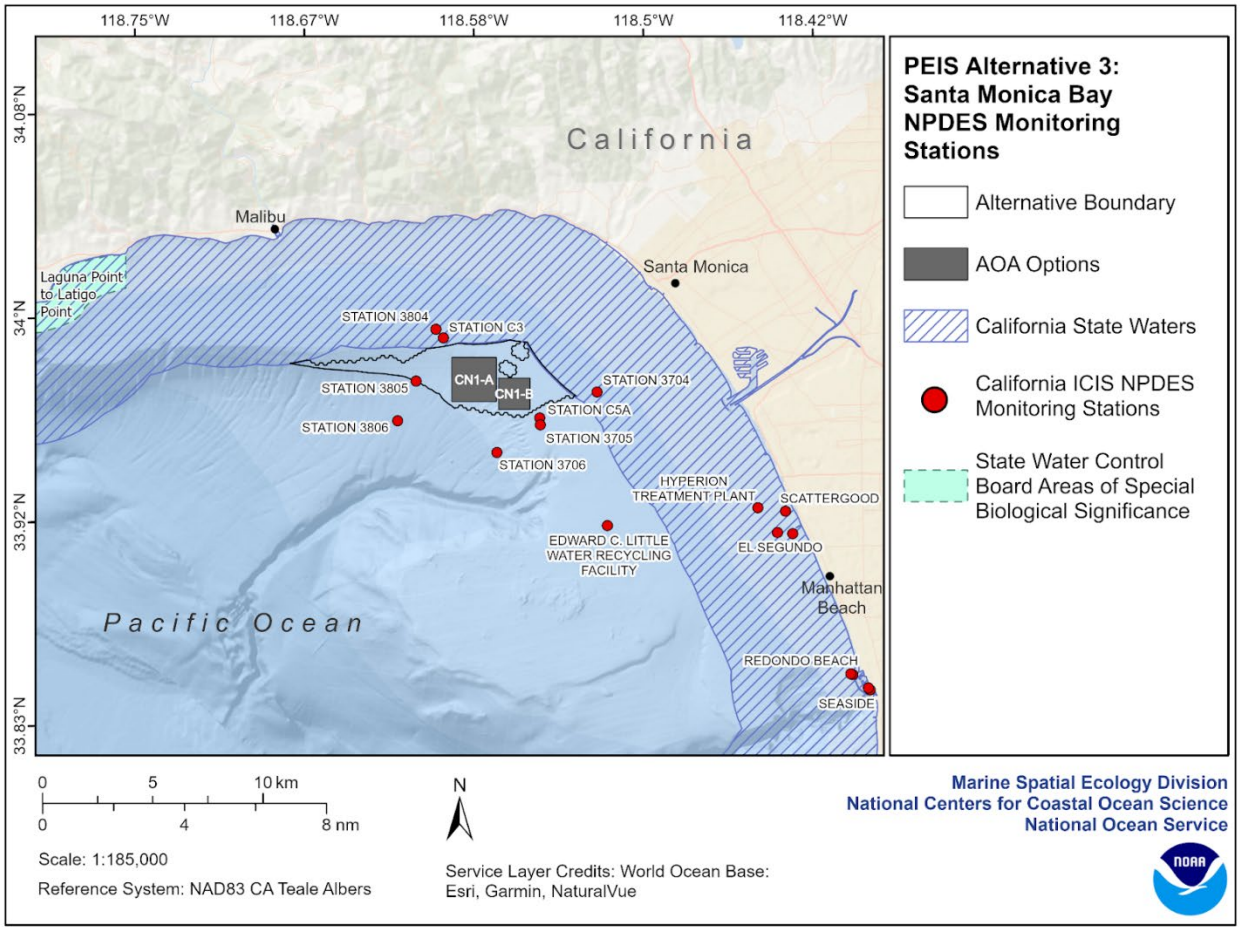


Figure 8: NPDES Monitoring Stations in Proximity to Alternative 3

Ongoing stressors are more severe in Santa Monica Bay than the Santa Barbara Channel, but the conditions at the AOA options within Santa Monica are relatively similar based on a recent assessment (Morris et al. 2021). The average key water quality parameters were similar to the Santa Barbara Channel AOA options. In cluster CN1, the surface water temperature varied between 11.9°C and 23.3°C, and the average was 17.2°C (see Figure 3.87 in Morris et al. (2021)). The water temperature decreased to 16.4°C at 10 m depth and was the lowest at 40 m depth (13.1°C). The current speed and direction vary by month and depth with a southeasterly direction on the surface. The annual average current velocity was 0.11 m/s. The current speed was 0.07 m/s at 10 m depth and slower at 40 m (0.05 m/s). Percent light transmissivity was lowest in April at 79.5% and highest in November at 88.1% (see Figure 3.96 in Morris et al. (2021)).

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same for Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternative 2b is the same for Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

Alternative 4: Combination of Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified. In theory, potential water quality impacts could be more considerable, positive or negative, compared to impacts reflected in Alternatives 2 and 3 if more farms were sited as a result of greater acreage. However, greater acreage may also encourage farms to be sited farther apart from one another which could decrease the risk of adverse impacts to water quality. It is unlikely potential adverse water quality impacts would be much different in Alternative 4 than in Alternatives 2 and 3, given the low probability that future aquaculture projects would discharge large quantities and concentrations of water pollutants if they are sited and operated appropriately. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2a and 3a is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4b. Overall depositional impacts could be greater with more area identified; however dispersed spaces could result in less concentrated water quality impacts.

v. Air Quality and Aesthetics

Affected Environment

This section provides an overview and discussion of the general impacts on air quality and aesthetics associated with aquaculture operations that may be sited in an AOA, if and when projects are proposed. As a form of air pollution, potential greenhouse gas (GHG) emissions/reductions are presented here, for additional discussion of those emissions/reductions in the context of environmental variation see Chapter 4, Section A.i. The air quality analysis here does not consider potential air quality impacts associated with any onshore facility areas or port(s); however, any future aquaculture project sited within an identified AOA may be required to consider shore side components to the project and its impacts as part of permitting decisions. Air quality analyses are subject to EPA review as part of permitting under the Clean Air Act (CAA).

Air Quality

The CAA of 1963, revised in 1970 and 1990, forms the basis for controlling and monitoring air pollution in the U.S. The Act authorizes the EPA to regulate all sources of air emissions from stationary (e.g., power plants and factories) and mobile (e.g., vehicles and vessels) sources to ensure the health and safety

of humans and the environment. The CAA establishes four major air pollution regulatory programs: the National Ambient Air Quality Standards (NAAQS), State Implementation Plans (SIPs), New Source Performance Standards (NSPS), and National Emission Standards for Hazardous Air Pollutants (NESHAPs). Under the CAA, the EPA established NAAQS for common and widespread pollutants, and controls for specific hazardous pollutants. NAAQS set specific concentration limits for criteria pollutants in the outdoor air, and hazardous air pollutants are controlled by rules that limit emissions of hazardous air pollutants from specific industrial sources, which are typically much smaller than concurrent emissions of criteria air pollutants. The six common criteria pollutants regulated by NAAQS are nitrogen oxides (NO_x), sulfur dioxide (SO_2), particulate matter ($PM_{2.5}$ and PM_{10}; particulate matter with a diameter less than or equal to 2.5 and 10 microns [μm], respectively), carbon monoxide (CO), volatile organic compounds (VOC), ozone (O_3), and lead (Pb). SIPs provide a plan for implementation, maintenance, and enforcement of the NAAQS in each state including measures to control emissions that could drift across state lines and potentially harm air quality in downwind states. The CAA has provisions to minimize pollution from motor vehicles. The EPA periodically reviews and sometimes revises the standards based on the best available science. The agency examines air quality data from a network of monitors to ensure a region/area is within the NAAQS.

The CAA established two types of NAAQS: (1) primary standards, which set limits to protect public health, including the health of "sensitive" populations (e.g., asthmatics, children, the elderly); and (2) secondary standards, which set limits to protect public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The NAAQS are set forth in 40 CFR Part 50. Table 1 lists the National and California ambient air quality standards (NAASQS and CAAQS) that may be helpful for any site-specific NEPA analyses in the future. Several pollutants regulated under both NAAQS and CAAQS are also greenhouse gases. These include carbon monoxide (CO), nitrogen oxides (NOx), and some forms of particulate matter (PM).

Table 1: National and California Ambient Air Quality Standards (NAAQS and CAAQS)

CRITERIA POLLUTANT	STANDARD	AVERAGING TIME
1-Hour Ozone	NAAQS	1979 1-Hour (0.12 ppm)
	CAAQS	1-Hour (0.09 ppm)
8-Hour Ozone	NAAQS	1997 8-Hour (0.08 ppm)
	NAAQS	2008 8-Hour (0.075 ppm)
	NAAQS	2015 8-Hour (0.070 ppm)
	CAAQS	8-Hour (0.070 ppm)
Carbon Monoxide	NAAQS	1-Hour (35 ppm) 8-Hour (9 ppm)
	CAAQS	1-Hour (20 ppm) 8-Hour (9 ppm)
Nitrogen Dioxide	NAAQS	1-Hour (0.10 ppm)
	NAAQS	Annual (0.053 ppm)
	CAAQS	1-Hour (0.18 ppm) Annual (0.030 ppm)
Sulfur Dioxide	NAAQS	1-Hour (75 ppb)
	NAAQS	24-Hour (0.14 ppm) Annual (0.03 ppm)
Particulate Matter PM10	NAAQS	1987 24-hour (150 $\mu g/m^3$)
	CAAQS	24-hour (50 $\mu g/m^3$) Annual (20 $\mu g/m^3$)
Particulate Matter PM2.5	NAAQS	2006 24-Hour (35 $\mu g/m^3$)
	NAAQS	1997 Annual (15.0 $\mu g/m^3$)
	NAAQS	2012 Annual (12.0 $\mu g/m^3$)
	NAAQS	2024 Annual (9.0 $\mu g/m^3$)
	CAAQS	Annual (12.0 $\mu g/m^3$)
Lead	NAAQS	3-Months Rolling (0.15 $\mu g/m^3$)
Hydrogen Sulfide	CAAQS	1-Hour (0.03 ppm/42 $\mu g/m^3$)

CRITERIA POLLUTANT	STANDARD	AVERAGING TIME
Sulfates	CAAQS	24-Hour (25 µg/m^3)
Vinyl Chloride	CAAQS	24-Hour (0.01 ppm/26 µg/m^3)

The EPA designates every area of the country as either in attainment, non-attainment, or unclassified for each criteria pollutant. Attainment is defined as an area where all criteria pollutant concentrations are within all NAAQS; non-attainment is an area that does not meet the NAAQS for one or more pollutants. Unclassified areas are locations where attainment status cannot be determined based on available information and are regulated as attainment areas. The EPA indicates an area can be in compliance (i.e., attainment) for some pollutants and non-attainment for others. A maintenance area is an area that was in non-attainment at any point in the last 20 years but is currently in attainment. The EPA requires non-attainment and maintenance areas to prepare a SIP, which is the region's program approach to attain and maintain compliance with the NAAQS. The CAA prohibits federal agencies from approving any action that does not conform to a SIP; however, this prohibition applies only to non-attainment or maintenance areas (i.e., areas that were previously non-attainment and a maintenance plan is required). Conformity to a SIP means adjusting to a SIP's requirement of reducing the severity and number of violations of the NAAQS to achieve attainment of the standards. The CAA applies to coastal waters within 3 nm of shore. The air quality geographic area of analysis includes areas that are unclassified as to the attainment status (including offshore areas outside of State waters (greater than 3 nm, and areas that are classified as nonattainment areas (e.g. South Central Coast Air Basin).

The CAA established requirements for the Prevention of Significant Deterioration (PSD) or the Haze Rule based on three types of class areas; the Act specified specific increments of SO_2 and the allowable particulate pollution in each class (CRS 2022). Class I are National Parks and wilderness areas (National Parks and wilderness areas 6,000 ac (2428 ha) and 5,000 ac (2023 ha) or greater, respectively that were in existence before August 1977) where very little degradation of air quality is allowed. Class II areas include all attainment and not classifiable areas (modest degradation allowed) and Class III are areas that individual States may designate for development; allowable increments of new pollution are large, but cannot exceed NAAQS. Projects subject to federal air quality permits are required to notify the federal land managers when Class I areas are within 100 km (62 mi) of a project. The nearest Class I area to Alternative 2 is the Channel Islands National Park, which is located about 16-19 km (10-12 mi) SSW. The nearest Class I area to Alternative 2 is the Santa Monica Mountains National Recreational Area, which is about 19-24 km (12-15 mi) NNW.

The CAA also directs the EPA to establish requirements to control air pollution from sources located beyond the state seaward boundary in the Outer Continental Shelf (OCS), with the exception of OCS sources located in the Gulf of America west of 87.5° longitude (i.e. offshore TX, LA, MS, AL) and areas offshore the North Slope Borough of Alaska. Sources in the latter areas are under the authority of BOEM and BSEE. Specifically, the regulations require OCS sources located within 46.3 km (25 nm) of a state seaward boundary, commonly known as inner OCS sources, to comply with the air quality requirements of the corresponding onshore area (COA), which include New Source Review preconstruction permitting and/or Part 70 Title V operating permit program requirements and other state and local requirements that apply to OCS sources. OCS sources located beyond 46.3 km (25 nm) from the state seaward boundary are subject to only federal air quality requirements, but may need an OCS permit complying with the EPA's PSD preconstruction permit program regulations and/or the Part 71 Title V operating permit program requirements.

To help reduce global emissions, the North American Emission Control Area was implemented after being approved by the International Maritime Organization on August 1, 2012. It requires the reduction of emissions of nitrogen oxides, sulfur oxides and particulate matter for ships within 200 nm of the coasts of

the United States and Canada through the burning of cleaner fuel and the installation of better air pollution control equipment on ships. The international law governing pollution caused by foreign ships is the International Convention for the Prevention of Marine Pollution by Ships ("MARPOL"). The annexes to MARPOL regulate pollution from ships, such as oil, noxious liquid substances carried in bulk, harmful substances, sewage, garbage, and air pollution. Within the United States, MARPOL requirements are codified in the Act to Prevent Pollution by Ships ("APPS").

The CAA authorizes the EPA to set NAAQS, but individual states are responsible for establishing procedures to attain and maintain the standards (CRS 2022). The states adopt SIPs, and must ensure plans are adequate to meet statutory requirements under the authority of Section 110. The CAA is implemented, monitored, and enforced primarily by states or local governments; they issue most air permits and conduct inspections. In California, the EPA designates the California Air Resources Board (CARB) as the authority to regulate emissions under Section 328 of the CAA. In California, four local permitting authorities (Santa Barbara, San Luis Obispo, South Coast and Ventura County) have delegated authority to administer OCS Air Regulations. Also, CARB issued their own regulations to control air pollution from ocean-going vessels in California ports, such as the Ports of Los Angeles and Long Beach, which are near the proposed AOAs. The regulations are aimed at reducing the emissions of particulate matter, nitrogen oxides, and sulfur oxides through the use of cleaner burning fuel. These regulations apply in addition to the Emission Control Area requirements mentioned above.

Aesthetics

Federal and state legislatures often incorporate scenic value, aesthetics, or community character with coastal management mandates (Kelty and Bliven 2003). Many individual states, including California, have specific language related to scenic or aesthetic value, but the primary federal law that considers scenic value is the CZMA. The CZMA states that one purpose of the Act is "to encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological, cultural, historic, and esthetic values as well as the needs for compatible economic development." NEPA also considers visual and aesthetics impacts.

Federal agencies have various standards, thresholds, and procedures for evaluating visual impacts. In general, an assessment considers the direct impacts of the proposed changes on views of the landscape because of intrusion or obstruction; the reaction of viewers who may be affected; and the overall impact on the view, which may range from degradation to enhancement (Kelty and Bliven 2003). Open/distance water views are a general concern and most people dislike commercial development in undeveloped coastal landscapes (Kelty and Bliven 2003). Assessments of potential visual impacts are conducted in various ways, but usually require a graphic illustration of how the proposed structure fits into the existing landscape, and consider where the general public could potentially view the project (Kelty and Bliven 2003). Mitigation and best management practices are often required by local, state, or federal agencies in permitting and consultation processes.

Stressors

Air pollution can impact not only humans, but terrestrial, aquatic, and marine species. Atmospheric deposition of nitrogen and sulfur resulting from air pollution around the world is a major stressor to natural ecosystems because it often causes acidification and eutrophication of terrestrial and aquatic ecosystems, which degrades water quality and can cause cascading ecological impacts (Walker and Beachley 2019).

As described above and required by the CAA, air quality is generally evaluated by comparing the ambient air concentrations of criteria pollutants to the NAAQS. Based on the geographical area, Alternative 2 and 3 are offshore of the three California air districts (Santa Barbara, Ventura, and South Coast). The Santa Barbara Channel AOA options are located between 10.02 and 19.72 km (5.41 and 10.65 nm) offshore of

Santa Barbara and Ventura Counties and the Santa Monica Bay AOA options are located between 8.06 and 8.82 km (4.35 and 4.76 nm) offshore of Los Angeles County. Currently, Santa Barbara and Ventura Counties are in attainment for all federal ambient air quality standards, except ozone and PM_{10}. Similarly, the South Coast air district is in attainment for all federal ambient air quality standards, but is in non-attainment for ozone and two of the $PM_{2.5}$ standards. Historically, ozone has been a major air pollution issue for California. Ozone is formed in the atmosphere from precursor chemicals in the presence of sunlight. For instance, ground-level ozone forms when nitrogen oxides from mobile and stationary sources like vehicle exhaust and industrial emissions react with organic compounds in the presence of heat and sunlight. According to CARB, ozone is an important component of smog, and it is a highly reactive and unstable gas capable of damaging living cells, such as those present in the linings of the human lungs. Ground-level ozone typically forms in greater quantities on hot, sunny, calm days, which are common in Southern California; ozone concentrations in California metropolitan areas frequently exceed the health-protective standards in summer. Light or no wind can be a problem for air quality because of low dispersion, especially in urban areas that are surrounded by buildings or mountains which can trap pollutants (Kgabi and Mokgwetsi 2009).

Data and information describing the baseline air quality conditions and status within the AOA options for the six criteria pollutants are unavailable and therefore could not be incorporated into the Atlas during the spatial modeling process; however, wind speed and direction were examined for AOA options, which can significantly influence air quality. Wind velocity and direction can disperse air pollutants and impact a much greater area than a specific project footprint. To understand air pollution and associated impacts from a given point source, it is essential to have data describing the local and regional meteorology, and understand the dilution and dispersion of pollutants, which is often estimated through models (Kgabi and Mokgwetsi 2009). Under the federal permit review, the EPA could address and require any necessary best available control technology or other potential mitigation measures and modeling processes.

Offshore aquaculture may have visual impacts on the seascape. Visual impact on the coastal landscape is often a leading cause for public opposition, especially in areas with high-value properties, historically important scenic views, or when a project is in the vicinity of a cultural resource. Another potential impact associated with aesthetics is fixed lighting on the offshore facility.

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- air quality impacts due to installation, decommissioning and operation; and
- visual impacts of aquaculture sited in AOAs.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

This section discusses potential impacts on air quality, seascape, open-ocean, and landscape character and viewers should an aquaculture facility be sited. The air quality analysis, including estimates of GHG emissions or reductions, is qualitative due to the programmatic nature of this PEIS and the unknown number of aquaculture facilities or types of operations that may eventually be sited. Project-level NEPA may consider impacts on air quality, including emissions of criteria pollutants, hazardous air pollutants,

GHGs, and conduct a General Conformity analysis with the CAA if required; those analyses may be quantitative and possibly involve modeling.

Evaluations of potential direct impacts of offshore aquaculture on air quality are limited. Feed pellets distributed by hand or machine in finfish operations can sometimes create fine dust (Fisheries and Oceans Canada 2003). However, the risk and likelihood of this impacting air quality from feed is considered low. Air quality could be impacted by aquaculture vessel activities because they may use diesel engines, which emit pollutants. Marine vessels operating around the world produce a large portion of the greenhouse gas (GHG) emissions and contribute to ongoing environmental variation, especially large ocean-going cargo vessels and harbor craft. Exhaust emissions from marine diesel engines emit nitrogen, oxygen, CO_2, carbon monoxide (CO), SO_x, NO_x, hydrocarbons, water vapor, and smoke. Port of Long Beach activity-based (ocean-going vessels, harbor craft, rail locomotive, and heavy duty vehicles) emissions (PM, diesel particulate matter [DPM], NO_x, SO_x, HC, CO, and CO_2) are a major air pollution source (Starcrest Consulting Group 2023). The primary pollutant produced by ocean-going vessels using the port of Long Beach is NO_x followed by CO, HC, PM_{10}, $PM_{2.5}$, and DPM. To reduce emissions associated with marine vessels, the EPA has adopted exhaust emission standards for marine diesel engines installed in a variety of marine vessels ranging in size and application from small recreational vessels to tugboats and large ocean-going vessels. EPA has implemented best management practices that have reduced emissions in the port of Long Beach, such as reducing vessel approach speed, and switching fuel to liquid natural gas.

Most air pollutant emissions and air quality impacts from aquaculture projects would likely be generated by diesel-fueled vessels traveling to and from the offshore facility. Marine vessels could be used to transport personnel, equipment, and cultured species. The magnitude of emissions and the resulting air quality impacts would vary by the number of vessels and frequency of trips associated with each individual project. Emissions would also vary by vessel size, hull type, vessel age, equipment optimization, and other factors. Over time, it is likely technology may advance, which could reduce future emissions from vessel traffic traveling to an offshore facility (e.g. automated systems, electric motors, etc.). It is likely the number of additional vessels would not constitute a meaningful change from baseline conditions and they would be similar in size to fishing vessels operating in the region. Vessels could be properly sized to meet the demands of the operation, but no larger than necessary to safely move equipment and personnel. Potential impacts to air quality associated with marine vessels is likely minimal, depending on the individual project. Given the size of the AOA options and the proximity to port, aquaculture operations may use medium size (9-23 m [30-75 ft.]) fishing or work vessels, which produce minimal air emissions. Vessels could be equipped with gasoline-fueled outboard engines rather than diesel engines, which produce lower air emissions, especially new 4-stroke engines.

Research on potential impacts associated with GHG emissions from aquaculture is a growing area of study. MacLeod et al. (2020) found global aquaculture production for nine major culture groups (93% of global aquaculture production) accounted for approximately 0.49% of anthropogenic GHG emissions or 263 Mt carbon dioxide equivalents [CO_2e]) in 2017. Raul et al. (2020) estimated global aquaculture production emissions may increase to 3.83×10^{11} g CO_2e by 2030. Still, the proportion of GHG emissions from aquaculture is significantly less than emissions from land-based production of livestock and crops or those produced by wild-capture fisheries (Halpern et al. 2015). Differences and variability in GHG emissions from aquaculture are greatly influenced by the type and volume of species reared, facility location, type of production system, and associated environmental factors (Jones et al. 2022, Zhang et al. 2023, and Cheng et al. 2023). Typically, GHG emissions are closely linked to the level of production, except in bivalves where there is an inverse relationship (MacLeod et al. 2020). GHG emissions in the aquaculture production cycle come from various sources, including feed processing, production and egg supply, larvae, other propagules, on-site energy use, processing, storage, and shipment. Upstream and downstream processes have been found to contribute a significant proportion of overall GHG emissions from aquaculture, often more than on-site operations themselves (Jones et al. 2022). However, differences in these processes (i.e., downstream shipping methods) make it difficult to estimate emissions from any

one “typical farm”. Also, many GHG estimates are regional in scope or from countries outside of the U.S. (e.g., Robb et al. 2017, Raul et al. 2020, Zhang et al. 2023, and Cheng et al. 2023); differences in production practices, policy, and regulatory frameworks make it difficult to use these sources to assess what may be expected from AOAs. New assessment methods are emerging to estimate GHG emissions associated with aquaculture operations, such as the Life Cycle Assessment (TNC 2022). TNC (2022) estimated the GHG emissions for *Forever Oceans* production of longfin yellowtail (*Seriola rivoliana*) in the Bay of Charco Azul, on the Pacific Coast of Panama was 7.13 kg CO_2 equivalent per 1 kg of edible product, including of GHG emissions to the site and land use, basic processing, and distribution to international markets. The assessment found 12% was associated with on-site operations, 48% with upstream activities (i.e., feed production), and 40% with downstream activities, mostly because of the use of fresh fish and air freight to markets. The report indicated that a reduction in the feed conversion ratio and shipping frozen products would reduce GHG emissions by 2.99 kg CO_2 equivalent per kg fish.

In general, there are some basic patterns and GHG emission estimates from different aquaculture operations that can be used to infer potential impacts. Finfish operations generally produce more GHG emissions than bivalves because of the amount of food needed to produce live weight gain, energy use for onshore operations, feed transfer, and product delivery. In contrast, bivalves (oysters, mussels, and clams) have lower emissions because no energy is used for feed production once they enter the growing environment. Compared to finfish and bivalves, seaweed aquaculture generates the lowest emissions. Meta-analysis has estimated that fed finfish averaged around 3,271 kg of CO_2e/ton wet weight produced, but varied from 1,382 to 44,400 kg of CO_2e/ton wet weight, depending on production system (coastal net pens vs. closed or recirculating systems) (Jones et al. 2022). Bivalves were estimated to generate 392 kg of CO_2e/ton wet weight produced, but the estimated amount also varies by production system. Seaweed operations generated around 22 kg of CO2e/ton of seaweed produced, but varied from 11.4 to 28.2 kg of CO2e. More recent modeling considering the carbon removal potential of seaweed farming in temperate waters off Canada estimated that marine sequestration was relatively inefficient, and realization of climate benefits required seaweed-based products to replace existing, more emissions-intensive products (Bullen et al. 2024). Overall, it is possible that future aquaculture operations in the proposed AOAs could produce minor impacts to air quality associated with GHG emissions.

Aquaculture emissions and resource usage (i.e., space, water, and energy) are orders of magnitude less than traditional land-based agriculture (MacLeod et al. 2020, Halpern et al. 2015). With or without AOAs being identified, aquaculture emissions are still likely to remain lower than other agriculture production already happening in the region, even after accounting for the rapid annual growth happening in the aquaculture sector. Assessing potential impacts are dependent on various factors and current tools for measuring GHG emissions are not specific to aquaculture; however, aquaculture has the potential to produce food with fewer input resources, less GHG emissions, and fewer environmental variation consequences than traditional land-based agriculture. Ray et al. (2019) note that “oyster aquaculture has less than 0.5% of the GHG-cost of beef, small ruminants, pork, and poultry” and estimate that “if 10% of the protein from beef consumption in the United States was replaced with protein from oysters, the GHG savings would be equivalent to 10.8 million fewer cars on the road.”

Visual impacts could be a contentious issue in Southern California. Impacts are mediated by the distance from shore, height of the structure, and the general meteorological conditions in the area. However, the human eye can only see about 5 km (2.7 nm) offshore in clear conditions when standing on the beach. Additionally, aquaculture operations that use submersible cages would likely reduce visual impacts. In Hawaii, cage placement near Keahole point was determined to have no effect on the seascape of the area (HI DLNR 2014). In previous planning studies conducted by NOAA’s National Ocean Service (NOS) NCCOS for southern California (San Diego), it was determined through modeling and photo-realistic simulations that offshore fish aquaculture would have minimal impact on the seascape when facilities are sited greater than 9 km (5 nm) from the shoreline (Aquarium of the Pacific 2015).

The USCG (14 U.S.C. 83 et seq.) requires that aquaculture structures located in navigable waters must be marked with lights and signals for navigational safety, which could be seen a greater distance at night. The number and type of lights would be project-specific. Surface work lights are often down-shielded to prevent light pollution. Without shielding, a strong white light is visible for 33 km (18 nm) (Cicin-Sain et al. 2004); however, most beacon lights are red or green, which are visible for 22 km (12 nm). Besides potential general visual concerns for the public, artificial lights at night can have adverse impacts on variety of marine life from corals to sea birds (Marangoni et al. 2022) for additional discussion on the impacts of artificial light on biological resources, see Chapter 3, Sections C. Potential impacts associated with artificial light could depend on various factors, including the color, intensity, and duration of the lighting. A short-duration synchronized flashing navigational safety light could have less anticipated impacts on the human and natural environment than a bright long-duration non-flashing light.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

The Santa Barbara Channel AOA options are located between 10.02 and 19.72 km (5.41 and 10.65 nm) offshore of Santa Barbara and Ventura Counties, which are currently in attainment for all federal ambient air quality standards, except ozone and PM_{10}. The wind velocity (10m above the sea level) in the AOA options averaged around 4.8 m/s, with a minimum of 0 m/s and a maximum of 19.5 m/s. In general, the higher the wind speed, the more contaminants are dispersed. The predominant wind direction is from the west, but it is unlikely air emissions would reach the coast given the low levels of emissions being generated. Diesel-powered vessels can impact air quality and increase greenhouse gasses. Emissions are directly correlated with fuel consumption and operating hours (Greer et al. 2019). Given the proximity between the AOA options and the local ports, it is unlikely potential impacts on air quality would be detectable compared to baseline conditions. Some or all of the fleet may use gasoline outboard engines, which are better for the environment, especially new efficient 4-stroke engines that produce minimal CO_2 emissions and other pollutants; petroleum generates lower emissions than heavier, less refined, marine diesel (Greer et al. 2019). Anticipated impacts on air quality from activity emissions would be transient, small in magnitude, and localized. Projected emissions would be minimal in scale when compared to other industries in the region, such as marine shipping. Given the distance from shore, it is unlikely there would be any visual impacts during the day, but there might be some minimal impacts at night. Atmospheric and environmental factors (e.g., haze and fog) would reduce visibility and perception of hazard lighting from sensitive viewing locations.

a) Shellfish and Macroalgae

Vessel activities associated with macroalgae aquaculture would emit GHGs, but on a minimal scale compared to other industries in the region and compared to global emissions. The changes to air quality during vessel activities would be local and temporary. Macroalgae aquaculture facilities could be sources of GHGs, such as methane, or sinks of GHGs, such as carbon dioxide. Seaweed aquaculture could lead to further reductions in overall carbon emissions associated with its operations if the biomass is used to replace high-carbon-footprint products, such as the case for bioplastics (replacing petroleum-based plastics) or biostimulants (replacing up to 30% of conventional fertilizers) (Bullen et. al. 2024; Li et. al. 2023). Overall, impacts are expected to be minimal at the scale of an AOA and may present both beneficial and adverse contributions of GHGs. There is no likely meaningful difference in visual impacts between impacts reflected under Alternative 2a and 2b.

b) All Types of Commercial Aquaculture

As compared to impacts reflected under Alternative 2a, without finfish, Alternative 2b could result in higher air quality impacts due to 1) increased vessel traffic due to feeding operations, or 2) increased emissions due to feed barge or automated feeder activity. Open-ocean finfish aquaculture operations could emit pollution into the air because feed pellets distributed by hand or machine can sometimes create a fine dust (Hargrave 2003). The manufacture of feed could also be a source of emissions. There is no likely meaningful difference in visual impacts between impacts reflected under Alternative 2a versus 2b.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

The Santa Monica Bay AOA options are located between 8.06 and 8.82 km (4.35 and 4.76 nm) offshore of Los Angeles County. Currently, the South Coast air district is in attainment for all federal ambient air quality standards, but it is nonattainment for ozone and two of the $PM_{2.5}$ standards. The wind velocity (10 m above the sea level) in the AOA options averaged 4.5 m/s, with a minimum of 0 m/s and a maximum of 16.8 m/s. Wind direction was predominantly from the west-southwest. Given the wind direction, air emissions could reach the coast, but is doubtful given the low level emissions expected. Similar to Alternative 2, anticipated impacts on air quality from activity emissions would be transient, small in magnitude, and localized. It is likely potential total emissions from vessels operating between shore and Alternative 3 would be lower than Alternative 3 given distance to shore. Again, it is unlikely there would be any visual impacts during the day because aquaculture finfish structures would be outside the maximum range the naked eye can see, but visual impacts at night would be greater since the AOA options are closer to shore than Alternative 2.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

Alternative 4: Combination of Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. Under this alternative, AOAs would be identified in the Alternatives 2 and 3. In theory, potential air impacts would be higher compared to Alternatives 2 and 3; however, impacts could be similar to Alternative 1 should aquaculture projects be sited anyway. It is unlikely potential air impacts or aesthetics would be much different than Alternatives 2 and 3 given the low probability that future aquaculture projects would emit large quantities and concentrations of pollutants. Although the wind direction is toward shore, it is unlikely any air emissions would reach the coast given the average wind speed. Anticipated impacts on air quality from activity emissions would be transient, small in magnitude, and localized. Marine vessel traffic and associated air emissions would increase, but it is likely the magnitude and severity would be minimal and not a meaningful change to baseline given predicted vessel size and proximity to shore at both locations. Potential visual and aesthetic impacts would likely not be any different than Alternatives 2 or 3 given the distance from shore; however, visual impacts at night could be compounded depending on various factors, including, but not limited to the number of aquaculture operations, types, color, duration of lights, and whether light shields were incorporated into design. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more

dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

vi. Acoustic Environment

Affected Environment

This section focuses on noise in relation to the physical environment. The effects on living resources (Section C) and human health (Section D.iii (Public Health and Safety)) are described elsewhere. Vessel traffic and its potential impacts is described in more detail in Section D.v (Tourism and Other Recreation) and D.vi (Transportation and Navigation). Potential impacts to other resources are covered in Chapter 3, see Section C.i for Level B and Level A ESA disturbance from underwater noise on protected resources, Section C.ii for noise disturbance impacts on wild fish stocks, and Chapter 4, Section B for cumulative socioeconomic impacts.

On a national level, noise in air is regulated pursuant to the Clean Air Act, Noise Control Act, and the Quiet Communities Act. Most in-air noise regulation occurs at state and local levels. Occupational noise hazards are addressed in OSHA standards pursuant to the Occupational Safety and Health Act, and meeting standards for employees is the responsibility of the employer. Noise in the air and in the water may be regulated due to its effects on animals, habitats, and other resources by many statutes including the MMPA, ESA, MSA and CZMA.

Noise in the ocean comes from natural and anthropogenic sources (Dziak et al. 2023), has increased in recent decades, and can be considered a pollutant (Duarte et al. 2021). Anthropogenic noise comes from sources like commercial and recreational boats and ships, military activity, sonar (e.g., navigation, seafloor mapping, research), development and maintenance activities (e.g., dredging, pile driving, construction), energy infrastructure (oil and gas, wind), scientific research, communication and transmission of data, acoustic deterrents, and onboard machinery, etc. (Hildebrand 2009; Chou et al. 2021). Commercial shipping is a primary source (ZoBell et al. 2024). Overwater noise, like from aircraft or traffic nearshore, can penetrate underwater. The properties and physics of sound are explained more in the BOEM Sounds Source List document (BOEM 2023a) and NOAA NOS (2022).

Southern CA waters have chronic noise caused by the busy ports of Los Angeles and Long Beach and shipping activity (Redfern et al. 2017). Military operations, training, and testing produce overwater and underwater sound in the SCB region (U.S. Navy 2013; Krumpel et al. 2021), though military transits have historically been rare in the AOA alternative areas (Morris et al. 2021). Seal deterrents have been a source of noise in the region (Krumpel et al. 2021). Vessel speed reduction programs to reduce air pollution and interactions with whales have had the ancillary effect of reducing noise levels in Southern CA.

Stressors

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- in-air noise generated by vessel traffic, activities, and machinery; and
- underwater noise generated by activities, systems, and acoustic devices.

For typical offshore aquaculture operations, noise occurs during BES's, construction (vessels, anchoring, pile driving in limited cases), operation (vessels, other sources), and decommissioning (vessels, equipment removal) (Burella et al. 2019). Sound generating devices used in BES's include side scan sonar, single-beam echo sounders (sub-bottom profilers), multi-beam echo sounders, and magnetometers as well as crewed vessels, Remotely Operated Vehicles, autonomous vehicles, and Acoustic Doppler Current Profilers. These devices and the sounds emitted are further described in NOAA NOS (2022), BOEM (2023a) and Sea Grant (2023). Aquaculture facilities may also use acoustic deterrent or harassment devices to deter marine mammals. No substantial sources of vibration are expected to be associated with offshore aquaculture activities except when pile driving is used, which would only occur in limited circumstances.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Only noise at sea is discussed here, however, any future aquaculture project sited within an identified AOA may be required to consider shore side components to the project and its impacts as part of permitting decisions (e.g., occupational noise or impacts on coastal communities from shore side facilities). There are many factors that influence whether a sound affects any marine animal, including how loud the source is, what it transmits, where it will be used, and what species might be in the area (DOSITS 2025). The offshore environment, due to deeper waters and more open space to maneuver, may help mitigate some adverse impacts on biological resources from noise. Background noise in the open ocean is lower frequency and not as intense as in coastal areas (Olesiuk et al. 2012). Projects sited in an AOA may be subject to additional compliance requirements or mitigation measures designed to minimize impacts to biological resources if they propose to generate more impactful types of noise (e.g. pile driving or the use of acoustic deterrents), for additional discussion see Chapter 3, Section C (Biological Resources).

Noise impacts could occur during BES, construction, operation, and decommissioning (Burella et al. 2019). Project-specific factors that may affect sound production include the number of lines, pens, anchors, and vessels associated with an activity as well as use of deterrents (Bath et al. 2023). The magnitude and duration of use of different technologies during the BES phase could have limited temporal and spatial impacts depending upon the location (NOAA NOS 2022). Noise from construction and operations may be impulsive (e.g. pile driving, limited instances in offshore context) or continuous (e.g. mechanical operations, engines), and generated by vessel and human activity (e.g., sonar, anchoring, on-board noise), fixed-bottom foundations, and floating structures.

Once constructed, offshore aquaculture facilities are not expected to make a meaningful contribution to ambient noise levels. During normal operations, aquaculture equipment is not generally louder than existing vessels in California's coastal waters (CDFW 2019, HI DLNR 2014). Vessel sounds associated with aquaculture operations would likely be in similar frequency and intensity ranges as those of commercial fishing and transport operations (Olesiuk et al. 2012). Safety buffers may be set up around project sites, which may slow vessel traffic and reduce noise (Findlayet al. 2023). Human activity at an

aquaculture site would likely be within confined areas like a net pen. The majority of human activity in the water would be for observation and inspection dives. Normal operations are unlikely to create hammering, drilling, or loud noises. Operators may use hand tools and lift bags and these create little to no noise. While feeding operations may require heavier equipment, it is unlikely to add much to the ambient noise in the environment. Few studies have examined the potential impacts of occupational noise exposure in the aquaculture industry (Stone and Morro 2022). Above water noise from vessel activity and onboard machinery has the potential to affect onboard personnel, but standard occupational health requirements would be instituted in specific projects to limit the intensity and duration of noise associated with vessel and machinery operation.

Existing NEPA documents for aquaculture facilities reinforce that noise is unlikely to cause an impact to the physical environment. The Kampachi Velella Project stated that noise generated from the feed barge is equivalent to a single fishing boat for one hour. The associated EA concluded that their operation would impart an imperceptible impact due to noise (EPA 2019). Further, the Blue Ocean Mariculture EA concluded that the facility would have no effect on ambient noise levels (HI DLNR 2014). Similarly, the Ocean Era facility was not expected to make a significant contribution to ambient noise.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

The Santa Barbara Channel is a major shipping and transit corridor and noise hotspot (Redfern et al. 2017, ZoBell et al. 2024). The Santa Barbara Channel basin is shielded from deep ocean noise by the presence of the Channel Islands and has abundant low-frequency ambient noise due to commercial vessel traffic (ZoBell et al. 2021). Underwater noise propagation changes with season, with a decrease in radiated noise during the fall due to warm surface waters. One additional single ship transit in the Santa Barbara Channel can increase ambient noise levels averaged over a day by 1 dB (ZoBell et al. 2021). Vessel traffic does occur in Alternative 2 with the majority from passenger vessels, followed by pleasure and sailing, then other vessel transits (Morris et al. 2021); these smaller vessel types are generally quieter than larger cargo ships that frequent the shipping lanes outside the Alternative. Sites in the N2 cluster overlap with a military training route, but historically military transits have been rare (Morris et al. 2021). There is existing energy infrastructure and known scientific survey sites within 5 km (2.7 nm) of the AOA options that contribute to the baseline noise levels. Site and project specific characterization would be considered in project-level NEPA.

a) Shellfish and Macroalgae

An example of noise from typical shellfish aquaculture construction and operations is provided in Table 3-3 on p. 257, and described in detail on pp. 258 through 262 of the NPS Final Environmental Impact Statement for Drake's Bay Oyster Company Special Use Permit (NPS 2012). While this facility was located nearshore, it was permitted in California and describes typical noise levels from gear types used in construction, oyster cultivation, and associated vessels. Potential impacts from those sound levels were predicted in this example to affect special-status species and wildlife habitat, as well as the natural soundscape of the surrounding area.

b) All Types of Commercial Aquaculture

The impacts reflected under Alternative 2b may generate more acoustic impacts compared to Alternative 2a, because finfish aquaculture operations require additional vessel trips or vessels for feeding purposes or the addition of automated feeders that could generate noise. Considering the distance from shore,

remote monitoring and feeding may be used. Theoretically, more vessel trips and more equipment as part of an operation would cause more acoustic changes to the baseline acoustic environment.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Noise from underwater explosions associated with the use of acoustic deterrents has been documented as considerable in Santa Monica Bay (Krumpel et al. 2021). Vessel transit within this area is highest from pleasure and sailing vessels, followed by other vessel and passenger transits (Table 3.18 Morris et al. 2021, p. 188; Table 3.19, Morris et al. 2021, p. 191); generally vessel traffic is low. Compared to Alternative 2, baseline noise levels are relatively lower and the total number of potential sites and footprint that may generate noise is lower. Therefore, siting aquaculture in Alternative 3 may be less impactful on the overall acoustic environment, but may represent a larger proportional change relative to baseline.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. The difference in geographic location between Alternative 2 and 3 would not create different noise levels from aquaculture operations or associated human activity. However, existing differences in other human activity and anthropogenic sounds between the two Alternative areas could create different impacts to the acoustic environment. Alternative 3 has less industrial and commercial traffic, so new noise in the area may have a greater impact than Alternative 2 which is nearer to oil rigs and shipping channels.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section. Compared to Alternative 3a, impacts reflected under Alternative 3b may generate more noise because of the use of feed barges or automated feeders.

Alternative 4: Combination of Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified. Potential impacts to physical resources from noise are greater with more development. Given the baseline condition in Southern CA, it is unlikely that aquaculture development would cause appreciable noise impacts.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

C. Biological Environment and Potential Impacts

i. Federally-Protected Species and Habitat

Affected Environment

The SCB, within the CCE, is known for its productive and biodiverse marine communities. Areas of converging currents, eddies, and upwelling within the SCB are important foraging habitat due to physical processes that concentrate prey (Bearzi 2005, USFWS 2005, Benson et al. 2011, Santora et al. 2012, Huff et al. 2013, Becker et al. 2014, and Kramer et al. 2015). The pelagic waters of the Alternatives provide foraging habitat for protected species groups described in this section of the PEIS. Many marine mammals, seabirds, sea turtles, and fish also make annual migrations between feeding and breeding sites. The specific species abundance in the SCB varies both seasonally and inter-annually. Data for the most highly vulnerable federally-protected species were incorporated into the Atlas spatial modeling, with suitability scores based on species status, population size, and population trajectory; the ranking for each species/stock used to develop the AOA options considered factors that were more or less likely to affect their ability to withstand mortality, serious injury, or other impacts that could affect the species' ability to survive and recover (Morris et al. 2021). Only the most highly vulnerable protected species were explicitly incorporated into the screening criteria for development of the AOA options, see footnote in Table 5, which indicates which species were not incorporated as screening criteria in the development of AOA options, and Appendix 3.

The Fish and Wildlife Coordination Act (FWCA) directs Federal agencies to conserve nongame species and their habitats, and assist state implementation of conservation plans (16 U.S.C. 2901 et seq.). In addition to coordination required by NEPA, FWCA requires Federal agencies to consult with each other on potential impacts of Federal actions on the environment, species, and habitat in accordance to the laws described in this section. Under Section 662 of FWCA, whenever any body of water is proposed or authorized to be controlled or modified for any purpose, by any department or agency of the U.S., or by any public or private agency under Federal permit or license, consultation is required with the USFWS representing the Department of the Interior (DOI), and with the head of the agency exercising administration over the wildlife resources of the particular state where the activity takes place. Some species have additional federal protections, discussed below. California has state-level protections for many of the same species, but state designations for protected species are not discussed further here. Future aquaculture operations proposed within an AOA would need to comply with applicable laws.

Threatened and Endangered Species

The Endangered Species Act (ESA) is the regulatory regime for species that are in danger of extinction throughout all or a significant portion of their range. Species listed as threatened or endangered under ESA have been determined by a formal agency population review, based on available scientific and commercial data, to be at risk of extinction due to the present or threatened destruction, modification, or curtailment of its habitat; due to the overutilization or harvesting; or due to disease or predation. Section 7(a)(2) of the ESA mandates that actions that are authorized, funded, or carried out by Federal agencies do not jeopardize the continued existence of plants and animals that are listed, or result in the adverse modification or destruction of designated critical habitat. Designated critical habitat is defined at 16 U.S.C. §§ 1532(5). In the spatial modeling for AOA options, a score of zero meant something was not compatible with aquaculture. Marine species listed as Endangered under the ESA were scored from 0.1 to 0.3, and those listed as Threatened under the ESA were scored from 0.4 to 0.5, depending on population size and trends (NMFS 2021b, Morris et al. 2021). Critical habitat was assigned a score of 0.2. Scores provided high level characterization regarding the potential presence of species of lower or higher concern at the scale of an AOA Alternative.

Federally-protected species that have the potential to occur in the AOA alternative areas, their designated critical habitat, characteristics of habitat use, and conservation concerns, are summarized in Table 5. Critical habitat for humpback whales (*Megaptera novaeangliae*) overlaps all Alternative 2 AOA options except N2-D and N2-E, as shown in Figure 3.48 on p. 116 and Figure 3.66 on p. 143 of the Results

Section of Morris et al. (2021). There is no designated critical habitat for any protected species within Alternative 3. The essential feature of humpback whale critical habitat in Southern California is prey, and for additional discussion of the potential impacts of siting aquaculture on other biological resources see Sections 3.C.ii and 3.C.iii (Wild Fish Stocks and Ecologically Important Marine Communities).

The southern portion of Terminal Island, at the Port of Long Beach, hosts approximately 13% of the state's total California Least Tern population (MESC 2023). Snowy plovers have ceased breeding on most of their historic habitat, which includes beaches north from Santa Barbara, south through San Diego County (USFWS 2007). There are nesting colonies of Snowy plover on the Channel Islands (NPS 2016). These two species use coastal habitat only for breeding and foraging, and are not thought to migrate between the mainland and the Channel Islands (NPS 2016). It would be rare for either to occur over offshore waters. Some of these species have designated critical habitat, but none of it overlaps any of the Alternatives.

ESA-protected fish species in the SCB include the Oceanic Whitetip shark (threatened), Scalloped hammerhead shark (endangered), Giant manta ray (threatened), and Steelhead trout (threatened). Protected shellfish species include the green and white abalone. Some of these species have designated critical habitat, but none of it overlaps with any of the Alternatives and all of these species are considered unlikely to occur.

The ways in which environmental variation may impact critical habitat in the marine environment are discussed in Chapter 4, Section A.i. Detailed life history information for Federally-protected species is not provided at length in this PEIS, but may be found online on the NMFS ESA Species Directory, and in the USFWS Environmental Conservation Online System (ECOS), web addresses provided below:

- https://www.fisheries.noaa.gov/species-directory/threatened-endangered
- https://ecos.fws.gov/ecp/

NMFS is responsible for implementing the ESA for marine and anadromous species, with a few exceptions that are managed by USFWS (e.g. southern sea otter). For aquaculture facilities sited in an AOA, NMFS has regulatory responsibility under the ESA for protected species of most marine mammals, sea turtles (in the offshore marine environment), fishes, sharks, rays, and invertebrates; USFWS would implement the ESA for protected species of birds and some marine mammals. This programmatic NEPA analysis may support permitting agencies' decisions for any future aquaculture facilities sited in an AOA, in addition to more detailed information that may be required to consult with NMFS and USFWS on specific activities associated with project designs and alternatives. Section 9 of the ESA additionally prohibits the "taking" of any protected species, defined at 16 U.S.C. § 1532(19). Prohibited take activities include those which actually kill or injure fish or wildlife, and may include significant habitat modification or degradation which actually kills or inures fish or wildlife by significantly impairing essential behavioral patterns, including, breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR § 222.102). Measures to avoid take pursuant to Section 9 would be developed with NMFS and USFWS during ESA Section 7 consultations, if applicable.

Sea Turtles

Three of the four species of sea turtles featured in Table 5 are thought to occur rarely in coastal waters of the SCB, and have been sighted in the offshore environment of the SCB. Leatherback sea turtles use eddies and persistent fronts to forage, but usually avoid the warm waters of the SCB (Benson et al. 2011, NMFS 2012, and CBD 2019). Olive ridley sea turtles inhabit warmer, more subtropical waters off the coast of Mexico, but may shift north during ENSO periods when the SCC strengthens; and there are stranding records in the CCE (82 FR 48674, Peavey et al. 2017). Juvenile loggerhead sea turtles may be found within or in proximity to the alternative areas, based on telemetry data and documented fisheries interactions (Eguchi et al. 2018, CA Herps 2024, and NOAA 2024a). Green sea turtles have resident populations in southern portions of the SCB and close to shore, with primary habitat in seagrass beds and

estuarine waters warmer than 15°C (82 FR 48674, Crear et al. 2016, and Hanna et al. 2021). Green sea turtles have been captured at Stearns Wharf in Santa Barbara harbor, and at the Channel Islands (VPD 2018). Of these four species, Loggerhead sea turtles are the most likely to be found near the Alternatives; but presence is thought to be sporadic and correlates with warm water periods (Eguchi et al. 2018, Morris et al. 2021). Both Green sea turtles and loggerhead sea turtles have stranded on nearby beaches within the last decade (VPD 2018). Some of these species have designated critical habitat, but none of it overlaps any of the Alternatives.

Marine Mammals

In addition to the marine mammals protected under ESA, all marine mammals are protected under the Marine Mammal Protection Act (MMPA). Intentional or directed take of any marine mammal is prohibited (16 U.S.C. §1362). Most activities that have the potential for incidental take of marine mammals require case-by-case approval upon request from the Secretary of Commerce. Sections 101(a)(5)(A) and (D) of the MMPA detail the authorization for a specified activity that may cause take other than commercial fishing, within a specified geographical region, with public notice and review. MMPA-protected species that have potential to occur in the AOA alternative areas are identified in Table 5. In the spatial modeling for AOA options, a score of zero meant something was not compatible with aquaculture. Marine mammals with no ESA listing status, but protected under MMPA, were scored from 0.6 to 0.8, depending on population size and trends (NMFS 2021b, Morris et al. 2021). Scores provided high level characterization regarding the potential presence of species of lower or higher concern at the scale of an AOA Alternative.

An example of an activity other than fishing that may have incidental take from is seismic surveys. Depending on specific project design, applications for permitted actions for projects sited in an AOA may require authorization if there is potential to disturb marine mammals during baseline environmental surveys, construction, operations, or decommissioning. NMFS has authority under the MMPA over cetaceans and pinnipeds; USFWS is responsible for select other marine mammals, including sea otters and Steller sea lions. Any incidental take of marine mammals during activities would be expected to be reported via procedures to be determined during permitting decisions.

Pinnipeds (seals and sea lions) that are most likely to occur in the alternative areas are identified in Table 5. The most common species in the SCB is the California sea lion. Northern elephant seal and Pacific harbor seal are also both common throughout the region. Sea lions and seals have rookeries (breeding/pupping sites) and haul out areas throughout the Channel Islands, especially on the northern islands, along with multiple mainland shores (Schiff et al. 2000, NCCOS 2005, Morris et al. 2021, and SWRCB 2021). Fur seals are less common than the other pinniped species in the SCB; but there is a small rookery on San Miguel Islands and on the Farallon Islands in central California, and populations are thought to be increasing (NCCOS 2005, Caretta et al. 2023 (Northern Fur Seal last revised 2015)). Some of the largest pinniped rookeries on the west coast are on San Miguel Island (Schiff et al. 2000, NCCOS 2005). Seasonal abundance of elephant seals, harbor seals, and sea lions within Santa Monica Bay is shown in Fig. 5 on p. 8 of Bearzi et al. (2008).

Cetaceans (dolphins and whales) are also diverse and abundant in the SCB. Multiple dolphin species are prominent, including Common (*Delphinus delphis*), Bottlenose (*Tursiops truncatus*), Long- and Short-beaked (*Delphinius capensis*) and (*Delphinius delphis*), Risso's (*Grampus griseus*), and Northern Right whale dolphins (*Lissodelphis borealis*). The most commonly observed baleen whales near the alternative areas are the Gray whale (*Eschrichtius robustus)* and Humpback whale. Blue (*Balaenoptera musculus*), Fin (*Balaenoptera physalus*), and Minke (*Balaenoptera acutorostrata*) whales are all observed commonly in the SCB, depending on season and oceanographic conditions (Becker et al. 2020, Carretta et al. 2023). The following resources provide more species-specific information on cetacean habitat use in the areas of analysis:

- Habitat models in the SCB for 14 cetacean species are provided in Section 6.1 on pp. 167 through 186 of the CJNMS Biogeographic Assessment (BGA) (NCCOS 2005).
- Seasonal abundance of three resident species of dolphins in Santa Monica Bay is shown in Fig. 2a,b,c of Bearzi (2005).
- Seasonal occurrences of marine mammals in the SCB are provided in Table F-2 of Appendix F in the Cabrillo Power LLC Marine Wildlife Contingency Plan (CSLC 2015).
- Becker et al. (2020) provides distribution models for multiple cetacean species in the CCE. Those that indicate high predicted density near the AOA alternative areas are Figure 2a-d and 32; Figure2g; Figure 2j; Figure 2k-n.
- Ecologically-important areas for protected resources relative to Alternative 2 are shown in Figure 3.48 on p. 116 and Figure 3.66 on p. 143 of the Results Section of the Atlas (Morris et al. 2021).
- Ecologically-important areas for protected resources relative to Alternative 3 are shown in Figure 3.86 on p. 175 of the Results Section of the Atlas (Morris et al. 2021).

NMFS has identified cetacean Biologically Important Areas (BIAs). The aim of delineating BIAs is to use the best available science to characterize important areas for specific species, populations, or stocks that can aid managers in cetacean impact assessments or other conservation efforts; BIAs are not regulatory. Phase I BIAs were considered in the Atlas. Recent updates to the methods and BIAs identified in marine waters of California were published after the spatial modeling in the Atlas (Calambokidis et al. 2024). Phase II BIAs are shown in Figures 9-11 in relation to the AOA Alternative areas. While the maps themselves are new, the underlying best available information used in their creation informed the development of this PEIS. These Phase II BIAs and any future updates may be considered in future site-specific environmental planning.

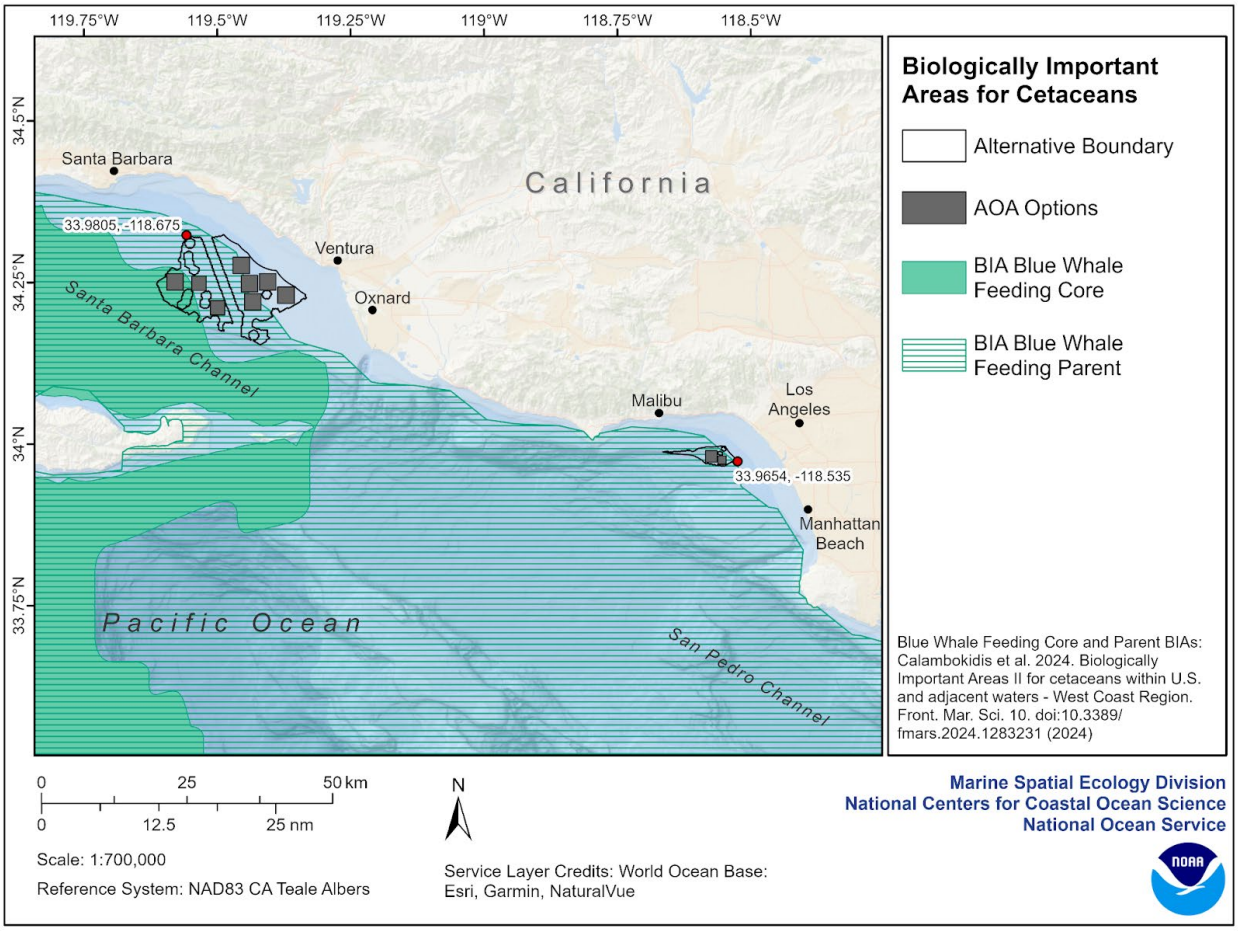


Figure 9: Blue Whale Biologically Important Areas (Phase II) in Relation to AOA Options

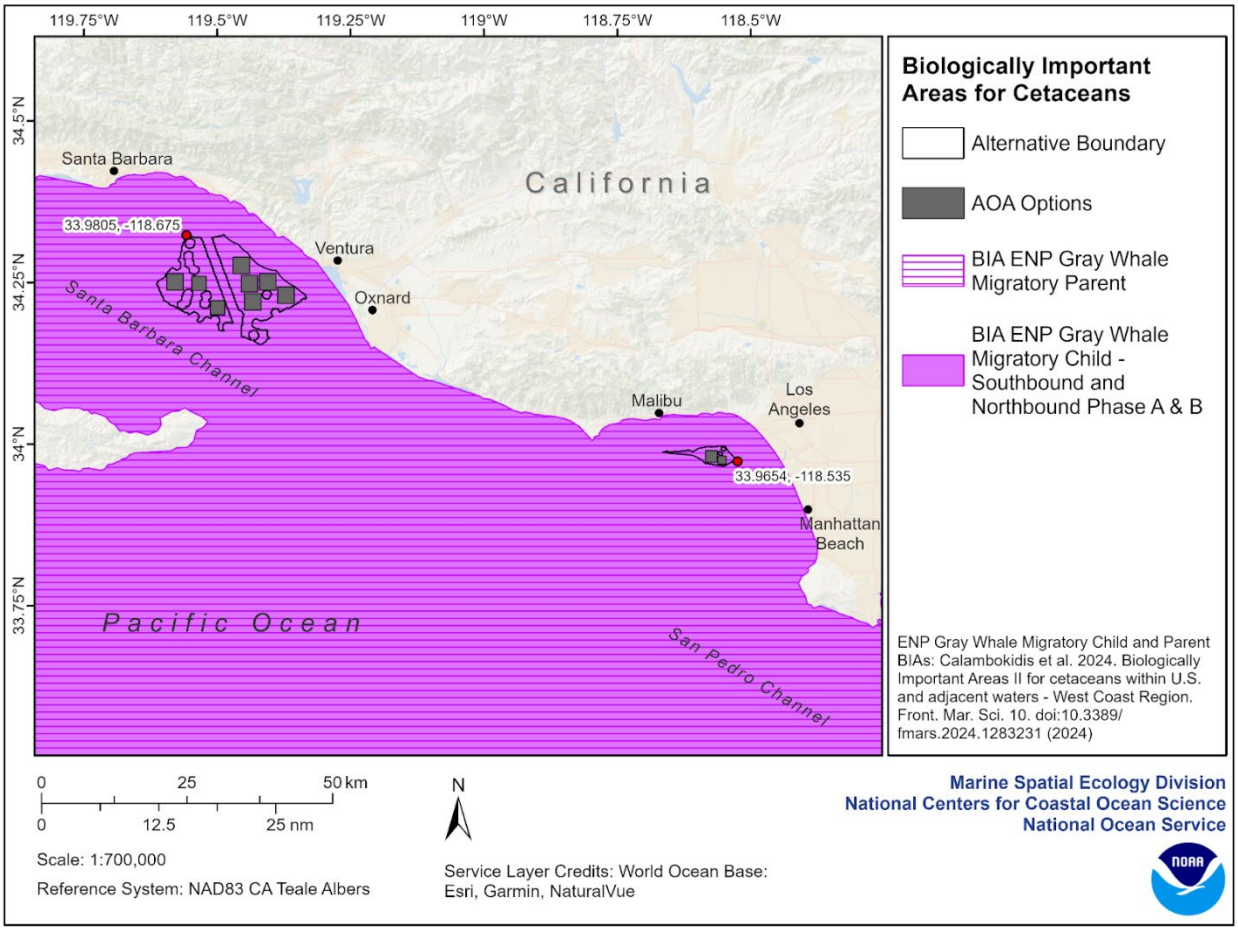


Figure 10: Gray Whale Biologically Important Areas (Phase II) in Relation to AOA Options

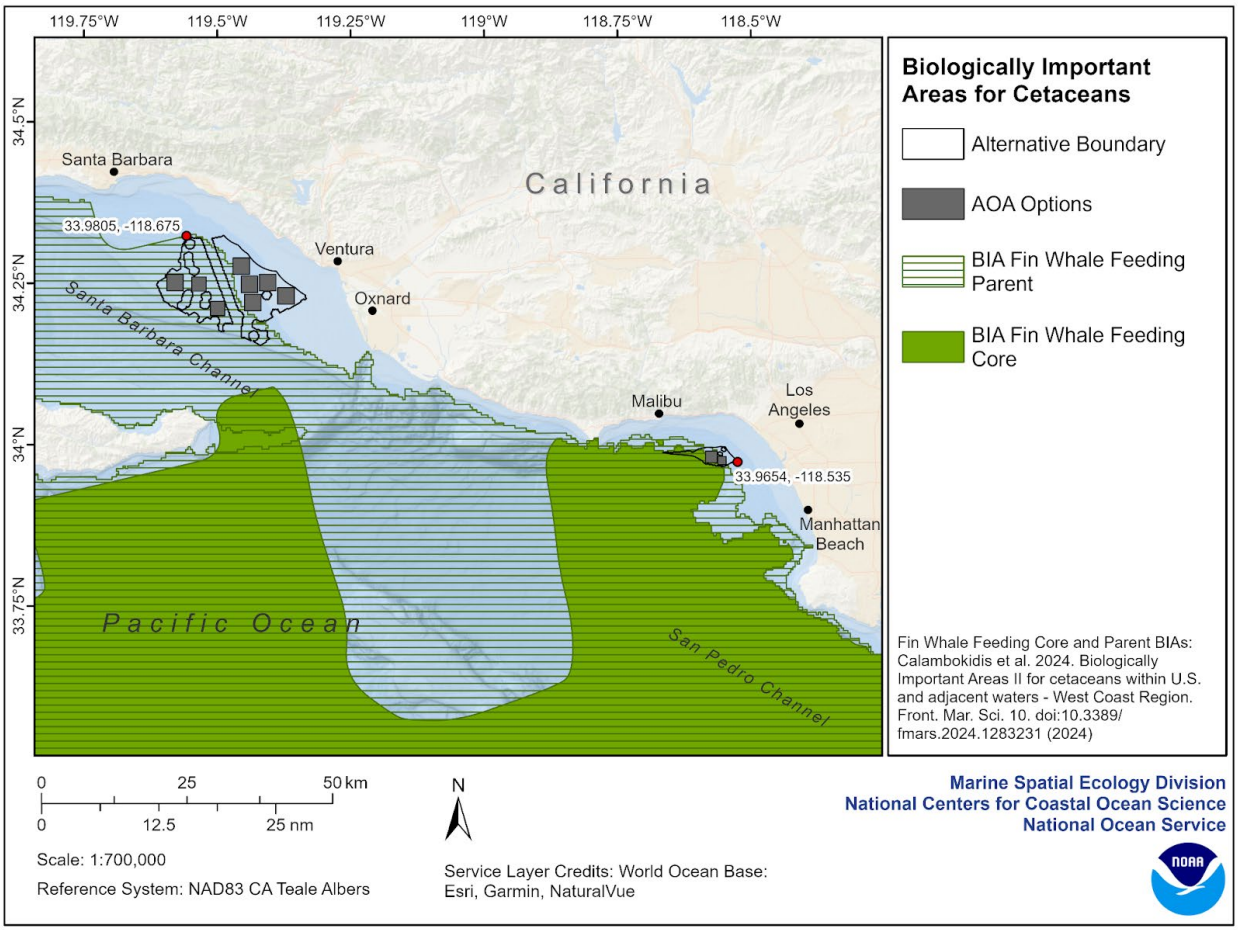


Figure 11: Fin Whale Biologically Important Areas (Phase II) in Relation to AOA Options

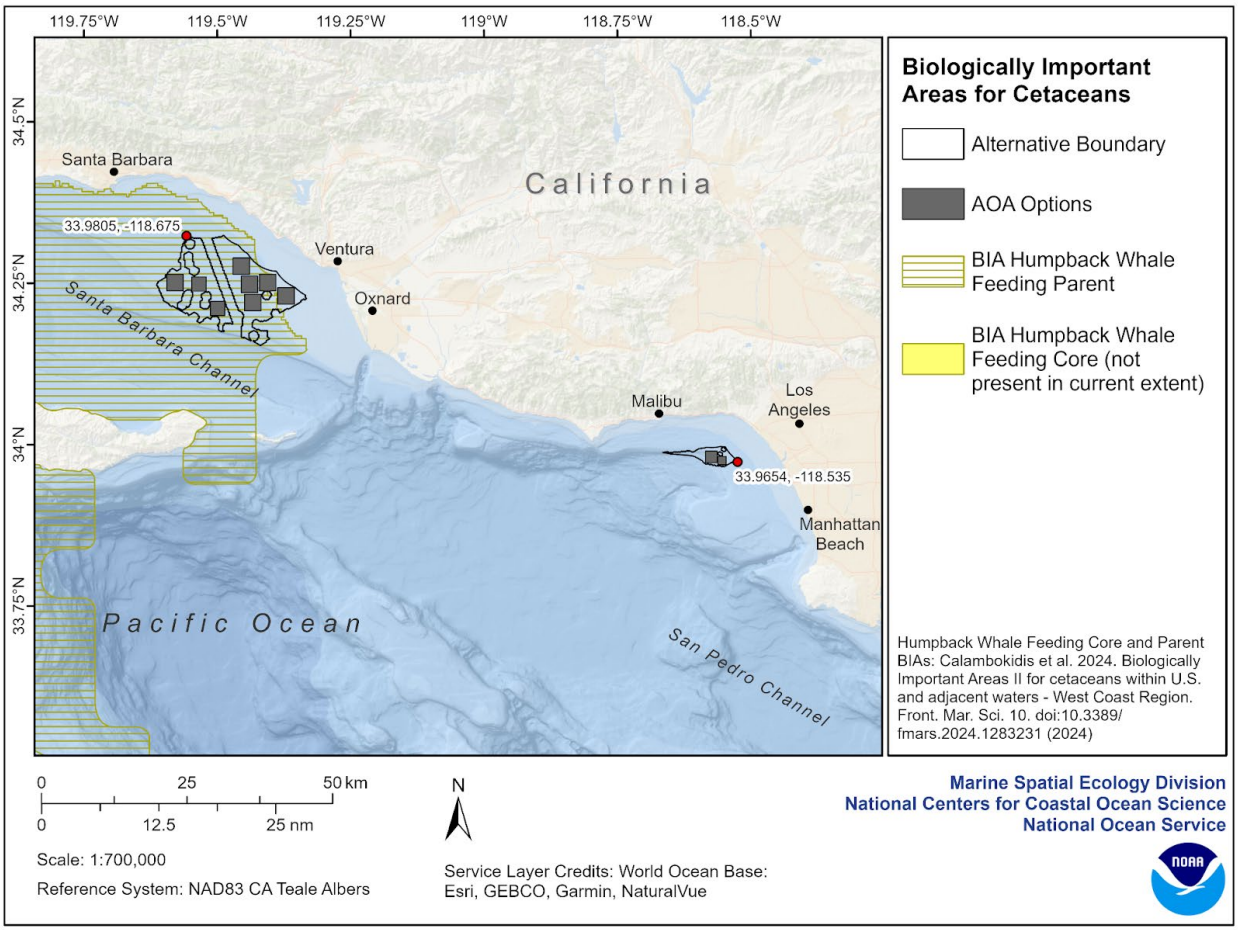


Figure 12: Humpback Whale Biologically Important Areas (Phase II) in Relation to AOA Options

Birds

In addition to the ESA-listed bird species identified in Table 5, most birds that occur in the EEZ are protected under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. §703-712, 50 C.F.R. §10.13). The list of species protected under the MBTA may be found at 50 C.F.R. §10.13. USFWS is the responsible agency for MBTA, including seabird management and colony monitoring. E.O. 13186, "Responsibilities of Federal Agencies to Protect Migratory Birds" (E.O. 13186, 2001), strengthens interagency efforts under MBTA and ESA and the implementation of international, bilateral conventions for the conservation of migratory birds. Although E.O. 13186 refers to interagency MOUs with USFWS outside of the AOA planning process, the conservation measures may still apply as practicable mitigation for Federal agency actions in the absence of an MOU (USFS 2022). USFWS also assesses U.S. migratory, nongame bird populations under the Fish and Wildlife Conservation Act for whether they are likely to become designated as threatened or endangered under the ESA, and designates those species likely to become ESA-listed without directed conservation measures as Birds of Conservation Concern (BCC) (USFWS 2021). The BCC list is updated periodically. Seabird population monitoring in the CCE is coordinated with the USGS, the NWR system, as well as state and local-level groups (USFWS 2005). USFWS also works with agency and organization partners to implement the Waterbird Bycatch Policy, which promotes public awareness on conservation issues or violations of MBTA at sea, along with the gathering of scientific information to inform guidelines for management, regulation, and compliance (USFWS 2000).

It is estimated that several million seabirds, representing over 100 species, occur off the coast of California (USFWS 2005). The range of many of these species is the greater Pacific region, for foraging

or nesting. Table 5 identifies the species of birds that are protected under the ESA only. Additional MBTA-protected species that may occur in the SCB are numerous. Species and detailed life history information may be found in the USFWS Pacific Region's Regional Seabird Conservation Plan (USFWS 2005). The following resources provide more species-specific information on seabirds:

- Seabird species that may occur in U.S. West Coast EEZ are listed on pp. 40 and 41 of PFMC's Environmental Assessment for the Comprehensive Ecosystem-Based Amendment 1: Protecting Unfished and Unmanaged Forage Fish Species of the U.S. Portion of the California Current Ecosystem (PFMC 2016).
- Breeding seabirds of coastal California are listed in Table 1 on pp. 18 and 19 of the USFWS Pacific Region's Regional Seabird Conservation Plan (USFWS 2005).
- More information on habitat use by commonly-sighted seabirds in the SCB, with additional literature review, in the SCB is provided in Figure 5.0.1 on pp. 136 and 137 of the CINMS BGA (NCCOS 2005).
- Six focal species thought to indicate foraging conditions in the CCE are featured in Table M.1 on p. S-61 in Appendix M of Harvey et al. (2023).

Temporal variations in seabird populations are associated with reductions in food supply caused by natural factors such as El Niño events. Seabird density and diversity is higher in the spring and fall during migration seasons than in winter (USFWS 2005). Nesting colonies are monitored throughout the California Coastal National Monument and Corridor, on the Channel Islands, and NWR lands near San Diego (USFWS 2005). San Miguel, Santa Cruz, Santa Rosa, Anacapa, and Santa Barbara Islands are important nesting colonies for many species, and the NWR lands near San Diego are important for gulls and terns (NCCOS 2005, USFWS 2005). It is likely that birds from these nesting colonies would use waters throughout the SCB.

Other

Some additional Federally-protected species are also acknowledged to have historic range, or rare sightings in the SCB, but the region is not managed as current habitat for the species. These species are not addressed further in the text of this PEIS, but may need to be considered in site-specific NEPA analysis, depending on new population trends or specific project plans at the time of permitting. Examples include:

- Bald eagles (*Haliaeetus leucocephalus*) and peregrine falcons (*Falco peregrinus*) exist on the mainland and on the Channel Islands, and are sometimes observed over the ocean; but both species are thought to forage close to their nesting territories, therefore it is unlikely either species would forage in offshore areas (Wiemeyer et al. 1993, Dekker and Bogaert 1997, Dooley et al. 2005, and NPS 2024a,b).
- California Condors (*Gymnogyps californianus*) are scavenger species that are sometimes observed in coastal habitat and very rare historic accounts of foraging live prey (Tyner et al. 2013, USFWS n.d.). The species relies on cliffs or other areas of reliable air currents to take off and fly, and is not known to ever fly between the mainland and offshore islands (Cornell Lab 2024, D'Elia and Haig 2013). Therefore, it is unlikely that condors would occur in offshore areas.
- There are historic populations and recorded occurrences of at least 14 bat species across the eight Channel Islands (Brown and Rainey 2018). The species are listed in Table 1 on p. 475 of Brown and Rainey (2018). Bats use the Channel Islands as a stop-over during migrations (Brown and Rainey 2018, NPS 2020). Bats are also shown to be affected by artificial light, including during foraging and migration (Buchler and Childs 1982, Rydell 2006, Lewanzik and Voigt 2014, and Brown and Rainey 2018). The potential for bats to occur in the offshore environment is low, so they are not included in Table 5. However, there are ongoing survey and monitoring efforts as a part of offshore wind leasing (Solick and Newman 2021, SEER 2022, BOEM 2023b, and Kennerley 2024).

- Killer whales (*Orcinus orca*) thought to be from the Eastern Tropical Pacific stock were sighted recently by whale watching ventures operating offshore between Oxnard and San Diego; and the recent activity may have been concentrated around Long Beach and Newport Beach (Fudge 2023, Sternfield 2024, and Waterhouse 2024).
- Historic range of the Southern sea otter (*Enhydra lutris nereis*) includes the SCB; and there is a very small translocated population at Nicolas Island far offshore (USFWS 2022). However, Southern California is not an area thought practical or achievable for reintroduction (77 FR 75266, USFWS 2022); and the species does not tend to use open offshore EEZ waters, primarily preying upon benthic invertebrates in state waters nearshore (Lafferty and Tinker 2014).
- Steller sea lion (*Eumetopias jubatus*) Western DPS had historic rookies on San Miguel Island; but the rookeries have not been occupied since the 1982 El Niño event (NCCOS 2005, NMFS 2023b).

Stressors

Existing conservation concerns for ESA, MMPA, and MBTA protected species in the SCB include fisheries bycatch, vessel strikes, invasive species, human disturbance, habitat degradation, and pollution. Species-specific conservation concerns are included in Table 5. Infectious disease is one of the top five stressors attributed to species extinction (Smith et al. 2006, Mashkour et al. 2020). See Chapter 4, Section A.i, and Appendix 4 for more discussion related to environmental variation and Federally-protected species and habitat. Environmental changes can act as a stressor; and certain life history characteristics can exacerbate the impacts when combined with these changes. For example, species with low fecundity such as marine mammals and seabirds are especially vulnerable to population declines if factors such as diminished food supply during El Niño events reduce survival of offspring.

Sometimes multiple animals are found stranded or dead within a certain timeframe or defined area, which can indicate environmental and ocean health issues, called a "mass mortality event" or "unusual mortality event (UME)" (NMFS 2024b,c). These types of events are sometimes attributed to past and ongoing activities that contribute to the baseline conditions of populations and habitat. UMEs that have occurred within the last 10 years are listed with associated species, probable cause, and NOAA Fisheries news feature or other source in Appendix 2.

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- fixed gear and other equipment placement in the water column and at the surface (leading to risk of entanglement, interference with migration, or foraging);
- increased vessel and human activity;
- noise generated by systems, equipment, activities;
- use of deterrents, artificial light;
- wildlife aggregations;
- risk of effluents;
- risk of marine debris; and
- risk of disease.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have

sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Siting aquaculture in AOAs may have direct and indirect effects on Federally-protected species or designated critical habitat in the SCB. The risk, severity of interactions with Federally-protected species, and potential impacts associated with future aquaculture operations would be context and location-specific, and dependent on the proposed activity. Operational procedures and the timing of operations also influence the degree of impacts (Young 2015). Uncertainty amplifies the risk of impacts; and there is a lack of available information on aquaculture impacts to Federally-protected species and their designated critical habitat in the SCB. These risks and potential impacts are discussed in more detail below. The analysis includes proxy information from aquaculture interactions outside the region, and from interactions in the region from other marine industries. Methods and criteria to quantify the risk of interactions may consider the likelihood of exposure, the rate or duration of exposure, sensitivity to consequence (e.g. life stage), and resilience to consequence (e.g. population size or reproductive strategy) (Verutes et al. 2020). An example of how to define and score exposure and consequence in a spatially-explicit area is summarized in Table 3 on p. 11 of Verutes et al. (2020). All impacts would be species- and scenario-specific. Many types of impacts may interact, e.g., additional entanglement risks may be created due to changes in habitat use and aggregations, or marine debris snagging on underwater aquaculture structures.

Offshore aquaculture activities have the potential to cause "take" of protected species during site assessments, construction, operations, and decommissioning. Under the MMPA, "take" means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. § 1362(13)). The ESA defines "take" as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" (16 U.S.C. § 1532(19)).

Any project sited in an AOA may be required to apply for an incidental take authorization, and/or may be the subject of take coverage through consultation on federal actions related to the project. An individual's behavior and movements through an area can change due to gear in the water, increased vessel and human activity, noise, and artificial light. Individuals could be injured or killed by seafloor disturbance, behavioral disturbance, entanglement, or vessel strikes. Any species' ability to detect disturbances or objects in the water to navigate or forage may be compromised in certain environmental conditions, such as low light conditions, storms, or turbid waters (Benjamins et al. 2014, Young 2015). Takes may result in population-level impacts, depending on incidental or chronic exposure, as well as the size and range of the population, however Section 7 of the ESA requires Federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. NOAA Fisheries may conduct more in-depth analyses under the Endangered Species Act Section 7 consultation process, the MMPA, and other relevant protected species statutes if and when specific aquaculture projects are proposed.

Section 118 of the MMPA classifies all U.S. commercial fisheries into one of three categories (I, II, III) based on the level of incidental serious injury and mortality of marine mammals that may occur in each fishery (e.g. Category I = frequent, Category II = occasional, Category III = remote likelihood). The current categories are included shown in Table 6. The categorization of a fishery determines the application of certain provisions of the MMPA, such as registration with NMFS, observer coverage, and take reduction plans. Marine aquaculture operations in the California EEZ are listed under Category III (CDFG 2010, NMFS 2023c). These categories are generally reviewed and updated annually by NOAA and published in the List of Fisheries (NMFS 2024d). A gear calendar for all fisheries that may occur in the SCB, both state and Federal, is provided in Table 6, based on the MMPA List of Fisheries.

Entanglement

Globally-documented cases of entanglement in shellfish and finfish aquaculture facilities are summarized in Table 3.2 of Mori and Riley (2021), and in Bath et al. (2023). Mooring lines and anti-predator nets are

the equipment associated with physical interactions with marine species (Bath et al. 2023). While these two literature reviews present examples of reported aquaculture entanglement incidents, the limited number of reports to date does not necessarily provide enough information to conclude injury or mortality rates per type of facility. However, gear types, gear materials, as well as species type and the size of an animal all could factor into aquaculture entanglement risk. In general, better assessment of entanglement monitoring processes and reliability in assessing aquaculture operations globally is needed to determine if the few recorded events are an accurate representation of the potential for entanglement (Mori and Riley 2021). The uncertainty in records from both aquaculture and from wild capture fisheries is high, due to the following considerations from Knowlton and Kraus (2001), Saez et al. (2021), Mori and Riley (2021), and Bath et al. (2023):

- incidents can be difficult to detect when they occur below the surface of the water;
- carcasses often sink when the animal dies and are not detected or recovered;
- observer(s) not likely to present at all times;
- gear goes missing and the reason for damages are unknown;
- lack of documentation and public awareness for information sharing;
- documents or other sources are missed due to limits on information sharing, language barriers, or policy relevance;
- patterns in animal interactions (more entanglement events) or in human activity at sea (more observations) could cause increases in reports; and
- reports may be biased for proximity to human activity and weather conditions.

Baleen whales may be at higher risk for entanglement, compared to smaller cetaceans that use echolocation to navigate their environment and feed (Swartz and Jones 2016, Saez et al. 2021, Mori and Riley 2021, and Bath et al. 2023). Based on reports globally, juvenile whales seem most likely to be at risk for entanglement (Benjamins et al. 2014, Swartz and Jones 2016, Price et al. 2017, and Bath et al. 2023). Gray whale cow-calf pairs pass through the SCB in high frequency March through May, and Humpback cow-calf pairs migrate through the SCB in summer and fall. Cow-calf pairs of both species tend to stay close to shore, near shallow waters, bays and lagoons (Swartz and Jones 2016, Guazzo et al. 2017, Swartz 1986, VPD 2018, and Jones et al. 2023). One local monitoring group noted in survey data from 2007 through 2017 that it was rare to see a Gray whale cow-calf pair more than 0.75 miles from shore (Gray Whale Count 2017), though fishing industry participants operating in or near the alternative areas suggest, based on years of experience in these areas, that water depth is far more important in determining where cow-calf pairs are likely to be found, rather than distance from shore (PFMC 2025). Many cow-calf pairs of other cetacean species are observed throughout the SCB, included in Table 2 on p. 7 of Smultea et al. (2017). Potential entanglement of female protected species with offspring, or pregnant females, would hypothetically have a higher risk of population-level implications (Clement 2013). In addition, whales' larger bodies make them less agile, and their feeding strategies to engulf large volumes of water make them more susceptible (Price et al. 2017).

Sea turtles are also thought to be susceptible to entanglement as a result of their body configuration and behavior (Seminoff et al. 2015, Upite et al. 2019). Based on fisheries entanglement records, Leatherback sea turtles may be the most vulnerable to interactions generally, due to a widespread species distribution and broad potential foraging grounds (Young 2015, Mori and Riley 2021). Many bird species may be attracted to floating aquaculture gear, as roosting or feeding sites, and can become entangled, which can cause them to drown, starve, or suffer physical trauma (Bath et al. 2023, Barnes 2019). Larger sharks could become entangled in predator-control nets, but are not likely to be at risk for other gear interactions. Benthic species and pelagic fishes are not likely to be at risk for entanglement.

While the presence of highly mobile species is difficult to predict, a habitat compression index (HCI) can describe how much cool, productive water is available in an ecosystem, from 0 (complete coverage of warm offshore water in the region) to 1 (cool water fully extending 150 km (81 nm) from the coast) (Santora et al. 2020). HCI values closer to 0 compress prey community composition and distribution,

which in turn can help forecast spatial aggregation patterns of top predators (Harvey et al. 2023). This physical-based index has been used to forecast increased rates of whale entanglements in fixed fishing gear along the west coast, and could potentially be applied to aquaculture in the region. These and other spatial variability models based on patterns in upwelling and associated hydrographic fronts could be used to address entanglement risk.

A potential proxy to assess risk to protected species in the SCB may be considered from reviewing regional reports of entanglements in fixed or stationary fisheries gear. Fixed gear is a major source of mortality and injury for cetaceans along the west coast (Saez et al. 2021). In data analyzed from 1982 through 2017, and 2015 through 2018 (during what was considered to be peak years for entanglements), Gray whales and humpback whales were the most frequently reported species; incidents with Blue whales, fin whales, minke whales, killer whales, and sperm whales (*Physeter macrocephalus*) were also reported (Seaz et al. 2021, Harvey et al. 2023, and NMFS 2023d). Entanglement reports increased during March and April (Saez et al. 2021). Perspectives are divided on whether or not fixed gear fisheries should be used as a proxy to estimate risk of longline aquaculture entanglement. A noted difference is the diameter of lines, (typically 12 mm in diameter in fisheries versus 20 mm to 50 mm or greater in shellfish longline aquaculture); however lines to surface marker buoys and spat collecting ropes are typically thinner 12 mm or less and may pose a comparable entanglement risk (Lindell and Bailey 2015, Young 2015, Knowlton et al. 2016, and USACE 2021). In data analyzed from 2015 through 2018, nine out of 16 entanglements with gear from an unknown source had buoys attached (NMFS 2023d). Another notable difference between fixed fisheries gear and aquaculture gear is that shellfish longlines tend to be under greater tension (e.g. 800lbs) (Young 2015, VPD 2018, and Mori and Riley 2021). The breaking strength of lines in the water would pose a tradeoff: greater strength for keeping gear integrity may also decrease the risk of entanglement because the lines would be too taught to wrap around an animal; but upon impact, the risk of injury to the animal may increase (Knowlton et al. 2016, VPD 2018).

As discussed above, many types of impacts may interact, and entanglement may leave animals more susceptible to other threats including injury, infections, and vessel strikes (ONMS 2019). Additional adverse impacts may occur when an animal that is already entangled encounters aquaculture gear and gets further entangled, which is known as secondary entanglement. Secondary entanglement may occur if an animal is already dragging gear, such as weather buoys, nets, or pot/traps and that material interacts with aquaculture gear (Benjamins et al. 2014, Saez et al. 2021, and Bath et al. 2023). Marine debris itself may be a source of entanglement risk, or, if aquaculture gear collects marine debris from other sources, wildlife may become entangled in the debris (SEER 2021). Injuries from primary or secondary entanglement can impair an animal's ability to swim, forage, or breathe – all of which may result in injury or death. Injuries to protected species may also occur during human interactions as part of rescue efforts, or because they get tangled in anti-predation measures (CDFW 2010, Bath et al. 2023). Primary and secondary entanglements may also lead to damaged gear, loss in revenue, and human health and safety risks (discussed in other sections of this PEIS).

Marine Debris

As described in Section B.iv (Water Quality), accidentally-discarded, lost gear or degraded materials from an aquaculture facility could result in marine debris interacting with Federally-protected species and designated critical habitat. Types of marine debris associated with aquaculture gear and the reported adverse impacts to wildlife are summarized in Section 3.5 on p. 21 of Bath et al. (2023). Debris that makes it to the seafloor accumulates near coastlines and submarine canyons (Spykra 2017). Protected benthic species may be more susceptible to impacts from marine debris directly around a project footprint. Behaviors observed in pelagic species related to marine debris include interacting with marine debris for reasons that imply play, socio-sexual displays, and tool use (Owen et al. 2012). There are reports of birds in Australia incorporating rope lines from mussel aquaculture into nesting material (Lloyd 2003). These interactions may not be adverse, but exposes individuals to risks associated with adverse impacts from marine debris, including entanglement, suffocation, or starvation if ingested (EPA 2011,

CalOPC 2018, ONMS 2019, and Bath et al. 2023). When ingested, marine debris may also increase tissue contamination with POPs and heavy metals (USFWS 2005, Spyrka 2017). The effects of marine debris may also diminish surrounding habitat condition and function, discussed further in Chapter 3, Section C.iii (Ecologically Important Marine Communities).

Vessel Strikes

Vessel strikes could occur for any pelagic species and diving seabirds. Impacts from vessel interactions range from behavioral disturbance to injury or death. Vessel interactions may also lead to damaged gear, loss in revenue, and human health and safety risks. Disturbance caused by motorboats is also related to behavioral responses in marine mammals and birds, in which animals stop foraging or resting activities and move away from what is perceived to be a threat (NPS 2012). Factors that may be considered include vessel speed, the number of vessel trips needed to install and tend to gear, existing volume and density of vessels in the action area, as well as the density of protected species and their behaviors, especially for the seasonality or timing of vessel operations. These factors would likely be incorporated into permit conditions for in-water work.

Historically, the risk of vessel strikes in aquaculture projects has been generally considered discountable, even in riverine or nearshore environments, provided mitigation requirements (VPD 2018, Mori and Riley 2021). Smaller boats have the potential to injure or kill marine wildlife when traveling at high speeds (Ritter 2012).

The expansive pelagic habitat of the offshore environment is thought to help mitigate risk for vessel strikes given the space for animals to disperse away from an action area (Moore and Wieting 1999, Mori and Riley 2021). However, the SCB has a very high volume of vessel traffic, ranging from sailing and pleasure craft to major shipping, oil tankers, and military vessels (see Chapter 3, Section D.vi (Transportation and Navigation)). The baseline conditions may create a high risk of vessel strikes in the SCB, where whale mortalities due to vessel strikes have been some of the highest in the U.S. (Rockwood et al. 2017, Rockwood et al. 2021, Cusato 2021). Most cases where whales were known to be hurt or killed occurred at vessel speeds of 14 knots or more, and were caused by large ships of 80 meters or more in length (Laist et al. 2001). Similar to entanglement mortalities, these recorded events are thought to be underestimated since the carcass would likely sink (Rockwood et al. 2021). Maritime shipping lanes that concentrate traffic of large vessels were considered not suitable for aquaculture and do not overlap with any AOA options (Morris et al. 2021). Vessel speed reduction (VSR) programs are a proven effective conservation technique (Rockwood et al. 2021, Cusato 2021). More information about vessel traffic may be found in Chapter 3, Section D.vi (Transportation and Navigation).

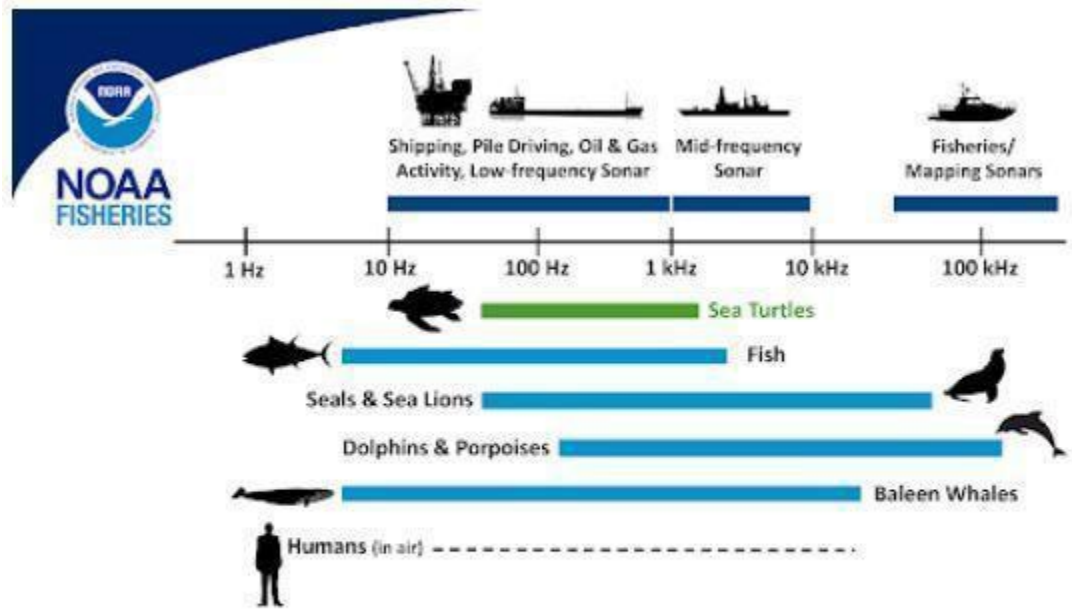
Increased vessel traffic and changes in traffic patterns due to AOA-associated maritime traffic may increase strike risks. Should animals avoid an AOA due to increased aquaculture activity within the AOA, they may end up closer to the shipping lanes or further offshore, and at higher risk to be in the way of large ships and fishing vessels. Buffers were applied to transportation and navigation considerations in the Atlas, and different AOA options are different distances from existing maritime traffic; this potential impact would be considered in more detail in future site-specific environmental planning if necessary. Siting multiple facilities within an AOA (versus a No Action Alternative where proposed facilities would not benefit from long-term planning and environmental review) could help permitting agencies and biologists assess the risk of increased vessel traffic that may be more specific for a coordinated, predictable area, rather than a generalized cumulative impact assumed for a region with multiple, uncoordinated uses.

Noise and Light Pollution

Sound is more important for some species' than others to navigate and interpret their environment. This, combined with variations in sensory capabilities, result in different reactions to sounds. Species may be exposed to underwater noise with no impact or habituate to the sound over time. They could be attracted

to the source out of curiosity; or they could startle and avoid the sound source, or even experience internal injuries (NMFS 2018, NMFS 2021a). Disruptions to the baseline acoustic environment can impact individual behavior, as well as community structure or even biodiversity for marine mammals, sea turtles, fishes, and invertebrates (Mooney et al. 2020, NMFS 2021a). Regulatory mechanisms to monitor and mitigate adverse impacts from underwater and overwater noise are discussed in Chapter 3, Section B.vi (Acoustic Environment).

The type of impact or risk of injury to marine life from anthropogenic noise depends on the specific activity and the hearing capability of the species present, as well as the distance from the sound source (Clement 2013, NMFS 2018, SEER 2021, and NMFS 2021a). The general hearing range of marine mammal species groups is summarized in Table ES1 on p. 3 of the most recent NMFS Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NMFS 2018). Many fishes and benthic invertebrates produce low frequency sounds (Mooney et al. 2020). Sea turtles also have a hearing range in lower frequencies (NMFS 2023e). Figure 9 shows the overlap of general hearing ranges with common anthropogenic noise in the marine environment. There is potential for diving seabirds to be affected by underwater noise as well; but more likely, seabirds may be attracted to an area due to overwater noise and activity. There are many established noise impact mitigation methods that have been developed for other marine industries under ESA, MMPA, and MBTA that may be incorporated into project designs and operations plans through the permitting process.



The range of frequencies sea turtles can hear overlaps with the general hearing ranges of many other marine species and sources of human-caused sound. 1 kHz is equal to 1,000 Hz. Credit: NOAA Fisheries.

Figure 13: Hearing Ranges and Common Anthropogenic Sounds in the Marine Environment

Underwater noise has the potential to occur at all stages of an aquaculture project. Project specific factors that may affect sound production include the number of lines, pens, anchors, and vessels associated with an activity (Bath et al. 2023). Any required seafloor mapping during baseline environmental surveys may also impact the underwater acoustic environment (NOAA NOS 2022). A comparison of how sound travels and refracts in shallow versus deep ocean water is described in Section 2.2.5 on pp. 9 and 10 of Olesiuk et al. (2012). Noise from construction and operations may be impulsive (e.g. anchors, chains) or

continuous (e.g. engines), generated by vessel and human activity, fixed-bottom foundations (e.g. pile driving), floating structures (e.g. mooring lines), or mechanical operations. Vessel sounds associated with aquaculture operations would likely be in similar frequency and intensity ranges as those of commercial fishing and transport operations (Olesiuk et al. 2012). Background noise in the open ocean is lower frequency and not as intense as in coastal areas (Olesiuk et al. 2012). The offshore environment, due to deeper waters and more open space, may help mitigate some adverse impacts from noise associated with aquaculture.

Artificial light could impact pelagic species and birds at any stage of an aquaculture project. It is not likely that benthic species would be impacted by lighting systems. Impacts could range from no impact to disturbance or injury, or an increase in predation activity (Clement 2013). Artificial light under barges, around oil and gas platforms, and other structures in the water can influence the behavior and community structure of plankton, nektonic invertebrates, fishes, and marine mammals (Nightingale et al. 2006, Ono et al. 2010, Barker 2016, Bassi et al. 2022, Simons et al. 2021, Marangoni et al. 2022, and Oyabu et al. 2024). A review of the impacts of artificially-lit coastal infrastructure on movements of juvenile salmonids is summarized in Table 1 on pp. 9 and 10 of Ono et al. (2010). Impacts observed in the marine coastal environment may be similar to what could occur in the offshore environment of the SCB. Predatory fish and marine mammals that may occur in the alternative areas may be drawn towards lighting systems, which could increase foraging opportunities. Seabirds and sea turtles would likely be most at risk for adverse impacts from artificial light. Documentation from fisheries shows that lights disorient birds and can cause them to fly into ships, causing injury or death (USFWS 2005). Light pollution is known to be one of the leading threats for sea turtles (Seminoff et al. 2015, Fisher 2021, and NMFS 2021c). In addition, Thums et al. (2016) found that Green sea turtle hatchlings were also attracted to light after entering the ocean. Attraction or disorientation associated with light may lead to sea turtles being more susceptible to predation, or changes in foraging success and fitness.

The potential is low for any shorebird species to occur in any of the Alternatives. However, shorebirds are known to be impacted by artificial light in the coastal environment (Simons et al. 2021). If an individual (e.g. California Least Tern, or other ESA-listed shorebirds included in Table 5) were to fly between the mainland and the Channel Islands it may be disoriented by a concentration of lights in an AOA.

Similar to vessel strikes, a potential benefit to siting multiple facilities within an AOA (versus a No Action Alternative where proposed facilities would not benefit from long-term planning and environmental review) could help permitting agencies and biologists assess the risk of increased noise and light for a coordinated, predictable area, rather than a generalized cumulative impact assumed for a region with multiple, uncoordinated uses. Potential noise and light generated by other marine industries interacting with aquaculture facilities is included in Chapter 3, Section B.v (Air Quality and Aesthetics), Section B.vi (Acoustic Environment), and Chapter 4, Section A.ii (Other Ocean Uses).

Habitat Use

Offshore aquaculture activities during site assessments, construction, operations, and decommissioning have the potential to impact habitat characteristics and habitat use. Changes to habitat use may include exclusion, avoidance, or attraction. Changes could occur due to the gear in the water, or from human activity. Behavioral impacts may be limited to individuals or during the time of a certain activity, or local populations may become habituated to aquaculture activities within an AOA and change foraging success or migration patterns, based on more continuous aquaculture activities. Habituation could range from no impact or beneficial impacts if it increases foraging success. In contrast, a population could be adversely impacted if individuals experience long-term foraging, navigation, or communication obstacles that may lead to decreased reproductive success in local populations. Adverse impacts can also occur if individuals are forced to move, even temporarily, to areas with higher vessel traffic, more congestion, and so forth.

The spatial scale of behavior and habitat use modification is thought to affect not only a project footprint, but the surrounding geographic area (Clement 2013, Price et al. 2017). This effect would likely be

amplified by siting multiple aquaculture facilities in an AOA. The temporal scale of impacts may vary according to lifetime of the project, and if the affected species are resident, transient, or migratory (Clement 2013). It is not likely that all projects sited in an AOA would have the same or similar lifespans, therefore, the temporal scope of impacts would likely extend past what would be considered for an individual facility. Adverse indirect impacts from changes in habitat use could be interspecies interactions, changes in breeding success, and localized population depletion (Bath et al. 2023). Individuals may be more likely to be impacted by short term changes associated with disturbance or wildlife aggregations. Populations may be more likely to be impacted by long term or permanent changes associated with marine habitat connectivity. Components of a project that could be used to analyze changes in habitat use include the distance across the longest length of gear, accessibility to prey, exclusion methods or structures, and interactions to modify behaviors (e.g. deterrents, predator mitigation) (NMFS pers. comm. August 2021).

Changes to pelagic habitat could occur from effluents. The offshore environment is thought to mitigate any significant impacts to benthic habitat from effluents (Price and Morris 2013). The types of effluents that would likely be considered in permitting decisions are described in Chapter 3, Section B.iv (Water Quality), and Section B.iv (Potentially-Farmed Species). Potential impacts to protected species from effluents are discussed under each sub-alternative in this section.

Aggregations of marine mammals, seabirds, predatory fish and schooling fish are observed near marine aquaculture facilities worldwide (Rensel and Forster 2007, Bath et al. 2023, and Rhodes et al. 2023a, Barrett et al. 2018). Aggregating cues include predation opportunities, physical protection by floating structures, and conditioned responses to sounds, lights, and aquaculture operations (Rhodes et al. 2023a). Prey may use structures to escape predators and alternatively, facility structures may aggregate prey and provide novel foraging opportunities (Duprey et al. 2007, Kramer et al. 2015, and Bath et al. 2023). Although some marine mammals and seabirds in the SCB prefer specific types of prey, most are opportunistic feeders (PFMC 2016). Sea turtles could also be drawn to new feeding habitat, if certain algal species and invertebrates that may be found near gear. Aggregations around aquaculture facilities offer alternative opportunities for food sources that could become a more attractive option than hunting wild prey over wide spatial ranges (Rhodes et al. 2023a). Aggregations around aquaculture facilities within an AOA may create a predictable, if not reliable, food source that could alter predatory behavior due to the baseline boom/bust characteristics of the SCB food web. Aquaculture sited in AOAs has the potential to change habitat use spatially for both resident and migratory species, and could even change habitat use temporally for migratory species (e.g. staying longer in the area, or stop migrating, due to a new reliable food source). Sea lions are known to haul out on man-made structures such as barges and stern ramps of vessels. If females of any species are drawn away from better foraging grounds, it could have population implications if it affects reproductive success or they are not able to support offspring.

Disease

Increased wildlife aggregations, on top of the baseline proximity and geographic overlap of protected species habitat, creates a potential risk for increased spread of pathogens and disease. Infectious diseases require a pathogen and host; the spread requires a third factor: a favorable environment, which makes a pathogen capable of infecting (e.g. temperature) and a host susceptible (e.g. poor nutrition) (Rhodes et al. 2023a). These three factors influence and may help identify the likelihood of disease and to identify mitigation. Many disease-causing agents routinely occur on a host or in the environment naturally, without causing disease. The focus in this PEIS is on those that do infect and cause disease, including compromised immune systems and other health issues, damage tissues, or death. Potential impacts to protected species from diseases that may be transmitted from different types of aquaculture projects are considered under each sub-alternative, below.

Most offshore aquaculture systems would likely have free seawater interchange with few barriers to flow between the culture system and the open ocean. The spread of disease to protected species may occur

from wild populations to cultured, or vice versa. It may also spread within wild populations due to intra- and inter-specific proximity in wildlife aggregations around an aquaculture operation. From Rhodes et al. (2023a), transmission methods include:

- waterborne transmission by release from an infected host into water and uptake directly from water by a susceptible host;
- direct or physical contact between infected and susceptible individuals, including predation, ingestion of shed material such as feces or mucus, and feeds;
- association with organisms that can carry pathogens, either as reservoirs or as intermediate hosts;
- association with contaminated inanimate materials (fomites) such as substrates and structures (e.g., equipment, sediments) contaminated with a pathogen; and
- active pathogen movement from infected host to susceptible host (e.g., motile stages of parasitic copepods).

Disease can affect individuals, populations, and habitat quality. Some pathogens have the ability to infect hosts of different species (Rhodes et al. 2023a). Withering syndrome is a top concern for abalone and other invertebrates in the SCB (Crosson et al. 2014, Moore et al. 2019). Sea lice, which have the potential to infect salmonids as well as other fishes, are a high-priority pathogen to control for fish health (Costello 2009, Thorstad et al. 2015, Guragain et al. 2021, Mordecai et al. 2021, and Rhodes et al. 2023a,b, Fjørtoft et al. 2021). Literature was not found on disease associations between sea turtles and commercial aquaculture; but it is known that sea turtles are susceptible to viruses when raised in captivity, and susceptible to bacterial infections in the marine environment (Haines 1978, Ebani 2023). Turtles are considered a risk to spread bacterial infections to other species, including humans (Warwick et al. 2013, Mashkour et al. 2020, and Ebani 2023). Birds would likely pose a risk to cultured populations through bacteria or parasitic infections (Rhodes et al. 2023a). Similar to birds, marine mammals may have the potential to introduce bacteria or share parasites with a cultured population. Baleen whales are hosts to many skin parasites, and all cetaceans are prone to internal parasites (Swartz and Jones 2016). The impacts on marine mammal health related to aquaculture projects has not been researched (Rhodes et al. 2023a). Due to behavioral influences on birds and marine mammals to aggregate near facilities and display intra- and inter-specific interactions, there may be higher potential for the spread of pathogens among seabird and marine mammal populations than between a cultured population and the predators. HABs (discussed in more detail in Chapter 3, Section B.iv (Water Quality)), can also sicken and kill marine organisms at all trophic levels.

There is potential for invasive species in aquaculture from biofouling organisms that can be invasive species in certain cases, novel parasites and diseases, and ballast water from vessels that move back and forth between farms or ports. Invasive species are species that establish and reproduce rapidly outside of their native range and may threaten the diversity or abundance of native species through competition for resources, predation, parasitism, hybridization with native populations, introduction of pathogens, or physical or chemical alteration of the invaded habitat. Through their impacts on natural ecosystems, agricultural and other developed lands, water delivery and flood protection systems, invasive species may also negatively affect human health and/or the economy. It is unknown what kinds of invasive species may potentially be introduced from activities in AOAs without project and production information, and therefore any potential impacts to specifically Federally-protected species and habitats would be context and location-specific, and dependent on the proposed activity. More information on ecological impacts of invasive species is provided in Section C.iii (Ecologically-Important Marine Communities).

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

There is high potential for aquaculture facilities that are sited in an AOA within Alternative 2 to have geographic overlap with breeding, feeding, migrating areas for protected species. The amount of pelagic habitat overlap that could occur for each AOA option in Alternative 2 is shown in Table 2. The largest option at 2,000 acres (8.09 km^2) is less than one percent of comparable habitat in Federal waters of the Channel, and about one-hundredth of a percent of surrounding habitat in the SCB. If multiple AOAs were identified in Santa Barbara Channel, it would increase the total potential acreage of 2,000 acres (Alternative 2) to 15,000 acres (60.7 km^2). The total amount of habitat overlap that could occur would be about 1.2% of the total habitat in Federal waters of the SCB, and less than one-tenth of a percent of the total area of the SCB. It is important to note that habitat overlap by itself doesn't represent an impact, rather all the stressors that may occur within that overlap. Site-specific surveys to characterize bottom habitat would be necessary to analyze potential impacts on protected benthic species. Highly mobile, pelagic protected species may be less at risk of impacts from habitat overlap.

Table 2: Alternative 2 Santa Barbara Channel AOA Option Footprints

AOA Option Name	Acres (km^2)	Percentage of Santa Barbara Channel (total 5,179 km^2)	Percentage of Southern California Bight (total 78,000 km^2)
N1-A	2,000 (8.09)	0.16	0.010
N1-B	1,500 (6.07)	0.12	0.008
N1-C	1,500 (6.07)	0.12	0.008
N2-A	2,000 (8.09)	0.16	0.010
N2-B	2,000 (8.09)	0.16	0.010
N2-C	2,000 (8.09)	0.16	0.010
N2-D	2,000 (8.09)	0.16	0.010
N2-E	2,000 (8.09)	0.16	0.010
Total	15,000 (60.7)	1.20	0.076

It is unknown whether aquaculture projects sited in Alternative 2 may have potential impacts on habitat connectivity for the Southern California Distinct Population Segment (DPS) of steelhead. Critical habitat for the Southern California DPS of steelhead includes the Ventura River, Coyote Creek, and the Santa Clara River. Site-specific analyses may need to consider the condition of the stock at the time of permitting decisions to better analyze if this impact could affect steelhead at an individual or population level. Future aquaculture operations proposed within an AOA would need to comply with applicable laws (e.g., ESA, EFH, etc.).

Composite species distribution models for invertebrate, fish, bird, and mammal data show high ecological importance in the areas around Alternative 2 (see Figure 7.2.5 and Figure 7.2.6 on pp. 204 and 205 of NCCOS (2005). Fin whale feeding and migration areas may also be impacted (VPD 2018). The area between Carpentaria and Ventura is a high activity area for coastal Bottlenose dolphins (NCCOS 2005). These habitat data imply interactions with protected species are likely to occur.

Marine mammals, seabirds, and sea turtles all have the potential to become entangled in aquaculture gear in the Santa Barbara Channel. There is no alternative location that could avoid the risk of a line or anchor separating. However, remote monitoring and response time may need to be considered when evaluating and mitigating entanglement impacts (USACE 2021). Locations nearer to shore may presumably enable faster response to an entanglement event. AOA options within Alternative 2 range from 5.7 to 14.4 km (3.1 to 7.8 nm) from shore, and from 8.5 to 20.7 km (4.6 to 11.2 nm) from the nearest port (Morris et al. 2021).

Vessel strike data and models of predicted mortality risk in the Santa Barbara Channel show that the risk of collisions with larger vessels is higher in the shipping channels than surrounding areas (Laist et al. 2001, Rockwood et al. 2021). It is important to note that the geography of the Santa Barbara Channel creates a bottleneck for all vessel activity, regardless of size, between the mainland and the Channel Islands. The combination of geography and the presence of shipping lanes may increase the risk of vessel strikes. Humpback risk seems to be concentrated in the northern extent of the shipping lanes, closer to Alternative 2 than Alternative 3, and is higher during summer and fall during feeding (Rockwood et al. 2021, Cusato 2021). Blue whales may also occur in higher densities closer to Alternative 2, as they congregate to feed near the Channel Islands (Cusato 2021). The risk to any species of vessel strikes from operations in an AOA would depend on the number and size of vessels associated with a project. The type of aquaculture would likely be less of a consideration relative to project footprint and production size.

The proximity of Alternative 2 to existing offshore infrastructure that contribute noise and light to the baseline environment is provided in Chapter 3, Sections B.v (Air Quality and Aesthetics), B.vi (Acoustic Environment), D.vi (Transportation and Navigation), and Chapter 4, Section A.ii (Other Ocean Uses). Predominant wind and ocean currents in the Santa Barbara Channel may help to alleviate pressures related to land-based marine debris and pollutants; but aquaculture projects would need to consider site location relative to other facilities and offshore infrastructure to properly assess risk of marine debris and effluents from other ocean-based sources. Localized changes to hydrology due to gear placement may also act to accumulate materials close to project sites, and close to wildlife aggregations. Significant and complex eddies in the Santa Barbara Channel can entrain and trap waters carrying contaminants, such as oil from natural seeps or anthropogenic sources (Rhodes et al. 2023a). Evidence from Channel Islands beach surveys show heavier debris, mostly associated with fisheries gear, gathers on offshore beaches more than on the mainland (Miller et al. 2018, Steele and Miller 2022). This type of gear would present higher risk for secondary entanglement. Any species passing through an area impacted by accidentally-discarded, lost gear, or degraded materials or other water quality stressors potentially generated by aquaculture operations could be subject to exposure to pollutants and marine debris. Hueneme Canyon is the closest bathymetric feature that may accumulate debris at the seafloor, but the nearest proximity is 14.8 km (8.0 nm) from Alternative 2. It is not likely that there would be any interactive effects from this bathymetric feature. Impacts to benthic protected species from marine debris from facilities sited within an AOA would likely occur within Alternative 2, under and close to a project footprint or associated vessels. Projects sited in an AOA would likely have BMPs or other permitting requirements that would be designed to manage water quality stressors, see Appendix 1 for more information on potential mitigation. It is anticipated that most potential adverse water quality impacts would be mediated and monitored through BMPs in permits, see also Chapter 3, Section B.iv (Water Quality).

Impacts to protected species due to changes in habitat use, wildlife aggregations, and disease may be more closely related to the type of aquaculture than geographic area within the SCB. These impacts are discussed for each sub-alternative.

a) Shellfish and Macroalgae

Potential impacts on protected species from changes in habitat use associated with shellfish and macroalgae aquaculture may occur associated with aquaculture sited in an AOA. According to global reports from Iceland, Chile, Australia, and New Zealand, shellfish operations seemed to restrict habitat

use for odontocetes (Lloyd 2003, Young 2015, Price et al. 2017, and Bath et al. 2023). Shellfish operations were also noted to take up more space across cetacean and sea turtle habitat than finfish operations (Young 2015). Global reports reviewed in Bath et al. (2023) imply shellfish operations attract seabirds. Based on longline fisheries bycatch data, the baseline behavioral conditions for seabirds include targeting floating longlines (Gladics et al. 2017). Reports from Washington show that seabirds may feed on biofouling organisms on gear as well (Nash et al. 2005). Loggerhead sea turtles feed on a wide variety of food items including mollusks and crabs and may investigate shellfish aquaculture sites (Mori and Riley 2021). Pinnipeds consume benthic organisms typically associated with mussel and other nearshore shellfish operations; but they do not commonly feed on shellfish and may be less likely to visit offshore operations in deeper water (Moore and Wieting 1999, Wursig and Gailey 2002, Price et al. 2017, and Bath et al. 2023). Similarly, Gray whales primarily feed on benthic crustaceans and invertebrates (Swartz and Jones 2016). Gray whales may be more likely to investigate shellfish aquaculture gear than other large whales, but unlikely to target facilities for foraging.

Microalgae systems are more likely to be used in nearshore, semi-protected areas and are outside the scope of this PEIS. However, Hughes et al. (2014) provides a detailed, behavior-specific and species-specific study within the CCE (specifically, Monterey Bay) that may be a useful reference to assess interactions with protected species in the alternative areas. Marine mammals and seabirds observed around this aquaculture equipment showed foraging, resting, grooming, and social, inspection, and direct interactions (e.g. pulling, pecking, biting, rolling) with gear (Hughes et al. 2014).

Baleen whales, dolphin species, and pinnipeds may be drawn to macroalgae gear based on their behavior to investigate, play, and forage in kelp beds (Meynecke and Kela 2023). Humpbacks, Gray whales, and Right whales have been documented interacting with marine vegetation around the world (Owen et al. 2012, Meynecke and Kela 2023). Gray whales may also feed on seaweed and seagrass (Swartz and Jones 2016). Many cetacean species are thought to use marine vegetation and marine debris as tools and socio-sexual displays (Owen et al. 2012). Small cetaceans may also be drawn to macroalgae aquaculture facilities since these structures attract forage fish species (Bath et al. 2023). Pinnipeds and sea birds may also be drawn to macroalgae aquaculture for opportunistic feeding on schooling fish. Sea turtles sometimes forage around, or take advantage of marine vegetation rafts (Moore and Wieting 1999). Novel rafting habitat, or potential aggregations of biofouling organisms or nektonic invertebrates around macroalgae aquaculture could alter sea turtle behavior.

There are no reports of entanglement in existing macroalgae aquaculture gear globally or in the SCB; but any line in the water column may pose an entanglement risk. There are no reports of entanglement in existing shellfish aquaculture gear in the SCB. Spat collecting ropes may pose a higher entanglement risk compared to other ropes used in mussel aquaculture (Moore and Wieting, 1999, Young 2015, Fujita et al. 2023, and Bath et al. 2023). Provided mitigation measures that would be applied in permitting decisions, this risk should be addressed (VPD 2018). It is unclear if entanglement in shellfish gear is due to attraction, or unawareness (Price et al. 2017, Bath et al. 2023). Species-specific behavior may play a role in entanglement risk. Documented entanglements of Federally-protected species in shellfish aquaculture gear in other areas have included cetaceans and sea turtles (Bath et al. 2023).

Continuous and impulsive noise may be generated underwater and overwater from construction and operations of offshore shellfish and macroalgae farms. Other aquaculture projects that have done acoustic modeling have predicted that underwater noise would be within acceptable thresholds for protected species, including both cetaceans and sea turtles, likely causing temporary disturbance, but not take of protected species (VPD 2018, NMFS 2016, and USACE 2021). Potential impacts were expected to be avoidance of the area and therefore minor, since sounds would be temporary and the size of the action area was small compared to surrounding habitat of similar quality (VPD 2018, USACE 2021). Modeling has shown however that above-water noise generated by one shellfish operation may have potential significant impacts to birds from the continued use of motorboats and other noise-producing equipment

greater than 41dBA more than 10% of the time, and some equipment that exceeded 60dBA at 50 feet (NPS 2012).

Predation around shellfish and macroalgae aquaculture, via interaction among aggregated wildlife, is likely to occur in the Santa Barbara Channel. Predation on shellfish operations from both diving and non-diving seabirds has been documented in Santa Barbara and in Tomales Bay (CDFW 2010). Impacts would likely be similar in offshore locations. Sea turtles may feed opportunistically on cultivated macroalgae, but the impact would not likely be significant on population behavior.

Shellfish and macroalgae aquaculture practices have the potential to introduce novel parasites, and/or pathogens into the environment via contaminated seed stock, or alternatively, may amplify and concentrate existing pathogens and parasites in the environment due to the close proximity of cultured organisms. From either mechanism, the spread of disease and parasites is an ecological impact that could hypothetically decrease both individual- and population-level fitness in non-conspecific wild populations and populations (Goedknegt et al. 2016, 2019, Bouwmeester et al. 2021, Purcell et al. 2025a,b). If projects comply with existing Federal and State regulatory mechanisms (discussed in Chapter 3, Section C.iv (Potentially-Farmed Species) and other management measures, seed stock should not contain parasites or pathogens of concern and this impact would not be significant. However, novel or existing parasites, and pathogens may still infect protected species due to wildlife aggregations around an aquaculture project. A list of pathogens (viruses, bacteria, and parasites) that are known concerns for marine aquaculture because they are commonly detected in aquaculture organisms and have an economic impact for affected species is provided in Appendix A of Rhodes et al. (2023a).

Macroalgae and shellfish aquaculture may not require inputs to growout systems. Therefore, beyond accidental spills, there would not likely be any impacts from most effluents. If shellfish and macroalgae aquaculture projects are configured in such a way that it causes changes to localized flow, stratification, dissolved oxygen, or other characteristics of the water column, that may impact protected species. Pelagic species may change how they use the surrounding waters, and avoid the area. The offshore ocean depths are thought to minimize water quality and nutrient deposition impacts to benthic species.

b) All Types of Commercial Aquaculture

Changes in behavior and habitat use of marine mammals and seabirds have been documented around finfish operations. Examples from IMTA aquaculture were not found in preparation for this PEIS. Based on reports reviewed in Bath et al. (2023), dolphins in the Mediterranean show site-fidelity, changed hunting tactics, and exhibited different social structures around finfish facilities. There are similar reports of dolphins changing social structures, as well as other odontocetes and seals associating with finfish aquaculture nearshore in New Zealand, Hawaii, and Scotland (Clement 2013, Northridge et al. 2013, NMFS 2021a, and Harnish et al. 2023). In Hawaii, marine mammal observations around finfish operations increased from about 550 between 2010 to 2016 to about 2500 from 2017 to 2020 (Sims 2013). Reports from Scotland, Australia, New Zealand, and Tasmania indicate pinnipeds also change behavior and social structures around finfish aquaculture (Kemper et al. 2003, Northridge et al. 2013, and Heredia-Azuaje et al. 2022). Diving seabirds are also drawn to finfish aquaculture (Lloyd 2003).

Entanglement has been documented for cetacean and pinniped species, as well as entrapment in offshore tuna ranching operations in Australia (Bath et al. 2023). Examples from IMTA aquaculture were not found in preparation for this PEIS. In contrast to shellfish and macroalgae operations, bird mortalities due to entanglement have been reported from finfish operations (Bath et al. 2023). Lines being considered for finfish aquaculture operations would likely include fixed structures moored to the sea floor with thick metal cables or high tensile strength line, typically under high tension (Clement 2013, Price and Morris 2013, and NMFS 2021a). They may, however, pose a risk of collisions resulting in lacerations and other impact injuries (Winn et al. 2008; Baldwin et al. 2012).

A literature review of noise characteristics from construction, operation, and predator deterrence associated with finfish aquaculture is summarized in Table 1 on p. 47 of Olesiuk et al. (2012). An example NEPA analysis of predicted noise generated by typical vessels and gear that may be used in a finfish operation is described on p. 185 of the Pacific Islands Aquaculture Management Program Draft Programmatic Environmental Impact Statement (DPEIS) (NMFS 2021a). In that programmatic NEPA analysis, offshore locations were thought to mitigate impacts from noise. In acoustic modeling that has been done for finfish aquaculture that have either been proposed or are in operation in the U.S., the most noise generated from a finfish facility was associated with vessels, and noise did not exceed thresholds for protected species (BOM 2014, EPA 2019, and CDFG 2012). However, this modeling was for smaller operations and potential impacts of multiple finfish operations in an area up to 2,000 acres (809 ha) would be greater. Site-specific NEPA analyses for facilities sited in an AOA may need project-specific assessments, including cumulative additive effects if projects are sited close to one another.

The risk of injury or entanglement may increase due to structures such as anti-predator nets or acoustic devices (Bath et al. 2023). The primary frequencies of acoustic deterrents occur within the most sensitive range for all functional groups of marine mammals (Olesiuk et al. 2012). The main environmental concern associated with acoustic deterrents is the potential for far-range, chronic effects on non-target animals. Field measurements and sound movement models conducted for finfish operations in Canada imply that sounds spread in a spherical-cylindrical way in the open ocean, when the path is unobstructed by islets and land (Olesiuk et al. 2012). In addition, the results of a field study, Shapiro et al. (2009), showed a high degree of fine-scale variability due to sound propagation from surface-reflected and bottom-reflected rays that could have important biological implications, as it would make it difficult for an animal to discern the direction of the sound source without traveling some distance, hampering its ability to avoid the deterrents (Lawson 2009, Olesiuk et al. 2012). The literature review in Olesiuk et al. (2012) implies that odontocetes are displaced from habitat during and up to a few months after devices were in use; but the devices are not effective for pinnipeds. This is consistent with the literature review in Bath et al. (2023), which also implies that acoustic deterrents may not be effective for large whales. While observations varied by species, it was noted that Bottlenose dolphins and common dolphins showed strong evasive behavior. The energy spectrum was thought to be above the estimated hearing range of turtles and invertebrates.

Predation from marine mammals and seabirds are a documented issue for finfish facility operators (Wursig and Gailey 2002, CDFW 2010, Harnish et al. 2023, Sims 2013, Northridge et al. 2013, and Bath et al. 2023). While enhanced foraging and opportunistic predation could be considered a positive impact for marine mammals and seabirds, there are tradeoffs. Aggressive interspecific behavior has been observed among odontocetes associating with finfish aquacultures in Hawaii, including one species harassing and separating a cow-calf pair of another species (Harnish et al. 2023). Baleen whales, smaller odontocetes, pinnipeds, and salmonids are preyed on by killer whales in the CCE (Baldridge 1972, Goley and Straley 1994, Dahlheim and White 2010, Strange 2016, and Pitman et al. 2015). Smaller odontocetes have been observed in the CCE feeding opportunistically on larger fishes, including salmonids (Elliser et al. 2020). The rate of interactions could increase due to wildlife aggregations at aquaculture sites within an AOA. It could also increase the risk of injury to both predator and prey if the interactions occur in concentrated areas, close to operations or associated vessels. Predation may increase the risk of human interactions. Human interactions may occur from recreational dives around a facility, monitoring predation activities, or monitoring systems underwater (Harnish et al. 2023).

Special-case scenarios, analyzed and permitted in accordance to the MMPA, have resulted in take of protected species by lethal measures. There were 11 reported incidences of lethal take of a marine mammals (California sea lion) in OREHP finfish growout facilities in coastal State waters in the SCB between 1992 through 2010 (CDFG 2010). Sea lions are an ongoing issue for salmon and steelhead hatcheries in the Columbia River (NMFS 2024e). Outside the U.S. jurisdiction, there have been lethal take of marine mammals and birds predating on salmon aquaculture facilities in Canada (Wursig and

Gailey 2002). Offshore fish aquaculture may be sufficiently far from major pinniped haul outs to help mitigate the concern of heavy predation from seals and sea lions; however, interactions with other predators may still be a concern (Forster 2013, Fujita et al. 2023).

Finfish aquaculture practices have the potential to introduce novel parasites and/or pathogens into the environment, or alternatively, may amplify and concentrate existing pathogens and parasites in the environment due to the close proximity of cultured organisms. There is substantial correlative data between infection in net pen salmon and nearby wild fish infestations (Thorstad and Finstad 2018, Rhodes et al. 2023a, Purcell et al. 2025c). The spread of disease and parasites are ecological impacts that could hypothetically decrease both individual- and population-level fitness (Nash et al. 2005, Thorstad and Finstad 2018, Bradbury et al. 2020, Purcell et al. 2025c). Sea lice, which have the potential to infect salmonids, as well as other fishes, are a high-priority pathogen to control for fish health (Costello 2009, Thorstad et al. 2015, Guragain et al. 2021, Mordecai et al. 2021, and Rhodes et al. 2023a, b, Fjørtoft et al. 2021). Any infection in a finfish cultured population has the potential to impact steelhead or other protected finfish that may occur in the area. Impacts to wild fish populations are discussed further in Chapter 3, Section C.ii (Wild Fish Stocks). Existing Federal and State regulatory mechanisms and stringent management practices (discussed in Chapter 3, Section C.iv (Potentially-Farmed Species)) may decrease the risk of disease. Bacterial infections, viruses, and parasites may infect predatory animals due to wildlife aggregations around an aquaculture project. A list of pathogens (viruses, bacteria, and parasites) that are known concerns for marine aquaculture because they are commonly detected in aquaculture organisms and have an economic impact for affected species is provided in Appendix A of Rhodes et al. (2023a).

Finfish and IMTA aquaculture may impact the water column via effluents. Impacts to protected species could occur due to exposure to effluents, sediment and nutrient flux, or other types of changes in water quality. Impacts could range from individual, localized, temporary disturbance, to risks to populations if chronic changes occur over the lifespan of a project. The offshore environment is thought to mitigate many of the adverse impacts to water quality in comparison to nearshore, more shallow and enclosed waters (Price and Morris 2013). However, some of the baseline conditions may amplify any risk of water quality changes. Sediments and organic matter that may occur as a result of waste, excess feed, or dead animals from a finfish project may cause localized nutrient enrichment. HABs are part of the natural ecosystem in the SCB. There is currently no documented connection between a HAB and aquaculture activity in the marine offshore environment; however the risk of naturally-occurring HABs having an effect on protected species could be exacerbated by nutrient enrichment from aquaculture.

Any chemicals or husbandry materials that may be used in a finfish operation may need to be analyzed more closely for both pelagic and benthic habitat interactions. Site-specific NEPA analyses would likely need to incorporate fine scale, site-specific data on species presence, hydrology, sedimentation and nutrient patterns to predict the risk of adverse impacts to protected invertebrates. If pollutants, nutrient, or sediment loads affect prey abundance, then protected species of higher trophic levels could also be impacted.

Bioaccumulation of DDTs and PCBs and ingesting marine debris are prevalent conservation issues that causes reproductive issues for many fishes and invertebrates (prey species for birds and marine mammals) as well as bird species in the SCB (Schiff et al. 2000, USFWS 2005, and LARWQCB 2011). The Brown pelican population in the SCB is especially-susceptible to tissue contamination (LARWQCB 2011). Longer-living species are at higher risk to exposure to pollutants due to bioaccumulation of heavy metals and tissue contamination over time and through the food web. SCB has long been documented to have elevated levels of chlorinated hydrocarbons, DDT, and PCBs in invertebrates, fishes, birds, sea turtles, and marine mammals, correlated with cellular damage (e.g. tissue erosion or tumors), decreased fecundity, and decreased fertilization success (Schiff et al. 2000, Komoroske et al. 2011). The existing trend in this baseline condition, however, is that contaminant levels detected in the tissues of fishes and benthic species are going down (Schiff et al. 2000, LARWQCB 2011). However, pressures from marine

debris are increasing, with their own array of persistent organic pollutants that are harmful to wildlife (Spykra 2017). The spatial relationships on contamination are not clear, especially for highly-mobile predators, but the magnitude of bioaccumulation is generally consistent with the magnitude of sediment contamination, and observed in higher levels in animals that live or forage at the seafloor (Schiff et al. 2000, Deheyn and Latz 2006).

The risk of adverse impacts at a population level from chronic exposure to water quality changes is low due to existing regulatory mechanisms and protective measures, discussed in more detail in Chapter 3, Section B.iv (Water Quality). Additional information on baseline conditions in hydrology, water quality and seafloor characteristics are also included in Chapter 3, Section B. Additional information on impacts to pelagic communities is provided in Chapter 3, Section C.iii (Ecologically-Important Marine Communities). For more information on impacts to wild fish, sharks, and rays, see Chapter 3, Section C.ii (Wild Fish Stocks). Resources are provided under Ongoing Monitoring and Coordination in Chapter 3, Sections B.iv (Water Quality) and D.viii (Public Health and Safety).

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Potential projects sited in an AOA within Alternative 3 would likely have geographic overlap with breeding, feeding, migrating areas for protected species. The amount of pelagic habitat overlap that could occur for each AOA option in Alternative 3 is shown in Table 3. The larger option at 1,000 acres (4.05 km^2) is under one-hundredth of a percent of comparable habitat in Federal waters of Santa Monica Bay, and even less of surrounding habitat in the SCB. If multiple AOAs were identified in Santa Monica Bay, the total potential acreage would still be under 2,000 acres (809 ha). It is important to note that it may not be the size of geographic overlap, but the combination of stressors that may occur within an area that may cause an impact. Site-specific surveys to characterize bottom habitat would be necessary to analyze potential impacts on protected benthic species. Highly mobile, pelagic protected species may be less at risk of impacts from habitat overlap.

Table 3: Alternative 3 Santa Monica Bay AOA Option Footprints

AOA Option Name	Acres (km^2)	Percentage of Santa Monica Bay (total 460 km^2)	Percentage of Southern California Bight (total 78,000 km^2)
CN1-A	1,000 (4.05)	0.009	0.00005
CN1-B	500 (2.02)	0.004	0.00003
Total	1,500 (6.07)	0.013	0.008

Composite species distribution models for invertebrate, fishes, bird, and mammal data show medium to high ecological importance in the areas around Alternative 3 (see Figure 7.2.5 and Figure 7.2.6 on pp. 204 and 205 of NCCOS (2005). More specifically, the overlap of Alternative 3 with protected resource important areas is shown in Figure 3.86 on p. 175 of the Results section of the Atlas (Morris et al. 2021). All of Alternative 3 overlaps with the Gray whale migration BIA; Fin whale and blue whales may also feed and migrate in these areas (VPD 2018, Morris et al. 2021). The area between Point Dume and Santa Monica is a high activity area for coastal Bottlenose dolphins (NCCOS 2005). Especially-high numbers of cetaceans are observed in the Bay in winter and spring (LARWQCB 2011). Pinnipeds are observed in high association with Santa Monica Canyon that runs just south of the alternative area at about the 100 m (328 ft.) depth (Bearzi et al. 2008). These habitat data imply interactions with protected species are likely to occur.

Marine mammals, seabirds, and sea turtles all have the potential to become entangled in aquaculture gear in Santa Monica Bay. There is no alternative location that could avoid the risk of a line or anchor separating; however, remote monitoring and response time should be considered for entanglement impacts (USACE 2021). AOA options within Alternative 3 are 6.1 and 6.7 km (3.3 and 3.6 nm) from shore, and 11.3 and 9.8 km (6.1 and 5.3 nm) from the nearest port (Morris et al. 2021).

Vessel strike data and models of predicted mortality risk in the Santa Monica-San Pedro Basin show that the risk of collisions may be higher in the shipping channels than surrounding areas, due to the concentration of large vessels in those areas (Rockwood et al. 2021). Fin whale and Blue whale density is predicted to be higher in the western approaches towards Long Beach and Los Angeles than northern routes (Rockwood et al. 2021). The western approaches are within 9.3 km (5 nm) to Alternative 3. In addition, fin whales are often observed near the 200 m (656 ft.) depth (VPD 2018). The deeper range of Alternative 3 is 145.6 m (478 ft.) (Morris et al. 2021). The risk of vessel strikes would depend on the number and size of vessels associated with a project. The type of aquaculture would likely be less of a consideration relative to project footprint and production size.

The proximity of Alternative 3 to existing offshore infrastructure that contributes noise and light to the baseline environment is discussed in Chapter 3, Sections B.v (Air Quality and Aesthetics), B.vi (Acoustic Environment), and D.vi (Transportation and Navigation), and Chapter 4, Section A.ii (Other Ocean Uses).

Marine debris and pollutants in Santa Monica Bay are attributed mostly to land-based sources, especially from the greater Los Angeles area and heavily impacted from urbanization (USGS 2003, LARWQCB (2011)). Coastal river outlets are shown in Figure 6, and existing NPDES monitoring stations are shown in Figure 8. Predominant currents towards the southeast and swell from the west may help to alleviate pressures related to marine debris and pollutant from coastal resources; but NPDES data show that movement of discharge plumes in Santa Monica Bay during storms and high flow events is highly variable (LARWQCB 2011). Complex eddies in the Santa Monica Basin can entrain and trap waters carrying contaminants, such as oil from natural seeps or anthropogenic sources (Rhodes et al. 2023a). Santa Monica Canyon is the closest bathymetric feature that may accumulate debris at the seafloor, located south, within 3.7 km (2 nm) from both AOA options within Alternative 3. Higher concentrations of existing contaminants are concentrated near the Palos Verdes Shelf, which is a designated Superfund site by the EPA. Palos-Verdes shelf is south and down-current of Alternative 3. Ongoing stressors and bathymetric features may have historically created more severe conditions in Alternative 3 than Alternative 2; but the current baseline conditions are relatively similar based on a recent assessment (Morris et al. 2021).

Protected species occurring within Alternative 3 are likely impacted by these baseline water quality concerns. It is not likely that aquaculture projects would create a significant impact. However, existing conditions may make protected species particularly susceptible to human activities. Localized changes to hydrology due to gear placement may also act to accumulate materials close to facilities, and close to wildlife aggregations. Projects sited in an AOA would likely have BMPs or other permitting requirements that would be designed to manage water quality stressors, see Appendix 1 for more information on potential mitigation. It is expected that most potential adverse water quality impacts would be mediated and monitored through BMPs in permits, see also Chapter 3, Section B.iv (Water Quality).

Impacts to protected species due to changes in habitat use, wildlife aggregations, and disease may be more closely related to the type of aquaculture than geographic area within the SCB. These impacts are discussed for each sub-alternative in this section.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as

described above in this section. Evidence taken from shellfish and macroalgae sites globally, the west coast, and California is the best available information to apply to both geographic areas under analysis, Santa Barbara Channel and Santa Monica Bay. More information is included here for shellfish and macroalgae water quality interactions, since water quality is an existing concern and baseline stressor in Alternative 3.

As noted under Alternative 2, shellfish and macroalgae aquaculture practices have the potential to introduce parasites, and pathogens into the environment via contaminated seed stock; or infections could spread among protected species in wildlife aggregations. If projects comply with existing Federal and State regulatory mechanisms (discussed in Chapter 3, Section C.iv (Potentially-Farmed Species) and Appendix 1) any impact due to contamination should not be significant. Due to the baseline water quality conditions of Santa Monica Bay and the historic tissue contamination observed in benthic invertebrates and fishes, some individuals of protected species may be more susceptible to infection and disease.

Areas with large shellfish populations in Santa Monica Bay are monitored closely due to existing water quality concerns in the watershed area, including algae blooms that create shellfish consumption advisories (LARWQCB 2011). Concentrations of pollutants that have been observed in plankton, invertebrates, and shellfish species increase as sample locations approach the Palos Verdes Shelf (Schiff et al 2000). Storms disrupt predominant conditions, and create highly variable flow in the marine environment. During storms and precipitation events that create high flow of coastal runoff, there may be suspensions on shellfish and seaweed harvesting (LARWQCB 2011). In order to maintain product viability, aquaculture projects sited in an AOA in Santa Monica Bay would likely need to monitor water quality conditions associated with storms and discharge plumes closely. This may require more logistics relative to Alternative 2 due to coordination with Federal, State, and local agencies. Variable water quality conditions and extra coordination may lead to extra vessel traffic, noise, and human activity at a project site, which could affect protected species. It would also be important that any accidental spills, other pollutant exposures, or marine debris from an aquaculture facility be prevented due to the state of the baseline conditions. Shellfish aquaculture has the potential to have a beneficial impact on the water quality conditions in Santa Monica Bay, which could impact protected species indirectly, on an ecological level.

b) All Types of Commercial Aquaculture

Rates of interspecific interactions could increase due to wildlife aggregations at aquaculture sites within an AOA, and may be especially-pronounced in Alternative 3 based on existing associations observed in the area. Observations of resident dolphin species indicate that different species partition habitat, except in areas where prey is aggregated (Bearzi 2005). Sea lions are observed frequently in association with cetaceans, and cetaceans form mixed-species aggregations in the Bay (Bearzi 2005, Bearzi et al. 2008). As noted under Alternative 2, killer whales have historically preyed on other marine mammals in the CCE, and one pod has been targeting sea lions and dolphins between Long Beach and San Diego more recently (Fudge 2023, Sternfield 2024). These interactions could increase the risk of injury to both predator and prey if the interactions occur in concentrated areas, close to operations or associated vessels.

Elevated concentrations of several contaminants (including PCBs and DDTs) in fishes have been found in Santa Monica Bay (Schiff et al. 2000, LARWQCB 2011). During storms and precipitation events that create high flow of coastal runoff, there may be suspensions on fishing (LARWQCB 2011). As described under sub-alternative a., an indirect impact on protected species from variable water quality conditions and coordination with Federal, State, and local agencies may be extra vessel traffic, noise, and human activity at a project site. It would also be important that any accidental spills, other pollutant exposures, or marine debris from a facility be prevented due to the state of the baseline conditions that may cause protected species in the area to be especially-susceptible to additional stressors.

Scenarios related to IMTA aquaculture are the same for Alternative 3 as discussed under Alternative 2, and not repeated here.

Alternative 4: Combination of Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. The geographic scope of a protected species is considered over a significant portion of its range. Multiple projects spread across Alternative areas may be more likely to have population-level implications based on species-specific life history and population size, and due to an assumed larger geographic scale of habitat disruption. If aquaculture increased in scale, so would the risk. Identifying AOAs across a larger geographic area may increase the risk of interactions more because the impacts are dispersed over a higher range of protected species stocks. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

Temporary increase in vessel traffic and noise associated with one aquaculture facility, or even up to an area of 2,000 acres (the maximum size of one AOA in the scope of this analysis), is unlikely to result in significant adverse impacts; however, the cumulative impact from several AOAs (a potential area up to 15,000 acres) in close proximity to one another could change that assessment. If multiple AOAs were identified in Santa Barbara Channel, it would increase the total potential acreage of 2,000 acres (809 ha) (Alternative 2) to 15,000 acres (6070 ha). The total amount of habitat overlap that could occur would be about 1.2% of the total habitat in Federal waters of the SCB, and less than one-tenth of a percent of the total area of the SCB, as shown in Table 2. If multiple AOAs were identified in Santa Monica Bay, the total potential acreage would still be under 2,000 acres.

Benthic species are not as mobile as pelagic species, and would not be able to disperse as easily away from stressors, though both species of protected abalone are considered to be unlikely in any of the AOA options. For example, abalone may be more susceptible to adverse impacts, due to a larger seafloor footprint as a result of more aquaculture in one area.

If multiple AOAs were identified across both geographic areas, the total potential acreage would be 16,500 acres (6,677 ha) across approximately 14.8 km (8 nm) of the SCB. The impact on migratory species if aquaculture is sited may increase in scale with more and larger AOAs, and a greater amount of habitat potentially altered across the region. Any exclusion of individuals from important habitats could have broader and longer-lasting repercussions on the population. Large whales would likely be most susceptible to this risk under Alternative 4. Exclusion from optimal migratory or foraging grounds could vary seasonally and inter-annually; but even one year of exclusion could reduce fitness and reproductive success for species with low fecundity. In the SCB, large baleen whales would be at greatest risk of potential adverse impacts from high aquaculture density across the geographic scope of Alternative 4.

Changes in fine-scale abundance and distribution patterns of protected species between Santa Barbara Channel and Santa Monica Bay may occur, especially in resident species as a result of new or increased aggregations around a predictable food source and habitat. This could potentially benefit populations with new opportunities for breeding and introduced genetic diversity. Alternatively, the spread of disease may also be amplified across the SCB. Long-term risks to species that usually stay close to breeding or other foraging could occur if multiple AOAs sited across the SCB result in longer foraging time and decreased fitness. However, this long-term impact would likely be minor or negligible, given the baseline conditions of the highly-variable, boom/bust ecosystem in which prey abundance changes drastically on a seasonal, annual, and decadal basis.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

ii. Wild Fish Stocks

Affected Environment

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) establishes management authority over fisheries within the U.S. EEZ (generally 3 to 200 nm from shore). Wild fish stocks that are harvested in Federal waters, commercially and recreationally, are managed through Fishery Management Plans (FMPs) and corresponding regulations in accordance with MSA (16 U.S.C. § 1853). Federal FMPs that may occur in Federal waters of the SCB are provided in Table 7. A species assemblage's potential to occur in each alternative area is analyzed collectively by FMP in this PEIS. Site- and project-specific NEPA analyses may need to consider potential to occur with more detail. To help conserve and minimize any adverse effects on essential fish habitat (EFH), Section 305(b)(2) of the MSA requires Federal agencies to consult with NMFS on any action that may adversely affect designated EFH. EFH for species on the West Coast is designated under four FMPs (Pacific Coast Groundfish, Pacific Coast Salmon, Highly Migratory Species, and Coastal Pelagic Species). All but Pacific Coast Salmon EFH overlap with AOA Alternative areas. Highly migratory species (HMS) and Coastal Pelagic Species (CPS) are most likely to be found in the SCB. While Groundfish fisheries occur in the region, it is not likely that those species would occur in the AOA Alternative areas due to non-rocky habitat. The Pacific Coast Groundfish FMP additionally describes EFH Conservation Areas, which are spatially discrete areas of particularly sensitive or productive benthic habitats where fishing with some or all types of bottom-contact fishing gear is prohibited. The MSA authorizes PFMC to identify habitat areas of particular concern (HAPC), a subset of EFH, and therefore subject to consultation under the MSA. HAPC designations for Pacific Coast Groundfish include rocky reefs, canopy kelp, seagrass, estuaries, and areas of interest such as seamounts and canyons (PFMC 2013). HAPC designations for Pacific salmon include estuaries, spawning habitat, marine and estuarine submerged aquatic vegetation, complex channels and floodplain habitats, and thermal refugia. Pacific Coast Salmon EFH off California is north of Point Conception, outside of any AOA Alternative area. Many other important habitat features are included in the overall descriptions of EFH, including methane seeps, sand, mud, and coral/sponge habitats. EFH HAPCs, currently mapped hardbottom, rocky reefs, and deep sea coral observations were incorporated into the Atlas with a score of zero, meaning not compatible with aquaculture, and a 500ft setback buffer was applied in the spatial modeling used to develop the AOA options (Morris et al. 2021).

The Pacific Fishery Management Council (PFMC) is one of eight Regional Fishery Management Councils established by MSA. PFMC is responsible for fisheries that primarily occur within Federal waters, 3-200 nm offshore, within the Council's jurisdiction (16 U.S.C. 1852(a)(1)(f)). PFMC may also comment on and make recommendations for actions that may affect the habitat, including EFH, of a fishery resource under its authority, under Section 305(b)(3)(A) of the MSA (16 U.S.C. 1855(b)(3)(A)). PFMC is required to prepare FMPs that achieve optimum yield for fisheries under the Council's jurisdiction, which requires sustainably managing these resources, including considering impacts on their habitats, and the fishing communities that rely on their harvest. In addition, California is a member of the Pacific States Marine Fisheries Commission (PSMFC), an interstate agency that participates in PFMC as a non-voting member. The PSMFC has no regulatory or management authority; but it coordinates research, fisheries monitoring, and maintains the essential databases used in accordance with MSA, by PFMC and other Federal and State agencies for resource management. Databases managed by PSMFC include PacFIN, RecFIN, the passive integrated transponder (PIT) tag programs, Regional Mark Information System (RMIS), the aquatic habitat data project (StreamNet), an aquatic invasive species prevention program, and the Pacific ballast water group (PFMC 2013). The Northwest Fisheries Science

Center (NWFSC) of NMFS manages groundfish observer data and the West Coast economics data program.

There are over 500 documented fish species in the SCB (McGinnis 2006, Huff et al. 2013). Fish assemblages in the SCB vary by habitat, water temperature, and depth. Fish groups are distinct for bay, rocky bottom, and soft-bottom assemblages (Allen, 1985). Seasonal and inter-annual migrations of temperate and subtropical fishes into the SCB coincide with periods of increased and decreased upwelling, ENSO, and PDO (Dailey et al. 1993, Lluch-Belda et al. 2003, Horn et al. 2006, and Allen 2006). Warm cycles may favor subtropical fishes, and cooler cycles may favor more temperate fishes to occur in and around the alternative areas. Fish species preferring soft-bottom are most likely to occur in the AOA options, as this type of bottom habitat predominates. Species associated with nearby or unmapped rocky bottom habitat may also occur in the alternative areas. The N1-C and N1-D AOA options in Alternative 2 are within 5 km (2.7 nm) of mapped hard bottom habitat (Morris et al. 2021). Both AOA options within Alternative 3 are within 0.3 km (0.16 nm) of mapped hard bottom habitat (Morris et al. 2021). Fish assemblages around the alternative areas may include benthic, demersal, or pelagic species. Based on 1992 through 2002 data gathered from RecFIN, SCCWRP trawl surveys, NMFS GSP trawl surveys, and PISCO visual surveys, Alternative 2 shows higher diversity in the marine fish assemblages than Alternative 3 (NCCOS 2005). This data includes an El Niño event in 1998 where SST were higher than normal.

Floating objects in the open ocean, such as logs or seaweed, attract fish. Fish aggregating devices (FADs) are devices that intentionally attract fish for capture. Major fixed structures that case fish associations include natural reefs, artificial reefs, oil and gas platforms, and aquaculture facilities; other existing features in the SCB that cause wildlife aggregations include kelp beds, drift kelp, and other floating objects (Kramer et al. 2015, Hobday 2000b). A map of aggregating structures in the SCB is shown in Figure 1 on p. 12 of Kramer et al. (2015) and the associated depth and fish assemblage characteristics are provided in Table 2 on pp. 12 through 15. The nearest existing man-made FADs to Alternative 2 are oil platforms (about 2.6 km [1.4 nm] from N1-A and N2-C) and submarine pipelines (about 0.8 km (0.4 nm) from N1-C) (Morris et al. 2021). The nearest existing man-made FADs to Alternative 3 is an oil platform within 1.9 km (1.0 nm) from CN1-A, and submarine pipelines within 0.8 km (0.4 nm) of both CN1-A and CN1-B (Morris et al. 2021). A literature review of the fish assemblages around oil and gas platforms in the SCB is provided in Section 3.1.2.3 on pp. 18 and 19 of Kramer et al. (2015). There are three mapped and monitored kelp beds within 5 km (2.7 nm) of Alternative 2, with the nearest occurring about 0.07 km (0.04 nm) from N2-E (Protected Seas 2022). There is one mapped and monitored kelp bed within 0.5 km (0.27 nm) from both AOA options within Alternative 3 (Protected Seas 2022). An estimated 30% of the total documented species and 40% of fish families in the SCB depend on kelp habitat (McGinnis 2006). Kelp beds are especially important to juvenile fishes, as they provide nursery grounds.

In addition to the Federal ESA protected species included in Table 5, there are special-status species protected under State laws and protected from overfishing that may occur in the alternative areas. Some stocks managed under Federal FMPs are harvested in State waters due to the movement of living resources. Wild fish stocks that are harvested in State waters, commercially and recreationally, are also managed through State-level FMPs in accordance with California's MLMA (FGC § 7070-7072). Habitat suitability models for four State-managed fish species thought to be representative of significant commercial, ecological, and recreational value in the SCB are provided in Section 4.1 of the NCCOS BGA of the Channel Islands National Marine Sanctuary (NCCOS 2005). NOAA Fisheries, USCG, CDFW, and other law enforcement partners enforce Federal and/or State laws and FMP compliance throughout the EEZ. See Chapter 3, Section D.i (Commercial Fishing) and Section D.ii (Recreational Fishing) for more information related to the community and socioeconomic aspects of Federal FMPs.

Cartilaginous fishes (class Chondrichthyes) include sharks, rays, skates, and chimaeras. Slow growth rates and relatively late reproductive maturity in some species makes this class especially susceptible to overfishing (NMFS 2001). Giant manta rays (*Manta birostris)*, scalloped hammerhead shark (*Sphyrna*

lewini), Pacific angel shark (*Squatina californica)*, and White sharks (*Carcharodon carcharias*) all occur in the SCB, while likelihood of occurring varies depending on typical range and habitat needs of the species. Giant manta ray movement, for example, is driven by multiple factors including foraging on zooplankton, current and tidal patterns, seasonal upwelling, seawater temperature, and possibly reproduction. The SCB is considered to be the northernmost range of the scalloped hammerhead shark, may be a potential nursery for juvenile great what sharks, and the PFMC has noted that fishermen with experience fishing in the areas near or within Alternative 1 believe that to be an important nursery area for thresher sharks and an area with historic presence of basking sharks (Morris et al. 2021, Guana and Sternes 2024, PFMC 2025).

The U.S. National Plan of Action for the Conservation and Management of Sharks (2001), in accordance with the FAO's International Plan of Action for the Conservation and Management of Sharks (2000), provides objectives for the conservation of shark populations and management of long-term sustainable fisheries. Incorporated as an amendment into MSA, the Shark Finning Prohibition Act (2000) and the Shark Conservation Act (2010) provide domestic provisions that allow for sustainable shark fisheries while eliminating shark finning practices. In addition, the Shark Fin Sales Elimination Act (Section 5946(b) of the James M. Inhofe National Defense Authorization Act for Fiscal Year 2023, P.L. 117-263, Dec. 23, 2022) makes it unlawful, with certain exceptions, to possess, acquire, receive, transport, offer for sale, sell, or purchase a shark fin or a product containing a shark fin, and California's Shark Fin Prohibition bans the possession, sale, trade, and distribution of sharks and detached shark fins (FGC § 2021 - 2021.5, FGC § 7704, Bonham 2014). These initiatives apply to domestic and international concerns on targeted shark fisheries, shark bycatch, and shark habitat. A proactive measure included in the United States National Plan of Action for the Conservation and Management of Sharks is to protect juvenile, sub-adult, and early reproductive stages in sharks, as well as the habitat for those life stages, in order to rebuild shark stocks (NMFS 2001).

The U.S. asserts exclusive jurisdiction over all highly migratory species of fish (HMS) within the EEZ. The U.S. is also a member of regional-international organizations to effectively manage HMS throughout their range including the high seas within the Convention Areas of the Regional Fisheries Management Organizations (RFMOs). The range of many species that occur in Federal waters extends throughout the west coast, CCE, and across national boundaries (CDFG 2010, PFMC 2013, PFMC n.d., IATTC 2024, and ISC 2024). International organizations or agreements in which the U.S. participates that include eastern Pacific Ocean waters include the Inter-American Tropical Tuna Commission, the Agreement on the International Dolphin Conservation Program, and the treaty between the governments of Canada and the United States on Pacific Albacore Tuna Vessels and Port Privileges (U.S. Commission on Ocean Policy 2004a, NMFS 2023f, PFMC 2025). In addition, the U.S. participated in the Western and Central Pacific Fisheries Convention, which establishes conservation and management measures for all countries and vessels operating in the region under the U.N. Fish Stocks Agreement, and the Western and Central Pacific Fisheries Convention (WCPFC) (U.S. Commission on Ocean Policy 2004a, NMFS 2023f). The WCPFC Convention Area includes the western and central Pacific Ocean, and not the Southern California Bight, but HMS vessels such as longline, purse seine, and albacore troll often fish in both the eastern Pacific and western Pacific Ocean. Biomass and recruitment estimates for many HMS stocks that occupy the CCE are available from stock assessments conducted by collaborators under the International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean or the Inter-American Tropical Tuna Commission (Harvey et al. 2023, PFMC n.d.). HMS that may occur in the SCB are included in Table 7, based on FMP information. HMS species under the HMS FMP could occur in that area; but the prevalence may vary depending on ocean conditions, seasons, and inter-annual variations. The following HMS are actively managed under the HMS FMP offshore of Southern California:

- North Pacific albacore (*Thunnus alalunga*);
- yellowfin tuna (*Thunnus albacares*);
- bigeye tuna (*Thunnus obesus*);

- skipjack tuna (*Katsuwonus pelamis*);
- Pacific bluefin tuna (*Thunnus orientali*s);
- common thresher shark (*Alopias vulpinus*);
- shortfin mako or bonito shark (*Isurus oxyrinchus*);
- blue shark (*Prionace glauca*);
- striped marlin (*Tetrapturus audax*);
- swordfish (*Xiphias gladius*); and
- dorado or dolphinfish (*Coryphaena hippurus*).

Forage species, including small fishes and invertebrates (e.g. krill) are an important foundation for the marine food web that feed large pelagic fishes (including salmon), sharks, marine mammals, seabirds, and turtles. Changes to forage species populations can have dramatic effects on other populations in the CCE (Enticknap et al.2011, CDFW 2016b, and PFMC 2016). Forage species are targeted by humans globally to provide fish for aquaculture feed, livestock and poultry feed, and human consumption (OIMB 2011, Enticknap et al. 2011). Tourism and recreational fishing that rely on healthy forage species brought in over $23 billion in gross domestic product (GDP) to the west coast California, Oregon, and Washington combined in 2004 alone (Enticknap et al. 2011). Forage data for the Southern CCE come from springtime California Cooperative Oceanic Fisheries Investigations (CalCOFI) larval fish surveys, along with various NMFS surveys, which can be used to identify regional shifts in forage composition in fish assemblage data (Harvey et al. 2023). A list of forage species that occur in the CCE is included on pp. 32 and 33 of Enticknap et al. (2011). Federal management of forage species considers certain species as Shared Ecosystem Components as Amendment 15 to the Coastal Pelagic Species (CPS) FMP, Amendment 25 to the Pacific Coast Groundfish FMP, Amendment 3 to the Highly Migratory Species (HMS) FMP, and Amendment 19 to the Pacific Coast Salmon FMP (PFMC 2016). The PFMC implements protections for forage fish species under ecosystem-based management policies. California has conformed State commercial fishing regulations to achieve optimum yield while avoiding conflict with Federal regulations (14 C.C.R. § 111, pursuant to FGC § 7652) (CDFW 2016b).

CalCOFI surveys show that spatial and temporal patterns in life stage can play an important role in considering impacts to wild populations. For example, both alternative areas show low habitat suitability probability (HSP) for adult bocaccio (*Sebastes paucispinis)*; but areas around Alternative 3 show moderate to high HSP for juvenile bocaccio (NCCOS 2005). Both alternative areas show high potential for all life stages, including spawning grounds, for Pacific sardine *(Sardinops sagax)* and northern anchovy *(Engraulis mordax)* (NCCOS 2005). Spawning grounds and larval distribution are influenced by SST and surface currents (Washburn et al. 2002, NCCOS 2005). The majority of the central subpopulation of northern anchovy occurs in the SCB, and most juveniles are found within waters less than 90 m (295 ft.) deep (Methot 1989, Smith 1985, NCCOS 2005, Dorval et al. 2018, Stierhoff et al. 2019, and Kuriyama et al. 2020). Some juvenile rockfish survival to adult dispersal has been associated with the presence of offshore oil platforms that can be used as nursery habitat (Vetter et al. 2003, Nishimoto et al. 2019). In the Santa Barbara Basin, the persistent counterclockwise gyre and bathymetric features restrict oxygen and larval distribution. Most larval survival and fishes occur in waters less than 300 m (984 ft.) deep (Vetter et al. 2003). Larvae are retained towards the northwest side of the Santa Barbara Basin (Nishimoto et al. 2019). Movements of eggs and larvae around Santa Monica-San Pedro Basin, are contained in eddies within the waters of the SCC entering the SCB from the south, except during upwelling relaxation in fall and spring transitions (Vetter et al. 2003, Logerwell and Smith 2001, and Nishimoto et al. 2019). Connectivity in particle disbursement between the two basins associated with alternative areas is seasonal.

Fisheries-harvested landings and squid were incorporated into the Atlas, and are included as part of the affected socioeconomic environment in Chapter 3, Section D.i (Commercial Fishing) and D.ii (Recreational Fishing). Additional species and habitat information that may be useful for future individual projects to assess wild fish stocks includes:

- Habitat suitability models for eight Federally-managed fish species thought to be representative of significant commercial, ecological, and recreational value in the SCB are provided in Section 4.1 of the CINMS BGA (NCCOS 2005).
- A detailed species description and habitat suitability analysis for market squid (*Loligo opalescens*) is provided in Section 3.1 of the CINMS BGA (NCCOS 2005).
- Figures 2 through 12 of Relano and Pauly (2022) show the migratory routes, larval distribution, and spawning grounds for HMS species in the Pacific Ocean, with associated literature reviews per species and geographic area.
- Page 359 of Caselle et al. (2010) summarizes the fish species and species groups that characterize the "central" Santa Barbara Channel, which includes the alternative areas.
- Pages 536 through 539 of Nishimoto et al. (2019) provides a detailed literature review about fish and invertebrate assemblages and larval distributions associated with offshore oil platforms in the SCB, as well as Table 1.
- The California Wetfish Producers Association surveys are also a potential source of information on wild fish presence and abundance.

Stressors

Existing conservation concerns for wild fish stocks in the SCB include targeted fishery pressure, fisheries bycatch, ocean acidification and other factors associated with environmental variation, habitat degradation, predation, and pollution. See Chapter 4, Section A.i. for predicted population trends associated with environmental variation. For larger, long-lived predatory fish, life history characteristics may act as a stressor when combined with any environmental changes and make them more vulnerable to human impacts. Smaller, forage species populations are more closely reliant on oceanographic conditions and primary productivity (discussed in more detail in Chapter 3, Section B.i (Oceanography and Climate)). The existing fluctuations of the SCB ecosystem determine reproductive potential and survival of many fish species. The variation in forage species density and abundance is often thought to be a factor in mass mortality or unusual mortality events for seabirds and marine mammals. It can also change the distribution of predators, like salmon, that have historically been commercial target species (though the salmon fishery in California has been closed for several years due to low stock numbers (Associated Press 2025).

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- fixed gear and other equipment placement in the water column and surface;
- artificial light and underwater noise generated by systems, equipment, activities;
- risk of marine debris;
- human interactions;
- new areas for wildlife aggregations;
- effluents;
- risk of escapes;
- risk of parasites, viruses, bacteria, and vector transmission;
- the use of antibiotics and/or other husbandry materials/therapeutics (e.g. antifoulants, probiotics); and
- risk of the introduction of nonnative species.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with

aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

This section covers potential impacts on wild fish stocks as part of the biological environment and ecology of the SCB. See Chapter 3, Section D.i (Commercial Fishing) and Section D.ii (Recreational Fishing) for more information related to socioeconomic aspects of targeted fisheries in the SCB. Site-specific NEPA analysis of impacts from offshore aquaculture activities on fishery resources may consider the effects of the proposed action on the ability of fisheries to continue to achieve optimum yield from managed wild fish stocks.

Habitat Characteristics and Habitat Use

While the action of identifying AOAs may not have impacts, offshore aquaculture activities during site assessments, construction, operations, and decommissioning have the potential to impact habitat characteristics and habitat use. While EFH HPACs were avoided in the spatial modeling of AOA options, the AOA alternative areas are within other EFH (Table 3.22, Morris et al. 2021). Chapter 15 of Kiffney et al. (2022) analyzes the impacts of aquaculture on EFH. Impacts could range from temporary and long-term depending on the activity and the type of EFH. The temporal scale may be short term for migratory or transient species, or long term for the lifetime of the project for resident species (Clement 2013). Operational procedures and the timing of operations also influence the degree of impacts (Young 2015). It is not likely that all projects sited in an AOA would have the same or similar lifespans, therefore, the temporal scope of impacts would likely extend past what would be considered for an individual project. Short term impacts e.g., water column disturbance or wildlife aggregations, are more likely to occur to an individual, whereas populations may be more likely to be impacted by long term or permanent changes associated with habitat. The spatial scale of any impacts on habitat use would likely be amplified by siting multiple projects in an AOA.

Temporary disturbance to benthic habitat (e.g. from vessel anchors) would not likely have significant impacts on wild fish stocks if considerations from the Atlas, this PEIS, and site-specific characterization surveys were conducted for siting and permitting decisions that avoid, minimize, mitigate, or otherwise offset adverse effects on EFH and other sensitive fish habitat. Activities associated with aquaculture that could adversely affect fish habitat include fill and excavations necessary for site surveys or placement of moored structures. Potential changes to pelagic habitat that may impact wild fish stocks include water diversions, shading or artificial light, noise, exposure to chemicals or hazardous materials, and exposure to increased competition, predation, or disease via wildlife aggregations. These potential impacts are described in more detail below.

EFH and sensitive habitat were incorporated into the site suitability analysis in the Atlas used to develop the AOA options (Morris et al. 2021). However, it is possible that currently-unmapped habitat conditions may be discovered during site-specific baseline environmental surveys within an AOA. MSA's consultation requirements for human activities that may impact EFH are found at 50 CFR 600.920(a)(1), including the potential impact of human activities on EFH functionality. During any permitting decisions for aquaculture facilities sited in an AOA, the permitting agencies would be required to consult with NMFS under MSA regarding any proposed actions that may adversely affect EFH that occurs within or near to the proposed area. Any aquaculture project would likely be required to undergo an EFH consultation to avoid, minimize, mitigate, or otherwise offset adverse effects (Morris et al. 2021, NMFS 2023e). More information on the proximity of the alternative areas to sensitive habitat is included under each alternative, below.

Changes to habitat use may include exclusion, avoidance, or attraction. Individual fish attraction and habituation could range from no impact, beneficial (e.g. increased foraging success), or adverse impacts (e.g. increased predation, risk of entanglement), depending on intra- and inter-specific interactions around

a facility. Exclusion and avoidance may range from no impact on individuals, or adverse impacts if individuals are influenced to occur in less desirable habitat and/or areas of increased fishing pressure. Populations may be impacted if individuals experience long-term foraging, navigation, or communication obstacles that may lead to decreased reproductive success. Wild fish stocks are known to be attracted to structures in the water, which could lead to beneficial or adverse impacts.

Wildlife Aggregations

Fish assemblages in the SCB already show connectivity between existing offshore oil platforms, kelp beds, and offshore rocky reefs. New hard surfaces in the water column can create areas for food growth (e.g. algae and sessile organisms) as well as areas for predator avoidance (NMFS 2021a). Habitat modifications that affect the abundance and diversity of marine organisms (e.g. biofouling invertebrates, algae, and surrounding fishes) can have both beneficial and adverse impact on fishes. Based on the literature review in Kramer et al. (2015) on ecological interactions of renewable energy structures, total number of bottom structures (e.g. anchors and foundations), vertical relief and complexity of bottom structures, and distance to the nearest natural reef or other hard structure would be important considerations to assess impacts on fish assemblages and ecological interactions. A map of existing FADs in the SCB is shown in Figure 1 on p. 12 of Kramer et al. (2015). Based on the literature review in Rhodes et al. (2023a), wild fish aggregate around aquaculture facilities globally, regardless of cultivated species.

Aquaculture structures in an AOA, regardless of cultivated species, would possibly increase potential for fish aggregations, and increase the connectivity between man-made structures in the offshore environment. This connectivity could create new dispersal pathways for native and nonnative invertebrates and fishes (Diana 2009, Adams et al. 2014). Gear footprints may also create site-specific eddy effects that may impact egg and larval retention around gear. Increased fish abundance and diversity from new areas for wildlife aggregations could also benefit wild fish stocks by increasing reproductive output in populations. Beneficial population-level effects due to facilitated recruitment and new nursery habitat may benefit any species in the SCB, while population-level effects resulting from fishing exclusion would likely benefit species most heavily targeted by commercial operations, and more residential species (Boehlert et al. 2013, Wilhelmsson and Langhamer 2014, and Kramer et al. 2015). Nishimoto et al. 2019, NMFS 2021a). The literature review in Nishimoto et al. (2019) concluded that fish and invertebrate assemblages and larval distribution are associated with offshore oil platforms in the SCB; and these observations may be similar for aquaculture facilitates sited in the area. Biomass and fish species density may increase around structures, but effects are species-specific (Mercader et al. 2017). Additional effects may be minor and positive, such as opportunistic feeding for large, predatory fishes, sharks, and rays that may occur around an AOA-sited aquaculture facility (NMFS 2021a). The PFMC has noted that aggregations of dolphin and/or porpoises around aquaculture facilities could change the behavior of market squid (PFMC 2025).

The potential effects of new areas of wildlife aggregation may be adverse and/or beneficial. While opportunistic feeding may increase around facilities, it would also increase the risk of entanglement and mortality from any increase in fishing activities (NMFS 2021a). Beneficial effects depend on the complexity of the modification that provides food opportunity and shelter from predators (Mercader et al. 2019). The availability of prey species may be a component of designated EFH, similar to temperature, water quality, or sediment type. (PFMC 2013). Large sharks and rays, or large HMS species may be at risk of entanglement and entrapment in aquaculture gear of any type. Incidents of manta rays entangled in mooring and boat anchor lines have been documented, in addition to entanglements in fishing line (Deakos et al. 2011). Shark entanglement would likely be due to the attraction to cultivated fish, and is discussed more under sub-alternative b. Smaller fishes may be subject to increased predation if large predatory fishes, seabirds, or marine mammals are present in wildlife aggregations around any aquaculture gear.

Examples of fish groups that may be influenced by new fixed gear and structural habitat are provided under each sub-alternative, below. Mesopelagic fishes are mostly found between 200 m (656 ft.) and 1,000 m (3,281 ft.) deep along the continental slope, beyond the area of analysis. While some studies show mesopelagic fishes may undertake spawning and feeding migrations of up to 1,000 km (540 nm) (Nafpaktitis et al. 1977 as cited in PFMC 2016, Brodeur and Yamamura 2005), large-scale population shifts would not be likely with the siting of projects in an AOA. Squid habitat varies per species, but is generally linked to salinity, temperature, and prey availability. It is not likely that mesopelagic population shifts would occur due to new areas for wildlife aggregations around an AOA.

Marine Debris

As described in Section B.iv. (Water Quality), accidentally-discarded or lost gear or other supplies from an aquaculture facility could result in marine debris and plastic pollution interacting with wild fish stocks. Potential impacts vary with type, size, and structure of the debris (Kiffney et al. 2022). Kramer et al. (2015) showed that in the SCB, rockfishes were the most common species group to gather around marine debris that had vertically complex structure to it (e.g. debris masses), but fish did not seem to be attracted to structurally-simple or flat debris floating just at the surface. These interactions may not be adverse, but exposes individuals to risks of adverse impacts including entanglement, suffocation, starvation if ingested, smothering/covering, or alteration of the benthic invertebrate community (EPA 2011, CalOPC 2018, ONMS 2019, Bath et al. 2023, Katsanevakis et al. 2007, Gregory 2009, and Kuhn et al. 2015, Kiffney et al. 2022). When tangled, animals are more susceptible to other threats including injury, predation, and infections (ONMS 2019). These observations may be used as a proxy for what may occur around any marine debris generated from offshore aquaculture facilities sited in an AOA. It is not likely that the type of aquaculture would affect the risk of marine debris; therefore, it is not discussed further under each sub-alternative.

Noise and Light Pollution

As discussed in Section C.i (Federally-Protected Species), sound is important for all fishes to navigate and interpret their environment. Variations in sensory capabilities result in different reactions to sounds. Many fishes and benthic invertebrates produce low frequency sounds (Mooney et al. 2020). Figure 9 shows the overlap of general hearing ranges with common anthropogenic noise in the marine environment. Vessel sounds associated with aquaculture operations could be in similar frequency and intensity ranges as those of existing commercial fishing and transport operations (Olesiuk et al. 2012). Fish may be exposed to underwater noise with no impact, startle and avoid, habituate to the sound over time, or experience injury or death. The risk of injury to marine life from anthropogenic noise depends on the specific activity and the hearing capability of the species present, the distance from the sound source, and the timespan of the disturbance (Clement 2013, Hawkins et al. 2014, Beta 2017, NMFS 2018, SEER 2021, and NMFS 2021a). For example, schooling pelagic fishes show similar startle response to temporary anthropogenic noise as a predator response, which has a metabolic cost; and if repeated over time, the fitness of the population could be reduced (Hawkins et al. 2014, Cox et al. 2018, and Weilgart 2018). Prolonged stress from noise may impact fitness via body malformations, increased stress hormones, higher egg mortality, developmental delays, and slower growth rates (Cox et al. 2018, Weilgart 2018). Disruptions to the baseline acoustic environment can impact populations' community structure and biodiversity (Weilgart 2018, Mooney et al. 2020, and NMFS 2021a).

As stated in Section B.vi. (Acoustic Environment), underwater noise has the potential to occur at all stages of an aquaculture project. Impacts from noise on wild fish populations would also impact cultivated finfish. Shellfish species also show increased metabolic stress due to noise (Weilgart 2018). In addition to regulatory mechanisms to limit noise pollution, it is likely that aquaculture operations would take precautions to limit stress on cultivated species during operations, regardless of aquaculture type. Therefore, noise is not discussed further under the sub-alternatives.

Artificial light could impact pelagic fishes at any stage of an aquaculture project. It is not likely that benthic species would be impacted by lighting systems. Impacts could range from no impact to disturbance or injury, or an increase in predation activity (Nash et al. 2005, Clement 2013). Artificial light under barges, around oil and gas platforms, and other structures in the water can influence the behavior and community structure of plankton, nektonic invertebrates, and fishes (Nightingale et al. 2006, Ono et al. 2010, Barker 2016, Bassi et al. 2022, Simons et al. 2021, Marangoni et al. 2022, and Oyabu et al. 2024). A review of the impacts of artificially-lit coastal infrastructure on movements of juvenile salmonids is summarized in Table 1 on pp. 9 and 10 of Ono et al. (2010). Impacts observed in the marine coastal environment may be similar to what could occur in the offshore environment of the SCB. Predatory fishes that may occur in the alternative areas may be drawn towards lighting systems, which could increase foraging opportunities. Indirect impacts from light attraction or disorientation include being more susceptible to predation, changes in foraging success and fitness.

The cumulative impacts from the noise and light of multiple aquaculture facilities in proximity to one another within an AOA would be an important consideration during permitting decisions. The cumulative dynamic range of sound levels and acoustic variation to measure species present in an area would also be important to monitor before, during, and after an aquaculture project to measure impacts to pelagic and benthic communities (Mooney et al. 2020).

Water Quality Pollution

Activities that introduce chemical pollutants, sewage, changes in water temperature, salinity, dissolved oxygen, and suspended sediment into the marine environment pose a risk to any surrounding fish species. Demersal, soft-bottom fish assemblages are susceptible to pollution impacts; the species are relatively sedentary and respond to environmental stressors in sediments (Schiff et al. 2000). SCB fish communities have shown historic shifts in abundance, biomass, diversity, and species composition in response to wastewater discharges, attributed to functional food web relationships to benthic communities and the toxicity in sediments (Schiff et al. 2000, 2016). HABs (discussed in more detail in Chapter 3, Section B.iv (Water Quality)), can also sicken and kill marine organisms at all trophic levels.

More on the impacts of changes to water quality are described in Chapter 3, Section B.iv (Water Quality), and how changes in water quality may impact biological resources is discussed under each alternative below.

Escapes

Escaped organisms and/or reproductive material from any type of aquaculture could cause impacts related to the introduction of new individuals or heritable traits to wild populations. Impacts to marine communities more generally are discussed in Section C.iii.

The risk of adverse impacts on wild populations from escapes depends on the way in which the escape occurs, the number of individuals that escape, the genetic traits and rate of survival of escaped individuals, and potential for recovery. The risk to wild populations largely depends on the frequency at which escapement (or dispersal of reproductive material) occurs, and the magnitude of those occurrences. Both the frequency and magnitude of escapement varies by type of aquaculture, production scale, species in culture, and the mechanism of escape (e.g., human error, weather conditions, gear failure). Impacts to wild populations from escaped organisms depend on the size and health of wild populations, the life stage of the escapees, the proximity to wild species and/or habitat, and the cultured population husbandry and genetic management (e.g., diversity, reproductive capabilities) (Lorenzen et al. 2012, Rust et al. 2014, Atalah and Sanchez-Jerez 2020, and Purcell et al. 2025a,b). Large scale, catastrophic or total losses are less common than leakage of small numbers of individuals.

The environmental consequences of escaped organisms from any type of aquaculture include potential genetic impacts and/or ecological impacts. Genetic impacts may include the introduction of maladaptive genes leading to reduced fitness in the wild populations, and/or the loss of genetic diversity within or

between populations (McGinnity et al. 2003, Waples et al. 2016, Sylvester et al. 2019, and Purcell et al. 2025a). Cultured populations of shellfish and finfish often show reduced genetic diversity compared to wild populations because broodstock represents a small subset of individuals, and often that broodstock only captures a fraction of the existing genetic diversity in the wild population; genetic diversity may become further reduced due to intentional or unintentional selective breeding processes used in aquaculture settings. Genetic diversity provides the basis for populations and species to adapt to changing or novel conditions, and it is believed to play a role in the long-term resilience of those populations and/or species (Lorenzen e al. 2012, Waples et al. 2012, Purcell et al. 2025a). Loss of genetic diversity in a population could result in the inability (or reduced ability) for that population to respond to new selective pressures (e.g., environmental changes and pathogens). However, the rate of survival and reproductive success of escapees can be highly variable, context-dependent, and hard to predict.

Adverse ecological impacts from interactions between wild populations and escaped organisms include increased competition with wild individuals for food, reproductive opportunities, and space/habitat, and the transmission of disease or parasites to wild individuals (Fleming et al. 2000, Green et al. 2012, Rhodes et al. 2023a, b). Ecological interactions may have immediate impacts, unlike genetic effects, which affect future generations of wild populations. Escapees may have lower survival in the natural environment compared with wild counterparts, and in particular, mortality may be high immediately following escape due to predation (Arechavala-Lopez et al. 2011a, 2012, Dempster et al. 2018). This may reduce the potential for competitive interactions with wild populations (NMFS 2022c). If escapees survive to reproductive maturity, both ecological impacts (in terms of mate competition) and genetic effects may arise. The spawning success of escaped or dispersed individuals, relative to their wild counterparts, may be identical to that of wild individuals (especially when little or no domestication has occurred, such as when using wild-capture broodstock), or it may be higher or lower due to selective breeding and domestication effects. In some cases, the escaped or dispersed individuals may also be sterile (Purcell et al. 2025 a, b, and references therein). If escapees successfully spawn or breed in the natural environment, both ecological and genetic impacts over multiple generations may need to be considered. Growing evidence suggests that natural selection acts against cultured genotypes in the wild, indicating that escaped individuals and their offspring may be less fit than their wild counterparts (e.g., Wacker et al. 2021), which could help mitigate multi-generational impacts. Modeling the size and frequency of escape occurrences may be valuable for predicting the potential long-term effects on wild populations in future project-specific NEPA, if and when projects are proposed.

Due to the potential for negative ecological and genetic impacts from escapement, NOAA Fisheries has helped develop a scientific decision-support tool called the Offshore Mariculture Escapes Genetics Assessment (OMEGA) model to better understand these effects. OMEGA is a mathematical model with inputs that include the size and growth characteristics of the cultured species, the frequency and magnitude of escape events, survival rates of escapees in the wild, probability of escapees encountering wild counterparts and interbreeding, and the dynamics of the wild population. Outputs from OMEGA describe the influence these aquaculture escapees may have on the abundance, fitness, and genetic diversity of the mixed population over time and are described below for the different types of aquaculture production method. The OMEGA reports describe the types of escape and interactions that occur, potential competitive and genetic effects on wild species, and mitigation measures to minimize adverse effects from escapes. Purcell et al. (2025d) demonstrate the application of the OMEGA model when considering a single farming operation using a proposed California yellowtail aquaculture operation in Southern California.

Escape risks can be managed through strategic siting, engineering design, selection of appropriate production species, and proper husbandry practices. However, any aquaculture operation must account for the potential risk of unintentional releases due to factors such as storm events, wave action, vessel collisions, handling mistakes, predator attraction, and gear malfunctions. Potential mitigation measures include broodstock management, genetic diversity monitoring, seeding time, siting, harvest before

maturity, and sterilization. Escaped/dispersed organisms and reproductive material may be considered biological material and a pollutant that must be considered in the NPDES permitting process. The CWA Section 402 authorizes the EPA to issue NPDES permits for the discharge of pollutants from point sources in compliance with CWA Section 403, and ocean discharges may not result in "unreasonable degradation of the marine environment." Potential pollutant discharges from aquaculture operations include solids, nutrients, ammonia, fish waste, feed waste, pharmaceuticals, and chemicals; most finfish operations require a NPDES permit. Shellfish and macroalgae operations that do not discharge pollutants at any time during operations may not need NPDES permits.

Disease

Aggregations, as well as the baseline proximity and geographic overlap of species habitat, create a potential risk for increased spread of pathogens and disease (Parrish and Karp 2024). Infectious diseases require a pathogen and host; the spread requires a favorable environment, which makes a pathogen capable of infecting (e.g. temperature) and a host susceptible (e.g. poor nutrition) (Rhodes et al. 2023a). These three factors influence and may help identify the likelihood of disease and to identify mitigation. Many disease-causing agents routinely occur on a host or in the environment naturally, without causing disease. The focus in this PEIS is on those that do infect and cause disease, including compromised immune systems and other health issues, damage tissues, or death. Changes in aggregations of some species of forage fish, such as anchovy, may contribute to thiamine deficiency in predatory fish that feed on them, like salmon (NMFS 2021d).

Some aquaculture operations may use antibiotics for cultured stocks, depending on the system and approved use. In the U.S., the use of antibiotics in aquaculture production is highly regulated by the FDA under various laws and there are currently no antibiotics approved for use in the open ocean environment for warm water marine species. The FDA Center for Veterinary Medicine maintains a list of approved drugs for aquaculture, which has primarily focused on freshwater aquaculture species to date (FDA 2025), and regulates the manufacture and distribution of food additives and drugs that may be administered to aquatic animals. All FDA-approved antibiotics for use in animals require a veterinary feed directive if administered in feed, or a veterinary prescription if administered by other routes (FDA 2023c, Rhodes et al. 2023a). The administration of antimicrobials, prescription, and veterinary feed directive drugs in the United States requires a valid veterinarian–client–patient relationship (Rhodes et al. 2023a, b; AVMA 2024).

A potential impact of antibiotic use in aquaculture production is the development of antibiotic resistant bacteria, as antibiotics in unconsumed feed or excreted feces can be accumulated by microorganisms in the surrounding environment (Rhodes et al. 2023a). Resistance occurs when exposure to an antibiotic causes selective pressure causing microorganisms to become resistant to antibiotics (Holmes et al. 2016; Rhodes et al. 2023a). Studies have documented antimicrobial resistance in benthic bacteria, such as associated with Chilean salmon farms (Buschmann et al. 2012; Shah et al. 2014). While studies have documented antibiotic resistance in fish pathogenic bacteria from the administration of antibiotics at aquaculture operations, these studies should not be interpreted to indicate that similar antibiotic resistance will occur under different environmental conditions and husbandry practices. The occurrence of antibiotic resistant bacteria in association with aquaculture depends on various factors, such as the diversity, frequency, and dosage of antibiotic administration; it depends on environmental conditions of culture, including temperature, dilution of the antibiotics, and the containment of fish and associated bacteria. Accumulation of antibiotics in marine sediments is also a function of the dilution factor (which determines the amount of antibiotic reaching the sediment), biotransformation of the compound in the sediment, oxidation state of the sediment, and water solubility of the antibiotic. The route of administration for antibiotics depends on the rearing system and approved use (Rhodes et al. 2023a); various antibiotics and antibiotic administration methods used in aquaculture production in other countries are not approved measures in the United States.

Aquaculture operators and fisheries managers are concerned about the risk of pathogen amplification on operations, transmission of pathogens from cultured to wild fish, and the introduction of nonnative pathogens and parasites when live fish are transported. Aquaculture facilities may use various mitigation measures, such as vaccines, probiotics, limiting culture density, high-quality diets, and antibiotics (where approved), which are effective at preventing and controlling bacterial disease. Antibiotics are a last resort method and managers are using other approaches. In addition to good husbandry practices (e.g., low fish culture density) prudent aquaculture siting (e.g., selecting a location with ample currents and flushing, and environmental conditions conducive to the cultivation of the species) can minimize the need for therapeutant use. When therapeutants are used in aquaculture production, the administration of drugs is performed under the control of a licensed veterinarian. Additionally, U.S. aquaculture operators must adhere to the conditions of all applicable permits, such as NPDES permits for effluent discharge that require all drugs and other chemicals be applied in accordance with label directions, including the use of any medicinal products (e.g., therapeutics, antibiotics, and other treatments).

More on the diseases and associated regulatory frameworks that may be considered in macroalgae, shellfish, and finfish aquaculture is discussed Chapter 3, Section C.iv (Potentially-Farmed Species). Potential impacts to wild fish stocks are discussed under sub-alternative (b) in this section.

Introduction of Nonnative Species

Presence of nonnative species on or around aquaculture gear may impact existing wild fish stocks in the area. If aquaculture gear within an AOA creates new habitat connectivity and pathways for nonnative species already existing in the SCB, such as biofouling organisms, then there could be a benefit for those fish that eat such biofouling species; alternatively, biofouling organisms may harbor or spread fish pathogens (Fitridge et al. 2012, Floerl et al. 2016, Rhodes et al. 2023b). Ecological, indirect impacts of new aggregations of existing nonnative species around facilities could be adverse or beneficial, if they contribute to predator-prey and other interspecific interactions for resources. More information on ecological impacts of invasive species and the relationship between nonnative and invasive species is provided in Section C.iii. (Ecologically-Important Marine Communities). It is unlikely that new nonnative species would be introduced by aquaculture activities. NOAA Marine Aquaculture Policy (2011) supports the use of only native or naturalized species in Federal waters unless best available science demonstrates use of non-native or other species in Federal waters would not cause undue harm to wild species, habitats, or ecosystems in the event of an escape (NOAA 2011). Regulatory frameworks that prevent contaminated (meaning the potential for nonnatives to occur) broodstock are discussed under Section C.iv (Potentially-Farmed Species); however, broodstock sourcing is outside the scope of the PEIS. It is unknown what kinds of nonnative or invasive species may potentially be introduced from activities in AOAs without project and production information, and therefore any potential impacts to wild fish stocks would be context and location-specific, and dependent on the proposed activity.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Alternative 2 options are near to, but do not overlap with deep-sea coral observations, based on the spatial modeling that avoided observed corals, rocky reefs, and other hard-bottom EFH and EFH HAPCs (see Figures 3.48 and 3.66 Morris et al. 2021). The amount of pelagic habitat overlap that could occur for each AOA option in Alternative 2 is shown in Table 2. The largest option at 2,000 acres (8.09 km^2) is less than one percent of comparable habitat in Federal waters of the Santa Barbara Channel, and about one-hundredth of a percent of surrounding habitat in the SCB. If all AOA options in Alternative 2 were

identified as AOAs, the maximum of 15,000 acres (60.7 km^2) would overlap with 1.2% of the pelagic habitat of the Channel. Habitat overlap may not have as much of an effect on mobile, pelagic species. Site-specific surveys to characterize bottom habitat would be necessary to analyze potential impacts on benthic species.

The results of Nishimoto et al. (2019) show that larval disbursement and recruitment has high connectivity between three offshore oil platforms, one north and one south of Alternative 2.

a) Shellfish and Macroalgae

While the action of identifying AOAs may not have impact, macroalgae aquaculture facilities that are sited could have beneficial and adverse impacts on wild fish stocks, depending on the cultivated species, wild fish species, and scale of operations. Potential impacts on EFH species or complexes for an 86-acre (35 ha) kelp facility in the SCB included considerations for entanglement, benthic disturbance, pelagic disturbance, underwater noise, accidental discharges, and wildlife aggregations but all potential adverse effects were considered "unlikely to be substantial" (USACE (2021). An estimated 30% of the total documented species and 40% of fish families in the SCB depend on kelp habitat (McGinnis 2006). In general, macroalgae aquaculture would create new areas for wildlife aggregations, habitat connectivity, shading, nursery habitat for juvenile fishes, and predator protection. Existing artificial FADs near the Channel Islands show high influence on jack mackerel (*Trachurus symmetricus*) and juvenile rockfish (Kramer et al. 2015). Another potential population interaction could occur with silversides (family *Atherinopsidae*), which are rarely found offshore. The baseline habitat range would therefore be out of the area of analysis; but they are associated closely with kelp and other structures in the water column, especially to lay eggs (PFMC 2016). Macroalgae facilities could provide novel offshore spawning habitat for this and other species groups that usually associate with kelp beds closer to shore. However, fishes may be left more susceptible to predation upon harvest of the macroalgae. Some interactions can result in substantial crop loss and potentially reduce the fitness of wild organisms, as is the case with Pacific Herring (*Clupea pallasii*) spawning on kelp farms in Alaska, and research is on-going to investigate non-lethal methods of deterring herring from aquaculture infrastructure while also minimizing impacts to marine mammals, e.g., bubble curtains (Hollarsmith et al. 2025).

The relationship between oceanographic conditions that favor kelp survival and abundance with conditions that concentrate and distribute fish larvae is important to understand the potential impacts of macroalgae aquaculture on regional fish populations. Caselle et al. (2010) found that in the SCB, there is a linear relationship between rockfish and kelp bass larval settlement and the timing and spatial dynamics of oceanographic processes in the SCB. Preat et al. (2018) showed that, in the North Sea, large-scale seaweed production may decrease fish biota in a local ecosystem due to the potential for cultivated seaweed biomass to replace phytoplankton biomass in the ecosystem carrying capacity. An integrated aquaculture model in a pelagic bay also showed decreases in phytoplankton in association with seaweed cultivation seasons (Sun et al. 2020). In other words, the required nutrient and light uptake for large-scale macroalgae yields would no longer be available for natural phytoplankton production which is a food source for fishes. Growing seasons may need to consider the natural bloom periods for regional plankton species to mitigate this potential adverse impact. A conceptual study of biomass subsidies and nutrient exchange between kelp forests on the west coast of North America and pelagic ecosystems is also detailed in Zuercher and Galloway (2019), that notes the importance to juvenile rockfish, herring eggs, and community-level consequences. All three of these studies highlight the important trade-off that while macroalgae farms may create new foraging, protective, and reproductive habitat for fish, there may also be adverse impacts on naturally-occurring primary productivity due to changes in light and nutrient concentrations within a farm footprint and surrounding ecosystem. Without adopting ecologically-sound management practices, an expanded aquaculture industry could make the world's food supply less resilient by posing a threat to ocean fisheries (Naylor et al. 2000, Clavelle et al. 2019). The restorative potential for habitat would likely be net-positive for fish populations as long as local species and species

groups lifecycles are considered carefully. The timing and amount of project-specific harvests may need to be considered along with spawning seasons to better analyze if impacts would be beneficial or adverse.

There are three mapped and monitored kelp beds within 5 km (2.7 nm) of Alternative 2, with the nearest occurring about 0.07 km (0.04 nm) from N2-E (Protected Seas 2022). Based on time series satellite data from 1984 through 2023 on KelpWatch.org, the total emergent kelp area in the Santa Barbara Channel was estimated roughly at about 1,600 acres (648 ha) from Point Conception south to Point Dume, and including the eastern side of the Northern Channel Islands (Bell et al. 2023, 2024). Using only data from the most recent season, 2022 to 2023, the estimated emergent kelp in the Channel was estimated at about 600 acres (243 ha). There is no way to predict what projects in an AOA would decide to grow and the size of production, but the potential to increase the amount of kelp habitat is pronounced, in acreage options ranging from 1,500 to 15,000 acres (607 to 6,070 ha) that could potentially be sited for macroalgae aquaculture. For example, Giant seabass (*Stereolepis gigas*), California sheephead (*Semicossyphus pulcher*), or California halibut (*Paralichthys californica*) are normally associated with nearshore kelp beds and could be drawn to macroalgal aquaculture, further offshore than what may be considered normal habitat in baseline conditions (Morris et al. 2021).

Shellfish and seaweed aquaculture would both increase structural complexity and productivity of the pelagic environment. Shellfish operations would likely improve water quality by removing particulates and excess nutrients from the water column (Clavelle et al. 2019). Underwood and Jeffs (2023) found that both mussel and seaweed aquaculture facilities in New Zealand increased settling and recruitment of fish populations, similar to a rocky reef habitat. Still, shellfish aquaculture may not have the same effect on spawning and early life stages of fishes, relative to those species that associate with macroalgae aquaculture. Studies in the SCB on pelagic fishes show an existing spatial association, but low functional, ecological relationships with structure-forming invertebrates (Tissot et al. 2006, Bright 2007, Bianchi 2011, and Hourigan et al. 2017).

The planktonic stages of many marine fish species last several months (Vetter et al. 2003). Therefore, seasonality of operations (e.g. harvest) and maintenance (e.g. eliminating biofouling organisms) would also be important to consider for potential impacts of macroalgae and shellfish aquaculture on the larval stages of wild fish stocks. More information on ecological, community level impacts, including ecosystem services, is provided in Section C.iii (Ecologically-Important Marine Communities).

Wild fish populations may experience changes in habitat function as a result of escaped genetic material from macroalgae and shellfish aquaculture. For instance, proliferation of nonnative macroalgae (e.g., *Sargassum horneri*) and shellfish (*Crassostrea gigas*) have already been observed in the SCB.

b) All Types of Commercial Aquaculture

Understanding species distributions can help narrow the list of species (wild and cultured) evaluated for potential impacts (Parrish and Karp 2024). Rhodes et al. (2023a) and Parrish and Karp (2024) analyzed the geographic overlap of the alternative areas with commercially and recreationally valuable species in the SCB. While the presence or absence of certain species in an area can vary greatly from year to year in the SCB, the analysis does provide a baseline for potential wild species interactions that should be considered in site-specific NEPA analyses. In catch-per-unit-effort (CPUE) data from the annual U.S. West Coast Groundfish Bottom Trawl Survey analyzed from 2003 through 2023, 8 out of 14 evaluated fish species show distributions that overlap with AOA options included in Alternative 2 (Rhodes et al. 2023a). Building upon Rhodes et al. (2023a), Parrish and Karp (2024) conducted a spatial analysis on wild fish biomass that are of conservation and/or commercial value in the SCB, and physiologically similar or the same species as those likely to be cultivated in an AOA. Alternative 2 has occurrence of bocaccio (*Sebastes paucispinis*), California halibut (*Paralichthys californicus*), Dover sole (*Microstomus pacificus*), English sole (*Parophrys vetulus*), lingcod (*Ophiodon elongatus*), Pacific pompano (*Peprilus simillimus*), California market squid, northern anchovy, and eulachon (*Thaleichthys pacificus*) (Parrish and Karp 2024). The amount of the SCB covered by areas of extremely low, low, moderate, and high

biomass areas of each highlighted species is shown in Figure 5 on p. 17 of Parrish and Karp (2024). These analyses can serve as a baseline against which future analysis can be compared upon the establishment of aquaculture infrastructure, and may provide a framework for site-specific NEPA analyses to inform permitting decisions. The potential socioeconomic impacts on commercial and recreational fisheries if these wild populations were impacted are included in Chapter 3, Sections D.i and D.ii.

Habitat Use and Wildlife Aggregations

Research and reports globally show net pens in marine aquaculture attract and create new areas of wildlife aggregations, sometimes involving multiple trophic levels. Reports and studies reviewed in Price and Morris (2013) from finfish aquaculture in the Aegean Sea and Greece concluded an overall benefit to wild fish community structure, factoring in wild fish abundance, length, and weight. Additional reports from the Aegean Sea imply fish abundance may be influenced up to 3 mi from a finfish facility (Callier et al. 2018). Excess feed, waste, and biofouling may provide a new food source for wild fish stocks, and net pens provide shading and shelter from predators (Price and Morris 2013, Kramer et al. 2015, Mercader et al. 2019, Fujita et al. 2023, and Rhodes et al. 2023a). During finfish grow outs, studies from Israel, Spain, and Australia reviewed in Price and Morris (2013) found that up to 80% of sedimented nutrients from fish aquaculture may be consumed by wild fish surrounding cages.

Studies have found much higher fish abundance, density and diversity below existing net pens in the region, compared to 500 m (1,640 ft.) away and distant reefs in the SCB, and some of the structures (Oakes and Pondella, 2009). Prior to harvest, wild fish abundance was about 50 times greater at cages than at control sites, and even after harvests, wild fish abundance was double control levels (Oakes and Pondella 2009). Most fish associations at the net pens in northern Baja occur in late spring through fall, when water temperatures were higher (Kramer et al. 2015). Feeding of live bait versus other types of feed may affect the degree of impact that net pens have on wildlife aggregations.

In a pelagic ecosystem, fixed gear and wildlife aggregations would create beneficial feeding opportunities including any algal and invertebrate growth on cages, feed pellets falling through the cage, and shelter and foraging habitat for fishes in a pelagic ecosystem primarily devoid of both (Vita et al. 2004; Helsley 2007; Sudirman et al. 2009; and Price and Morris 2013). Nutrient enrichment, and related increases in primary productivity in the waters surrounding a finfish facility may create a new, reliable food source for planktivorous fishes and rays. For example, Pacific Herring populations (suborder Clupeoidei) are found typically closer to shore in the SCB, but can occur in depths up to 200 m (656 ft.). This species could alter normal distribution patterns to take advantage of new productive habitat within the pelagic environment further offshore. At a finfish operation located in northern Baja, California, Mexico, large schools of forage species including anchovy and sardines have been documented around net pens, whether or not the cages were stocked (Kramer et al. 2015). Aggregations of forage species may cause thiamine deficiencies in predatory fish (NMFS 2021d). Accounts from Hawaii also state that baitfish species distributions were especially-influenced by the presence of finfish cages (NMFS 2022d). Fishes that feed on detritus, such as large benthic chondrichthyid rays and *Pagellus* spp. would likely shift with operation activities, but studies reviewed in Price and Morris (2013) show herbivores and mid-sized benthic carnivorous fishes remain after harvests of cultivated species.

Feed is a unique input to finfish aquaculture, unlike shellfish or macroalgae aquaculture. Feed may impact naturally-occurring fish in the surrounding area by supplying a new reliable food source, and would likely cause wildlife aggregations with new intra- and inter-species interactions. Uneaten feed would add nutrients to the pelagic environment (as discussed in Section B.iv (Water Quality). Nutritional value added to wild fish stocks would depend on the type of feed. Strategies for adverse feed impacts risk management are available in Waldemar (2009) and Bøhn et al. (2024). Additional information on fish feed may be found under subalternative b in Section C.iv (Potentially-Farmed Species).

Net pens are also attractive to predatory fishes and sharks because of the food availability not just in facility outputs, but from the fish and other wildlife aggregated around the facilities. Literature and

reports from the west coast, Puerto Rico, Bahamas, Hawaii, Indian Ocean, southern Atlantic Ocean, and Australia all show that sharks are attracted to fish cages (NMFS 2021a, Fujita et al. 2023, and Bath et al. 2023). In Hawaii, it has been hypothesized that finfish facilities may even serve as navigational landmarks for sharks as they move throughout the islands (Papastimatiou et al. 2010). Shark attraction would increase potential predation on other fishes, and may increase the risk of shark entanglement in aquaculture gear (Mori and Riley 2021, NMFS 2021a). In Australia and South Africa, white sharks (a species with conservation status in the SCB) have been killed annually at finfish facilities due to entanglement and predation concerns, which has led to public outcries and the shutdown of projects (Price and Morris 2013). The literature review of shark interactions with aquaculture provided Bath et al. (2023) shows sharks may be attracted to dead fish occurring at the bottom of net pens and during fish transfers. Some reports included in Bath et al. (2023) also noted seeing the same individual sharks repeatedly, which may increase risk of shark entanglement or net breaching over time.

An additional potential impact from finfish aquaculture on wild fish stocks may occur from the use of predator deterrents. The use of acoustic deterrents and small-charge explosive deterrents are used in the SCB already for other offshore industries, especially in areas where market squid are targeted in the purse-seine fishery (Krumpel et al. 2021). The potential effects of marine mammal deterrents on finfish around salmonid aquaculture in Canada include temporary hearing loss, physical fatigue, and behavioral responses, but not thought to cause permanent injury or death, even in smaller species (Olesiuk et al. 2012).

Escapes

Fish escapes at various scales can occur during normal aquaculture operations and have been reported in almost every country where aquaculture occurs (Jackson et al. 2015, Glover et al. 2017, McIntosh et al. 2022, and Purcell et al. 2025c). Although diligence through technology and operational management helps to mitigate the occurrence of such escapes, it is likely that cultivated fish, organisms, and organic material from macroalgae and shellfish aquaculture will, on occasion, escape or be released from facilities. In the event of an accidental large-scale escape or release, some proportion of the escapees may be recovered, with varying success dependent on the species (Dempster et al. 2018), but it is likely that a portion of cultured individuals would escape into the natural environment. As reviewed in Purcell et al. (2025a, b, c), examples of different types of escapes include:

- Release of reproductive material, fertilized eggs, or larvae during grow-out.
- Breakage or detachment of macroalgae capable of vegetative growth during grow-out.
- Low-level escape (also known as leakage) during normal operational activities, such as cleaning, maintenance, inventory, net transfers, or harvest; or due to normal wear and tear (e.g., small tears in a net). This type of escape is often the most common but also most difficult to track (Skilbrei et al. 2015). For fish, this could involve the release of 10s to 100s of individuals over a grow-out cycle, depending on the scale of the operation.
- Episodic escape due to small- to medium-scale loss of infrastructure and occasional gear failures, such as breaches by a predator, collapse of one net pen, grow-out container loss, cage malfunction, bag tearing, damage to mooring lines, vessel collisions, or the impact of waves and currents at the farm site. For example, 1,000s to 10,000s of fish could be released, depending on the production scale.
- Large-scale or catastrophic escape due to a total system or gear failure across a facility, resulting in the loss of a substantial portion or even the entire farm system. In this scenario, 10,000s to 100,000s of fish could escape.

Data from other countries on the dispersal abilities of cultivated finfish (e.g., tagged and recovered Atlantic salmon, farmed cod, gilthead sea bream, and European seabass) show that escaped fish are capable of traveling great distances to find their way to wild populations of the same species. However, survival of escaped fish may be lower than wild individuals (Arechavala-Lopez et al. 2012, Arechavala-

Lopez et al. 2014), which may be due to challenges in acclimating to the natural environment (Glover et al. 2017), higher predation susceptibility (Dempster et al. 2018, Solberg et al. 2020), or increased susceptibility to fishing gear and capture (Lorenzen et al. 2012). If escaped fish survive to reproductive maturity, their ability to interbreed with wild populations will depend the likelihood that they will encounter breeding populations of wild fish, and on the biological characteristics of both the escaped fish and the wild fish stocks with which they interact (Purcell et al. 2025c). Studies have shown that cultured fish generally have lower reproductive success compared to their wild conspecifics (e.g., Fleming et al. 2000, Leggatt et al. 2010, Lehnert et al. 2013), although much of this data comes from Atlantic salmon, which have undergone significant domestication. Differences in relative reproductive success between cultured and wild fish may be smaller in other, less established aquaculture species (Purcell et al. 2025c).

The risk posed by escaped organisms to the fitness and genetic diversity of wild conspecific populations is species-dependent. This risk varies based on factors such as the abundance and health of the wild population (particularly in relation to the scale of aquaculture production), as well as the biological life history characteristics of both wild and cultured populations (e.g., lifespan and spawning behaviors). Operational practices also play a role in determining the overall risk. For instance, the duration of grow-out and harvest can influence the risk, depending on the age and sexual maturity (or time to sexual maturity) of escaped fish.

The OMEGA model (described above) can be used to assess the potential risks of farmed escapees to their wild counterparts and predict consequences on wild population fitness and genetic diversity from escape occurrences. Using the OMEGA model, case studies were developed to demonstrate how the biological characteristics of species can influence the potential effects of escaped fish, and to highlight how levels of uncertainty (e.g., for data-rich or data-poor species) can affect the modeling outcomes (Purcell et al. 2025c). These case studies are not specific to any particular operation but are generalized based on published literature for the selected species. In Southern California, three species were selected for these case studies due to their potential for aquaculture development in the region. While these case studies represent the best available science to examine relative differences among species, the analyses do not reflect specific project designs or anticipated production scales. The case study results for the three species are described in Purcell et al. (2025c). It is important to note that each species has unique considerations that affect the modeling outcomes (e.g., data availability, size at harvest, etc.), but generally, the modeling predicted the following:

- For California yellowtail (*Seriola dorsalis*), there would be no significant impact on wild population fitness even at high production levels. There would be minimal to low potential impacts on genetic diversity, depending on the modeled population abundance, production levels, and escape assumptions.
- For white seabass (*Atractoscion nobilis*), fitness would not be impacted in the short term; however, over multiple generations (e.g., 90 years), there would be a low to moderate loss of wild population fitness, depending on the modeled population size and escape assumptions. Most scenarios predicted the potential for a loss of genetic diversity in the wild population.
- For striped bass (*Morone saxatilis*), as a naturalized species of great interest to sport fishing in California, there was limited genetic information to infer the consequences of escaped fish on the naturalized populations. However, the number of escaped fish based on the generated escape scenarios suggested that the potential for both fitness loss and genetic diversity loss is likely low, based on the estimated naturalized population abundance.

While the likelihood of fish escapes in aquaculture is high, the likelihood of escapees contributing significant genetic changes to wild populations is generally not high and is species-dependent and variable (Purcell et al. 2025c). The ability of domesticated fish to survive and compete with wild fish stocks for food or habitat is also species-dependent and variable, but is also likely low.

Disease

Most offshore aquaculture systems would likely have free seawater interchange with few barriers to flow between the culture system and the open ocean. Infectious diseases caused by viruses, bacteria, fungi, parasites, and sporozoans (spore-forming protozoan pathogens) are a risk for wild fish stocks surrounding aquaculture facilities (Mugimba et al. 2021). The spread of disease may occur from wild populations to cultured, or vice versa. It may also spread within wild populations due to intra- and inter-specific proximity in wildlife aggregations around an aquaculture operation. Transmission methods include:

- waterborne transmission by release from an infected host into water and uptake directly from water by a susceptible host;
- direct or physical contact between infected and susceptible individuals, including predation, ingestion of shed material such as feces or mucus, and feeds;
- association with organisms that can carry pathogens, either as reservoirs or as intermediate hosts;
- association with contaminated inanimate materials (fomites) such as substrates and structures (e.g., equipment, sediments) contaminated with a pathogen; and
- active pathogen movement from infected host to susceptible host (e.g., motile stages of parasitic copepods).

More detailed descriptions of each transmission method are provided on pp. 5 through 7 of Rhodes et al. (2023a).

Disease can affect individuals, populations, and habitat quality. Some pathogens have the ability to infect hosts of different species (Rhodes et al. 2023a). Sea lice, which have the potential to infect salmonids as well as other fishes, are a high-priority pathogen to control for fish health (Costello 2009, Thorstad et al. 2015, Guragain et al. 2021, Mordecai et al. 2021, and Rhodes et al. 2023a,b, Fjørtoft et al. 2021). Fishes, sea turtles, and marine mammals in wildlife aggregations are all considered a risk to spread bacterial infections to other species, including cultivated or wild fish (Warwick et al. 2013, Mashkour et al. 2020, Ebani 2023, and Rhodes et al. 2023a).

The risk of adverse effect of disease is expected to be lower in the offshore environment compared to nearshore, shallow waters or in closed systems due to higher flushing rates, distance between facilities, and other natural factors of the offshore environment, such as those described in Chapter 3, Section B.i. (Oceanography and Climate), that would mitigate the risk and spread of disease (Price and Morris 2013, Rust et al. 2014, and Fujita et al. 2023). Still, the proximity and geographic overlap of potentially cultured species with wild populations increases the risk of disease (NMFS 2021a. Parrish and Karp, 2024). Most of the research on disease and pathogens in finfish aquaculture comes from salmonids (Morton et al. 2017, Godwin et al. 2022, and Fjørtoft et al. 2021), which would not likely be grown in the SCB due to industry interest and policy directives from the State. However, this research represents a preponderance of the literature available on the methods of disease transfer, and on mitigation strategies, that may be used as a proxy to analyze the risks in other types of finfish aquaculture. A list of pathogens and diseases that have been identified by the World Organization for Animal Health with host type is provided in Appendix A of Rhodes et al. (2023a). General descriptions of diseases and current management tactics for them are provided in Appendix B of Rhodes et al (2023a).

Pressure on Forage Species

Globally, wild forage fish species may be used in the production of feeds for finfish aquaculture. Formulated feeds are dependent on inclusion of fish meal and fish oil to provide the protein and nutrients necessary for proper growth of cultured carnivorous fish, varying depending on the species being raised. The primary fish species used for feed in the U.S. are the Gulf and Atlantic menhaden, followed by Atlantic herrings and Californian pilchards (NMFS 2021a). The reliance of finfish aquaculture on wild fish stocks is an existing conservation concern that requires both managing fisheries sustainably and

fostering an innovative aquaculture industry (Duarte et al. 2009; Naylor et al. 2000, 2009, and Clavelle et al. 2019).

Aquaculture relies on approximately 20 million tons of wild-capture fish—about 20% of the global wild fish harvest—as a primary source of protein and essential amino acids for feed (FAO 2018b). Forage fish, such as anchovies, sardines, and menhaden, have historically been key ingredients in aquaculture diets due to their high protein content and rich supply of omega-3 fatty acids. However, the use of fish meal and fish oil in aquaculture feeds has been decreasing in the past two decades, despite a four-fold increase in global feed production. The absolute amount of FM has remained constant, while inclusion in aquaculture feeds has decreased by a third (Majluf et al. 2024). Despite this trend, these ingredients remain important for many marine species that require high-quality protein sources. Since the availability of sustainably harvested forage fish has remained stagnant, further reducing their inclusion in aquaculture feeds is essential for the industry to meet the growing demand for farmed seafood in a sustainable manner (Shepherd and Jackson 2013; Hua et al. 2019).

The aquaculture feed industry has also made significant strides in utilizing locally sourced and cost-effective ingredients, including fish meal and fish oil derived from domestic fisheries. In the United States, the menhaden fishery and other forage fish stocks are managed under science-based regulations overseen by agencies such as the Atlantic States Marine Fisheries Commission and the Gulf of Mexico Fishery Management Council. These regulatory bodies implement stock assessments, catch limits, and ecological reference points to ensure sustainable harvest levels while maintaining the ecological role of forage fish in marine food webs. Continuous monitoring and adaptive management strategies help balance economic interests with conservation goals, ensuring responsible fishery operations that support both aquaculture and marine ecosystems.

The amount of wild fish biomass needed to produce a unit of farmed fish biomass (i.e., the “fish in-fish out” metric) has also declined over time as technological and management improvements have been made. The calculation of fish in to fish out is complicated and there are many estimates in the literature, depending on what's included in the calculations. It can also vary widely by species, depending on nutritional needs and feed conversion ratios. Roberts et al. (2024) reported a ratio of 0.28 to 1.13 on average across all production types, including freshwater and herbivorous fish. Feeds also no longer require whole fish for production; currently, 53% of fish oil and 34% of fish meal used in aquaculture comes from seafood processing byproducts (Majluf et al. 2024).

The aquaculture industry is innovating and shifting to other land-based crops and alternative ingredients for production of more sustainable and cost-effective feeds. Research has demonstrated that alternative protein sources can replace most, if not all, of the fish meal in marine fish diets without compromising fish health or growth (Rust et al. 2011). Plant-based proteins such as soy, corn, algae, and seaweed, along with insect meal and single-cell proteins derived from bacteria and fungi, offer effective substitutes. These alternatives reduce the industry's reliance on wild fish stocks, minimizing environmental impact while ensuring that farmed fish receive the necessary nutrients. Advances in feed formulation and processing have further improved the digestibility and nutritional balance of these alternative ingredients, making them practical and scalable solutions for the expanding aquaculture sector.

In addition, the California Fish and Game Code (FGC) for potential finfish marine aquaculture that could occur in state waters requires the use of fish meal and fish oil be minimized in feed (FGC §15400(b)(3)). If projects sited in Federal waters were to consider and operate consistently with this requirement in state waters, impacts may be minimized (CDFW 2019).

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Alternative 3 options are near to, but do not overlap with deep-sea coral observations, based on the spatial modeling that avoided observed corals, rocky reefs, and other hard-bottom EFH and EFH HAPCs (see

Figure 3.86 Morris et al. 2021). The amount of pelagic habitat overlap that could occur for each AOA option in Alternative 3 is shown in Table 3.The larger option at 1,000 acres (4.05 km^2) is under one-hundredth of a percent of comparable habitat in Federal waters of Santa Monica Bay, and even less of surrounding habitat in the SCB. Habitat overlap may not have as much of an effect on mobile, pelagic species. If aquaculture facilities are sited in this area, site-specific surveys to characterize bottom habitat would be necessary to analyze potential impacts on benthic species.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section. Two differences to note are the proximity to mapped kelp beds, and the relationship of historic water quality concerns to harvests of marine life in Santa Monica Bay.

There is one mapped and monitored kelp bed within 0.5 km (0.27 nm) from both AOA options within Alternative 3 (Protected Seas 2022). Based on time series satellite data from 1984 through 2023 on KelpWatch.org, the total emergent kelp area in Santa Monica Bay was estimated roughly at about 67 acres (27 ha) from the Ventura-Los Angeles County line south to Griffith park, extending to the shelf (Bell et al. 2023, 2024). Using only data from the most recent season, 2022 to 2023, the estimated emergent kelp in the Bay was estimated at about 119 acres (48 ha). The increase in emergent kelp appears to be concentrated near Palos Verdes Estates. There is no way to predict what projects in an AOA would decide to grow and the size of production, but the potential to increase the amount of kelp habitat is pronounced in acreage options ranging from 500 to 1,500 acres (202 to 607 ha) that could potentially be sited for macroalgae aquaculture. This would likely be a net-benefit for wild fish populations, again depending on sustainable methods, amounts, and seasonality of harvests. The example of how EFH was considered for an offshore kelp facility in the Santa Barbara Channel provided in Section 11.2.3 on pp. 32 through 33 of USACE (2021), is the nearest proximal location to Alternative 3 and is incorporated by reference.

Shellfish aquaculture has the potential to have a beneficial impact on the water quality conditions in Santa Monica Bay, which could impact wild fish stocks on an ecological level. Areas with large shellfish populations in Santa Monica Bay are monitored closely due to existing water quality concerns in the greater watershed area, including algae blooms that create shellfish consumption advisories (LARWQCB 2011). Concentrations of pollutants that have been observed in plankton, invertebrates, and shellfish species increase as sample locations approach the Palos Verdes Shelf (Schiff et al 2000). Storms disrupt predominant conditions, and create highly variable flow in the marine environment. During storms and precipitation events that create high flow of coastal runoff, there may be suspensions on shellfish and seaweed harvesting (LARWQCB 2011). Aquaculture facilities sited in an AOA in Santa Monica Bay would likely need to monitor storms and discharge plumes closely that may impact product viability, which may require special coordination with Federal, State, and local agencies. An indirect impact on wild fish stocks from these variable water quality conditions and coordination may be extra vessel traffic, noise, and human activity at a project site, compared to Alternative 2. It would also be important that any accidental spills, other pollutant exposures, or marine debris from a facility be prevented due to the state of the baseline conditions. Example BMPs for preventing marine debris and other spills are provided in Appendix 1.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section. There are a few differences in species that may be highlighted in Santa Monica Bay

for potential interactions with cultivated finfish populations, and the relationship of historic water quality concerns to harvests of marine life in Santa Monica Bay.

Rhodes et al. (2023a) analyzed the geographic overlap of the alternative areas with commercially and recreationally valuable species in the SCB. In CPUE data from the annual U.S. West Coast Groundfish Bottom Trawl Survey analyzed from 2003 through 2023, 5 out of 14 finfish species evaluated overlap with AOA options included in Alternative 3, as shown in Appendix D2 on p. 104 of Rhodes et al. (2023a). While the presence or absence of certain species in an area can vary greatly from year to year in the SCB, the analysis does provide a baseline for wild species interactions that should be considered in site-specific NEPA analyses. Building upon Rhodes et al. (2023a), Parrish and Karp (2024) conducted a spatial analysis on wild fish biomass that are of conservation and/or commercial value in the SCB, and physiologically similar or the same species as those likely to be cultivated in an AOA. Alternative 3 has occurrences of Dover sole, English sole, lingcod, Pacific pompano, and sablefish (Parrish and Karp 2024). These analyses can serve as a baseline against which future analysis can be compared upon the establishment of aquaculture infrastructure, and may provide a framework for site-specific NEPA analyses to inform permitting decisions. The potential socioeconomic impacts on commercial and recreational fisheries if these wild populations were impacted are included in Chapter 3, Sections D.i and D.ii.

The potential impacts of finfish and IMTA aquaculture may impact the water column via effluents, which could exacerbate baseline stressors for wild fish in Santa Monica Bay. The offshore environment is thought to mitigate many of the adverse impacts to water quality in comparison to nearshore, more shallow and enclosed waters (Price and Morris 2013). However, some of the baseline conditions may amplify any risk of water quality changes. Elevated concentrations of several contaminants (including PCBs and DDTs) in fishes have been found in Santa Monica Bay (Schiff et al. 2000, LARWQCB 2011). According to the State Office of Environmental Health Hazard Assessment (OEHHA) of potential risks to humans associated with consumption of seafood species taken from the Bay, white croaker (*Genyonemus lineatus*) is considered to be the most contaminated fish, along with California corbina (*Menticirrhus undulatus*), queenfish (*Seriphus politus*), surfperches, and California scorpionfish (*Scorpaena guttata*) (CRWQCB, 1997).

Due to the existing water quality and sediment stressors in Santa Monica Bay, wild fish stocks may be especially-susceptible to human activities and impacts from an aquaculture project. As with shellfish and macroalgae aquaculture, finfish or IMTA projects sited in an AOA in Santa Monica Bay would likely need to monitor storms and discharge plumes closely for product viability, which may require special coordination with Federal, State, and local agencies as well as extra vessel traffic, noise, and human activity at a project site, compared to Alternative 2. It would also be important that any accidental spills, other pollutant exposures, or marine debris from a facility be prevented due to the state of the baseline conditions. Site-specific NEPA analyses would likely need to incorporate fine scale, site-specific data on species presence, hydrology, sedimentation and nutrient patterns to predict the risk of adverse impacts to wild fish stocks.

Alternative 4: Combination of Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

The spatial scale of any impacts on habitat use would likely be amplified by identifying multiple AOAs across a larger geographic scale, assuming more aquaculture would be sited across 14.8 km (8 nm) of the SCB. The greater the geographic range, the greater the scale of impacts may occur – for both beneficial (e.g. kelp habitat and habitat connectivity) and adverse impacts (e.g. fish escapes, effluents).

Any cumulative impacts of aquaculture sited close to one another could be mitigated by a broader geographic context (Gentry et al. 2017, Fujita et al. 2023). Identifying AOAs in both geographic areas could speak to this effect, with the assumption that projects would be encouraged to use spatial distribution as impact mitigation and management. A few examples include compounding effects of noise, light, and glare from facilities sited close to one another; wild fish populations may maintain distribution patterns more similar to baseline conditions with facilities spaced farther apart across the SCB; spacing facilities further apart from one another and away from other concentrations of wild populations would reduce the transmission rates of disease; and if water quality concerns arise to limit operations in one area, they may be maintained elsewhere.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

iii. Ecologically-Important Marine Communities

Affected Environment

Ecological communities are important to consider in programmatic evaluations of proposed activities that may cover a large area or region, especially in the marine environment. Due to the large geographic scope of some of the marine resources covered in this PEIS, and without knowing site-specific presence-absence information within each alternative, describing potential interactions at a community level may be necessary to assess impacts from future activities. The information provided in this section builds upon the habitat modeling and suitability analysis of the Atlas, which analyzes over 200 large-scale datasets in the SCB (Morris et al. 2021). The information provided in this section also builds upon more targeted sections of the PEIS that focus on specific species and other natural resources protected by Federal regulations. This section provides information generally and qualitatively on lower trophic levels, as well as benthic and pelagic resources, as a comprehensive approach to support ecological management of marine resources.

Interactions between California state and Federal regulations are discussed in Chapter 3, Section A.ii. (Federal and State Regulatory Frameworks). Incorporating the State and Federal species into aquaculture permitting discussions would support ecosystem-level management, which improves the likelihood of recovery of protected species and habitats and helps prevent future endangered species act listings by improving conditions for all native species (Mount et al. 2019).

It is the policy of the U.S. to prevent the introduction, establishment, and spread of invasive species, as well as to eradicate and control populations of invasive species that are established. Invasive species may be plants, animals, or other organisms, and can occur in any type of habitat within the ocean. The National Invasive Species Council (NISC), established under E.O. 13112, describes invasive species as non-native species whose introduction does, or is likely to cause, economic or environmental harm or harm to human, animal, or plant health; and further, that do not provide an equivalent or greater benefit to society (ISAC 2006). Although some invasive species are considered harmful, (e.g. resource competition) others may consider them beneficial (e.g. new food source). The Department of the Interior's most recent National Invasive Species Management Plan (NISC 2016) and Invasive Species Strategic Plan (DOI

2021) provides further policy guidance and notes that many established nonnative species are non-invasive and support human livelihoods or a preferred quality of life. Various nonnative species have been approved for cultivation and importation into California, through registrations, permits, and lease conditions that are subject to ongoing adaptive management over time (CDFW 2020a). Those specific cases related to aquaculture are discussed in Chapter 3, Section C.iv (Potentially Farmed Species).

The United States Coast Guard (USCG) has established standards for allowable concentrations of living organisms that may occur in ballast water discharged in waters of the U.S., with the intent of preventing and controlling invasions of aquatic invasive species (77 FR 17254). Maritime vessel masters, owners, operators, and persons-in-charge are integral to training crews to properly maintain and achieve compliance in management systems (USCG 2018). The EPA built on the USCG ballast water regulations and standards with general vessel permits for vessel discharges, limiting pollutant discharge in U.S. waters (PFMC 2013).

Benthic refers to anything occurring at or in the bottom of a body of water. Infauna are benthic organisms that live in the sediments (e.g. polychaetes, flatworms, and small crustaceans); and epifauna are benthic organisms that are found on or attached to the seafloor (e.g. corals, sponges, barnacles, echinoderms, and sponges) (Schiff et al. 2000, Walag 2022). There are over 5,000 documented benthic invertebrates in the SCB (Huff et al. 2013, PFMC 2016). Polychaetous annelids dominate in most unimpacted regions (Schiffet et al. 2000). According to Schiffet et al. (2000), areas of altered benthos due to environmental stress were estimated to occupy a very small area (less than 10%) of the mainland shelf of the SCB. Those areas that showed changes in community composition included reduced benthic diversity in approximately 2% of the region, with many of these areas located near river discharges.

Benthic habitat may be soft-bottom or hard-bottom in the action alternative areas. Soft-bottom species include generally bottom-dwelling invertebrates and fishes. Sandy benthic habitat in the SCB generally extends to water depths of approximately 91 m (300 ft.); and muddy sediment bottoms are typically found in water depths greater than 91 m (300 ft.) along the shelf but also occur in estuaries and lagoons (CDFW 2022). Structure-forming invertebrate taxa support the function of benthic habitat, and may support nursery habitat for higher trophic levels, although the science is divided on whether aggregations of adult fish species are associated directly with structure-forming benthic invertebrates (Tissot et al. 2006, Whitmire and Clarke 2007, PFMC 2013, and Poti et al. 2020). Benthic structure-forming invertebrates, in particular corals and sponges, is considered by NMFS and PFMC in EFH designations and other conservation areas, especially within the Groundfish EFH review (PFMC 2013). Water depth, nutrient availability, geology (e.g. sediment type and grain size), and geography (e.g. bathymetry) influence the characteristics of benthic communities (Schiff et al. 2000, NCCOS 2005, and CDFW 2022). See Chapter 3, Section B.iii (Seafloor Characteristics) for more information. Benthic life zones, by depth, in the SCB are shown in Figure 1.3.2 on p. 8 of the CINMS BGA (NCCOS 2005).

The geographic distribution of benthic habitats and biological communities of the SCB are classified by substrate type and depth. As described in NCCOS 2005, those include:

- the top 30 m (98 ft.), light penetrates surface waters (known as the photic zone), supporting a highly productive nearshore community;
- soft bottom or rocky reefs at depths between 30-100 m (98-328 ft.) (known as the upper continental shelf), that support kelp forests and associated biological communities, as well as flatfish and mollusks occupying soft substrates;
- soft bottom or rocky reefs at depths of 100-200 m (328-656 ft.), that support commercially-valuable fisheries species such as rockfish and prawns; and
- continental slope soft substrates at depths greater than 200 m (656 ft.) (beyond any alternative area in this PEIS).

Section 3.1 of the CINMS BGA provides habitat suitability models for 13 benthic and pelagic invertebrates (NCCOS 2005). The results of the analysis showed high suitability can occur over hard and

soft substrate types in waters between 0-60 m (0-197 ft.). Habitats between 60-90 m (197-295 ft.) were classified as moderately suitable, and depths between 90-140 m (295-459 ft.) were considered low suitability. Many organisms, including phytoplankton, zooplankton, euphausiids, crustaceans, mollusks, fishes, marine mammals, and piscivorous birds may occupy the pelagic habitat of the SCB. The CPS FMP prohibits harvest of all species of euphausiids (krill) that occur within the U.S. West Coast EEZ to help maintain important predator-prey relationships and the long-term health and productivity of the West Coast ecosystem (PFMC 2013). Fish assemblages are described in Chapter 3, Section C.ii (Wild Fish Stocks), and Federally-protected species of all other taxonomic groups are included in Section C.i (Federally-protected Species and Habitat).

Primary productivity is the base of the food web for most marine life. Primary production is considered under CWA management decisions (79 FR 22188). Corals protected under ESA depend on primary productivity and symbiotic algae to survive; and coral density in the SCB is associated with chlA persistence, especially in shallower depths (Huff et al. 2013). All marine life protected under ESA, MMPA, and other Federal regulations depend on plankton biomass to maintain complex habitat and food resources, especially in upwelling areas (PFMC 2013, PFMC 2016, and Harvey et al. 2023). These needs relate to human wellbeing for seafood and recreation. Primary productivity has been shown to be the limiting factor on fisheries economic performance, which relates management decisions on these lower trophic levels to MSA regulations (Marshak and Link 2021). The direct link of primary production and fisheries economic performance supports the need for continued implementation of ecosystem-based fisheries management and developing a greater understanding of ecosystem overfishing along with its economic consequences. Monitoring primary production and its impacts on regional ocean economies is vital for understanding how the ocean is responding to shifts in production due to environmental variation, fishing pressure, and other stressors.

Both Alternative 2, in the Santa Barbara-Ventura Basin, and Alternative 3, in the Santa Monica-San Pedro Basin, reflect higher than average chlorophyll-a (chlA) densities within and surrounding the areas of analysis (NCCOS 2005). Seasonal trends in chlA concentrations in Alternative 2 are shown in Figure 3.56 on p. 124 and Figure 3.74 on p. 151 of the Results section of the Atlas (Morris et al. 2021). Seasonal trends in light attenuation in Alternative 2 are shown in Figure 3.57 on p. 125 and Figure 3.75 on p. 152 of the Results section of the Atlas (Morris et al. 2021). Seasonal trends in chlA concentrations in Alternative 3 are shown in Figure 3.94 on p. 183 of the Results section of the Atlas (Morris et al. 2021). Seasonal trends in light attenuation in Alternative 3 are shown in Figure 3.95 on p. 184 of the Results section of the Atlas (Morris et al. 2021). Nutrient enrichment from coastal river and creek flows contribute to especially-high concentrations of chlA within Santa Monica Bay (NCCOS 2005). Waters adjacent to the Santa Monica-San Pedro Basin (west and further offshore of Alternative 3) exhibit chlA densities lower than average, due to influence from the SCC (described under Chapter 3, Section B.i. (Oceanography and Climate)).

Major phytoplankton classes within the CCE include diatoms, dinoflagellates, small eukaryotes, and cyanobacteria (PFMC 2016). Diatoms and dinoflagellates can have large productive blooms in upwelling regions in winter to early spring, which provide an important food source but can also cause harmful algal blooms (HABs). HABs occur on the west coast in a progression from south to north, and can vary in timing from year to year (Lynn et al. 2003, Holt and Mantua 2009, and PFMC 2013). Phytoplankton biomass in the SCB increases in spring and summer, and seasonal surface currents push the biomass offshore (Airame et al. 2003, NCCOS 2005). Eukaryotes and cyanobacteria productivity rates may be high in offshore regions (Sherr et al. 2005, PFMC 2013). Other phytoplankton blooms tend to occur largely after the main spring transition. In particular, some dinoflagellates and other types of blooms occur after spring and into fall, as waters stratify (PFMC 2013).

Marine vegetation is an important component of California's marine ecosystems that offer vertical and horizontal substrate for a variety of marine organisms, and account for a large portion of the primary productivity in nearshore ecological communities, and feeds pelagic and benthic organisms. The natural

extent of the kelp canopy in the SCB in the 1990s was estimated to be 88 km^2 (34 mi^2), less than 0.1% of the SCB area, yet still provided an estimated 6% of the total energy input into the SCB (Hood, 1993). Kelp beds provide habitat for more than 800 species of fishes and invertebrates, and are important for sport fishing, and recreational diving (CRWQCB, 1997). Species of polychaetes, amphipods, decapods, gastropods, and ophiuroids are common among kelp holdfasts (NCCOS 2005). In the SCB, kelp forests provide shelter for both juvenile and adult species of fishes, and historically provided important nursery habitat for Southern Sea Otters (*Enhydra lutris nereis*). Piscivorous birds feed among kelp beds, and marine mammals have been observed seeking shelter, grooming, or playing (see Chapter 3, Section B.i. (Federally-protected Species and Habitat).

Algal beds in the SCB include 87 species of macroalgae (MESC 2015). There are two primary canopy-forming kelp species: Giant Kelp (*Macrocystis pyrifera*) and Bull Kelp (*Nereocystis luetkeana*) (CDFW 2022). Genetic studies have identified three population clusters in the SCB: the Channel Islands, mainland central California, and mainland Southern/Baja California, suggesting isolation due to ocean currents between these regions despite close geographic proximity between populations (Johansson et al. 2015). Several other canopy-forming species are found in lesser abundance in the offshore environment and around the Channel Islands including *Macrocystis integrefolia*, the elk kelp—Pelagophycus, Cystoseira, and Sargassum (PFMC 2013). In California, kelp is managed through a system of Administrative Kelp Beds, and harvest limitations are administered by CDFW. Kelp restoration projects have been done for several decades in southern California, which contribute to management efforts (CDFW 2021). Kelp forests grow along rocky coastlines and are usually found attached to the seafloor or nearshore in the intertidal zone. It is common for these species to become dislodged and form floating rafts, which could occur in the offshore environment. Bull kelp occurs in water as deep as 23 m (75 ft.), while giant kelp forests can occupy reefs at 37 m (120 ft.) in areas with excellent water clarity (PFMC 2013). In the SCB, kelp beds can also occur on sandy surfaces, where they attach to worm tube reefs (NCCOS 2005, and PFMC 2013). Kelp distribution, productivity, growth, and persistence is dependent on a variety of environmental factors related to water quality, geology, and grazer abundance (e.g. sea urchins).

Monitoring indicates significant declines in Bull Kelp within certain parts of their range. A petition was submitted in 2022 for the listing of bull kelp under ESA, but the listing was rejected in July 2023 (88 FR 40782). While generally abundant, factors like eutrophication and environmental contaminants have also been associated with population stress and declining abundance in Fucus species (Whitaker et al. 2017, Meichssner et al. 2021, and Knoop et al. 2022). All kelp beds are sensitive to both natural and anthropogenic impacts. They die off in the SCB seasonally due to fluctuations in water temperature, nutrient availability, and wave energy, as well as with periods of low nutrients (such as El Niño events). Seasonal effects are often more localized, and more large-scale, low-frequency episodic changes in nutrient availability seem to result in the most significant changes due to cascading community effects (NCCOS 2005, PFMC 2013). Anthropogenic impacts have been attributed to increased turbidity that reduces light penetration, nutrient inputs, and pollutants. Overgrazing by urchins on kelp have also resulted in major losses of whole kelp forests or the creation of "urchin barrens" (Pearse and Hines 1979, Tegner and Dayton 2000). Urchin grazing can destroy kelp forests at a rate of 9 m (30 ft.) per year (PFMC 2013).

Stressors

Existing conservation concerns at the community level in the SCB include targeted fishery pressure, fisheries bycatch, ocean acidification and other factors associated with environmental variation, HABs, habitat degradation and pollution. See Chapter 4, Section A.i for predicted population trends associated with environmental variation. Existing physical and chemical oceanographic fluctuations of the SCB ecosystem determine primary productivity and the reproductive potential and survival of many organisms.

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- increased vessel traffic and fixed gear in the water;
- risk of effluents and marine debris;
- localized changes to the physical and chemical characteristics of the water column (e.g. increased or decreased temperature, dissolved oxygen, and nutrient levels, depending on the type of aquaculture pursued);
- localized changes to habitat characteristics and quality;
- potential escape of biological and genetic material; and
- new areas of wildlife aggregations.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Potential community-level impacts that may occur as a result of human activities and environmental shifts include biophysical composition of habitat, species abundance, and organism diversity. Without adopting ecologically-sound management practices, an expanded aquaculture industry could make the world's food supply less resilient by posing a threat to ocean fisheries (Naylor et al. 2000, Clavelle et al. 2019). Changes in habitat can lead to exclusion and competition for space, food, mates, and other resources. Changes in standing biomass can lead to changes in food web interactions such as predator-prey and competition. Community species assemblages may be impacted, and also the assemblages of age and sex within species groups (PFMC 2013). Disturbance of benthic and pelagic organisms may occur at any stage of an aquaculture project due to vessel traffic, construction and maintenance activities, noise and light, and turbidity. Abundance and diversity of benthic and pelagic organisms may change during operations of an aquaculture project as a result of fixed gear in the water, the organisms being cultivated in the gear, and wildlife aggregations around the gear.

Benthic Community Highlights

Potential adverse effects of future aquaculture operations on the benthic environment could include physical disturbance of seafloor from gear and anchors, deposition and accumulation of waste, uneaten feed and marine debris around aquaculture operations and changes in composition of benthic organism communities. However, the potential effects could be less or more severe depending on site proximity to sensitive benthic habitats (i.e. hard-bottom, reefs) and physical site conditions (i.e. current, sediment composition).

Benthic community structure impacts would be expected to be dependent on sediment characteristics, and tied to any impacts to sediments (discussed in Chapter 3, Section B.iii (Seafloor Characteristics). At Pt Conception, Hardin et al. (1994) examined the spatial distribution of epifaunal assemblages in relation to suspended sediment flux. In the SCB a negative correlation has been shown between sediment flux within 2 m (6.6 ft.) of the seafloor and the coverage of filter-feeding organisms, including stony corals – *Lophelia pertusa* and *Desmophyllum dianthus* (Whitmire and Clarke 2007). Changes to the characteristics of benthic habitats could occur due to disturbance from vessel anchors, certain survey methods, other gear disturbance and gear anchoring systems. The placement of anchors may also result in a reduction in available benthic habitat for foraging (Mori and Riley 2021). Alternatively, anchors may be utilized as habitat by marine invertebrates such as tunicates, sponges, corals, and bryozoans. These species may or may not provide additional foraging opportunities. Examples from the installation of anchors and energy

transmission cables in the SCB imply the potential for altered hydrodynamic flow and redistribution of sediments, which likely alter biological species and abundance near the area (Poti et al. 2020). For example, deployment or operational aspects of BOEM's marine projects are considered for impacts to the seafloor (Boehlert et al. 2013, Hourigan et al. 2017). While the effects of pollutants in nearshore habitats are documented, the effects to deeper, offshore benthic communities is uncertain or not thought to be likely to cause changes at a community-level (Whitmire and Clarke 2007, Price and Morris 2013, and NMFS 2021a). Additionally, impacts to water quality and benthic habitat could occur during transportation and mooring of aquaculture support vessels, from accidental spills of oil and other hazardous material, or from scouring of benthic habitat from vessel anchors (Neira et al. 2014, PFMC 2022a).

Although the use of antibiotics is not likely to occur (there are currently no antibiotics approved for use in the open ocean environment for warm water marine species in the U.S.), any future use of antibiotics may impact surrounding communities. The potential effects related to antibiotic use would be assessed once project-specific details (e.g., proposed site location, culture species, production method and antibiotics that may be used) for prospective aquaculture operations are developed and proposed through the permit and environmental review process. See Sections 3.C.ii (Wild Fish Stocks) and 3.C.iv (Potentially-Farmed Species) for more information about potential impacts from antibiotics.

Pelagic Community Highlights

In general, the effects of pelagic habitat modification from floating aquaculture gear may include the loss or creation of habitat, depending on the species. For most existing lease sites, the size of the lease area in relation to the actual gear footprint (which is typically much smaller) has ensured sufficient suitable habitat remains for pelagic species to forage, migrate, or rest in a potential action area (Mori and Riley 2021). However, habitat modification may affect behaviors of higher taxonomic groups, discussed above and in other sections of this PEIS. Human interactions with pelagic marine organisms may occur at any stage of an aquaculture project. Potential interactions with marine mammals, birds, and sharks are described in Chapter 3, Section C.i (Federally-Protected Species and Habitat), C.ii (Wild-Fish Stocks), D.v. (Tourism and Recreation), and D.viii (Public Health and Safety). In addition, the illegal harvesting of wild fish in aquaculture–driven wildlife aggregations by employees of aquaculture facilities has been observed and recorded as a concern in the Mediterranean (Akyol and Ertosluk 2010, Bacher et al. 2012, Bacher and Gordoa 2016). If regulatory compliance mechanisms are put into place this impact should not occur; however, it is important to examine for ecological biomass considerations.

Pollution from noise and light has the potential to impact all marine life surrounding an aquaculture operation. In addition to impacts discussed for Federally-protected species and wild fish stocks, many species of pelagic plankton and invertebrates show similar reactions to noise pollution (Hawkins et al. 2014, Weilgart 2018). In the numerous studies reviewed in Weilgart (2018), there are evident behavioral responses in some species; however, some large invertebrates including squid, octopus, and cuttlefish that have been in controlled noise response experiments may not show a direct reaction to sounds, even over prolonged amount of time, but then do not eat or mate. Studies reviewed in Weilgart (2018) showed that biofouling organisms (e.g. bryozoans, tube worms, barnacles) settle faster in environments with noise than silence, and some species grow larger in noise-stimulated environments. The settling effect also impacts shellfish, including oysters and mussels, but species-specific size impacts may be beneficial or adverse.

Marine Debris and Biofouling

As stated in previous physical and biological sections of this PEIS, marine debris has various adverse effects on the marine environment. In addition to potential impacts on water quality, protected living marine resources, plastics can interfere with the health and functioning of marine ecosystems overall – at a community level and across trophic levels (UNEP 2009, Macfadyen et al. 2009, Mouat et al. 2010, EPA 2011, Spykra 2017, Miller et al. 2018, CalOPC 2018, and Bennett et al. 2022). There is evidence that

marine plastics may reduce atmospheric oxygen production by inhibiting the growth and functioning of marine photosynthetic microorganisms (Spykra 2017, Zeldovich, 2019). Debris can serve as transport vectors for invasive species and disease. Algae can coat the exterior of floating debris and create a new habitat substrate for native or nonnative biofouling organisms. Examples of biofouling organisms observed on marine debris include microbes, epibiont, barnacles, tube worms, foraminifera, coralline algae, hydroids, and bivalve mollusks (Spykra 2017). If debris aggregates due to eddies or other localized current conditions, it may provide habitat for larval and the juvenile stages of multiple marine organisms of different taxonomic groups. These floating islands have been observed worldwide, and have been described as a "plastisphere", or an ecological community that lives on plastics (Journal of College Science Teaching 2014). Although marine debris may provide suitable settling or foraging habitat for pelagic and benthic communities, which at first could increase abundance and biodiversity, it could also have adverse impacts on biodiversity due to the lack of permanence or potential hypoxia and anoxia. Hypoxic and anoxic zones can exist in pelagic aggregations, which could kill any biomass on the debris; and marine debris on the sea floor could also lead to anoxia and hypoxia zones induced by inhibition of gas exchange between pure water and seawater (Spykra 2017).

Biofouling would likely occur at any growout facility. Suspended culture sites may facilitate introduction or spread of biofouling organisms and/or invasive species. If cultured sites act as a 'stepping stone' for organisms, it could help transport around naturally-occurring biogeographic breaks (Mooney et al. 2020). The SCB is known to be a biogeographic break from the rest of the California and Baja coasts (NCCOS 2005). Gear would likely be cleaned in situ and may produce short-term increases in organic matter around or under the facilities that would be dispersed by ocean currents. Biofouling organisms could spread disease or tissue covered in antifouling agents into the surrounding marine environment when cleaned off of gear (Floerl et al. 2016). Biofouling organisms may also provide a new food source for surrounding organisms, which could be a benefit or have adverse food web effects if tissues covered in antifouling agents are eaten.

The cleaning of biofouling organisms from other artificial FADs that exist currently in the SCB is not thought to affect the population stocks of pelagic communities such as wild fish stocks, because most reef fish species in the SCB, including those that occur at the base and amid vertical structures of artificial FADs, utilize natural areas with rock substrate at depths shallower than 100 m (328 ft.) for settlement, and newly recruited fishes are much less abundant at deeper depths (Nishimoto et al. 2019). It is not thought that biofouling organisms and the debris released during cleaning are significant sources of organic input to sediment beneath aquaculture facilities, even for net pens in the coastal environment (CDFG 2010).

Introduction of Nonnative Species

Introduction of nonnative species may establish and spread by being transported on vessels, materials, and organisms brought into an AOA, or by using fixed gear as new habitat. This impact could occur at any stage of an aquaculture project, but is most likely to occur during growout or harvesting phases of operation. Microbial, parasitic, or pathogenic species may spread among cultivated organisms, or between cultivated and wild populations. For a non-native organism to be considered an invasive species in the policy context, the adverse effects that the organism causes or is likely to cause are deemed to outweigh any beneficial effects (NISC 2016). Invasive species can lead to the displacement or even extinction of native plants and animals, decrease biodiversity, and permanently alter habitats. This can result in economic impacts and fundamental disruptions of aquatic ecosystems. Invasive species may adversely affect native species due to interactions like predation, and competition for food, light, or habitat. Invasive species can also spread disease to and between species. If disease-causing pathogens are also new to the ecosystem, this can cause native species to be more vulnerable to infection. See Chapter 3, Section C.i (Federally-protected Species), C.ii (Wild Fish Stocks), Section D.iv (Potentially Farmed Species) for a discussion on the potential impacts of disease on other biological resources. Invasive species can sometimes establish and reproduce rapidly outside of their native range, which may threaten the diversity or abundance of native species through competition for resources, predation, parasitism, hybridization

with native populations, introduction of pathogens, or physical or chemical alteration of the invaded habitat (CNRA 2008). Impacts are often characterized by a cascade of impacts realized throughout the environment; and the severity of potential impacts of invasive species are often the result of the effects that invasive species have on a wide range of ecosystem services that underpin marine ecological cycles, human well-being, and economic stability or growth (NISC 2016). It is unknown what kinds of nonnative or invasive species may potentially be introduced from activities in AOAs without project and production information, and therefore any potential impacts to ecologically important communities would be context and location-specific, and dependent on the proposed activity.

Escapes

Escaped organisms and/or reproductive material from any type of aquaculture could cause impacts on ecologically-important communities due to the introduction of new individuals and new genes to wild populations in the same ways as described above for wild fish stocks, see Chapter 3, Section B.ii.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Most of the benthic monitoring in southern California has examined the mainland shelf up to 100 m (328 ft.) depth (Schiff et al. 2000). That majority of the AOA options within Alternative 2 are inclusive of 100 m depth. The mean depths of the AOA options within Alternative 2 range from 25.4 to 95.0 m (83.3 to 311.7 ft.), so they may include benthic communities typical of the photic zone and upper continental shelf. Mapped hard bottom, rocky reef, other EFH, and deep sea coral observations and mapped hard bottom habitat relative to Alternative 2 are shown in Figure 3.48 on p. 116 and Figure 3.66 on p. 143 of the Results section of the Atlas (Morris et al. 2021). The rest of the alternative area is either unmapped, or is soft sediment. Using benthic communities that occur around existing oil platforms in Santa Barbara Channel as a proxy for what may occur around anchoring systems in an AOA, Gillett et al. (2020) describes them as "in a relatively good state, with reference-condition infauna, minimal levels of chemical exposure, and five instances (25% of samples) of low-level toxicity. Samples from around the oil platforms were in overall similar condition to the region, with slightly better condition infauna, nearly identical chemistry, and slightly worse toxicity." The pelagic habitat of the Santa Barbara Channel is surrounded by Federal NMSs and State MPAs, and the waterbody supports abundant populations of pelagic organisms of multiple trophic levels (CINMS 2010). There are 34 freshwater drainages that pass through agricultural and urban areas in Santa Barbara and Ventura Counties before draining into the ocean, which may affect plankton communities and water quality in the Santa Barbara Channel (CINMS 2010, FDA pers. comm. December 2023). The following sections of NOAA's Water Quality Characterization of the Channel Island National Marine Sanctuary and Surrounding Waters (CINMS 2010) to characterize pelagic ecology and potential habitat effects:

- Section 4.1 addresses direct and in some cases point sources that originate offshore and in the Santa Barbara Channel;
- Section 4.2 addresses those direct point sources that originate on land, including sewage treatment and power plants; and
- Section 4.3 addresses indirect sources, including the large contributions of storm water runoff.

a) Shellfish and Macroalgae

There are three mapped and monitored kelp beds within 5 km (2.7 nm) of Alternative 2, with the nearest occurring about 0.07 km (0.04 nm) from N2-E (Protected Seas 2022). Based on time series satellite data from 1984 through 2023 on KelpWatch.org, the total emergent kelp area in the Santa Barbara Channel

was estimated roughly at about 1,600 acres (648 ha) from Point Conception south to Point Dume, and including the eastern side of the Northern Channel Islands (Bell et al. 2023, 2024). Using only data from the most recent season, 2022 to 2023, the estimated emergent kelp in the Channel was estimated at about 600 acres (243 ha), which could dramatically increase the amount of comparable habitat in Santa Barbara Channel, and change the majority of habitat from nearshore to offshore waters.

Kelp beds increase the complexity of the surrounding pelagic habitat, and provide a new source of shelter and food for invertebrates and fishes. Seaweeds also can absorb carbon, serve as a carbon-dioxide sink, and reduce emissions by providing raw materials for biofuel production and livestock feed (Sultana et al. 2023). Kelp growth rates have been measured up to 2 m (6.6 ft.) per day; and can exert large effects in the SCB (Schiff et al. 2000). Seaweed monitored in correlation to phytoplankton productivity in coastal environments of France and Ireland show high seasonality, depending on localized carbon concentrations and regenerated nutrients from plankton blooms (Preat et al. 2018). Overall, aquaculture seaweed showed a lower net primary productivity than the phytoplankton (Preat et al. 2018). A study of existing biomass subsidies and nutrient exchange between kelp forests on the west coast of North America and pelagic ecosystems is detailed in Zuercher and Galloway (2019). A literature review for community-level impacts from cross-ecosystem attributes is summarized in Table 3 on p. 17 of Zuercher and Galloway (2019).

Extensive studies since the 1960s have been conducted on the west coast to address concerns regarding the impacts of harvesting giant kelp in nearshore ecosystems. Findings showed potential impacts may include displacement of adult or young-of-the-year fishes, predation on those young-of-the-year by larger fishes, increased growth of sub-canopy species, increased harvesting of fishes and invertebrates by anglers or divers when harvesters create pathways through the beds, and delayed regrowth (PFMC 2013). These predicted impacts may be expected in the offshore space as well; however, depending on the production size, macroalgae facilities could increase the amount of comparable habitat dramatically. There is no way to predict what projects in an AOA would decide to grow and the size of production, but the potential to increase the amount of kelp habitat is pronounced, in acreage options ranging from 1,500 to 15,000 acres (607 to 6,070 ha) that could potentially be sited for macroalgae aquaculture. Commercialization and scalability of seaweed aquaculture offers great environmental potentials; however, it also presents challenges such as oligotrophication and encroachment for existing ecosystems due to nutrient and spatial requirements (Bigelow Laboratory for Ocean Sciences 2024). Decreased light penetration and anchor placement that may occur from installation of facilities could adversely affect sensitive habitat and light-sensitive communities, by decreasing growth rates of light-dependent species or crushing benthic species (CDFW 2019).

Ecosystem services of seaweed aquaculture are well-described in the literature, particularly nutrient removal and habitat provisioning services (Alleway et al. 2019, Gentry et al. 2020, and Bigelow Laboratory for Ocean Sciences 2024). Kelp has been used historically in SCB monitoring programs for toxicity testing to protect ecosystem health (EPA 1995). The potential ecosystem services from seaweed cultivation are shown in Figure 1 on p. 4 of Mooney-McAuley et al. (2016). The alignment of seaweed aquaculture with the United Nations Sustainable Development Goals are listed in Table 3 of the Bigelow Laboratory for Ocean Sciences Interagency Working Group for the Farming of Seaweeds and Seagrasses' Congressional Report (Bigelow Laboratory for Ocean Sciences 2024). Hard substrate of mooring systems and lines in seaweed aquaculture would provide novel habitat for fouling organisms; and during growout seasons vegetated lines may provide novel habitat for resident and transient fishes. Seaweeds and macroalgae grown in aquaculture facilities would mimic natural drift habitat, which supports fouling invertebrates, fishes, and marine mammals (CDFW 2010, MESC 2015). Torn pieces that drift from sites and potentially reach the bottom would add to natural pelagic and benthic food webs and carbon cycles (MESC 2015). The escape of genetic material is often considered as an adverse environmental impact; but in areas where restoration is warranted because of historic declines, spillover of stock from sites could support the maintenance of wild populations, if genetic diversity if maintained in the cultured lines (Alleway et al. 2019, Purcell et al. 2025b). This may be an important consideration in the SCB and greater

California coast, where kelp populations have seen severe declines (Schiff et al. 2000, MESC 2015, Bigelow Laboratory for Ocean Sciences 2024, Purcell et al. 2025b). Seaweed aquaculture can also increase dissolved oxygen at surface waters and create localized reduced acidification and temperature buffers from surrounding waters (Gentry et al. 2020, Xiao et al. 2021).

Gene flow between cultivated and wild populations would also be an important potential impact. Although significant population decline has been observed in kelp forests along the California coast, there were low impacts to genetic diversity of kelp populations (Klingbeil et al. 2022). Persistent high genetic diversity within populations may be due to the oceanographic transport of dislodged living sporophytes from distant populations via rafts (Johansson et al. 2015). Kelp rafts can float alive for a long time, 74 to 88 days on average (CDFW 2021). Data from the U.S., China, and Norway all show that macroalgae blade erosion is common, which could release gametophytes into the water column (Buck and Buchholz 2005, Broch et al. 2022). According to global studies reviewed in Purcell et al. (2025b), dispersal ranges of varying cultivated macroalgae species have been observed to be limited to about 10 m (33 ft.) from the parent plant, up to 16 km (8.6 nm) away from a facility, although species capable of rafting may disperse hundreds of kilometers from their point of detachment (Hobday 2000a, Hernández-Carmona et al. 2006). Petroleum has been shown to inhibit spore release in some macroalgae species (Klinkenberg 2020). Given the three populations identified in the Southern California region, there is more risk that facilities in particular locations may impact one or more of these populations, and selection of seed stock should take into account oceanographic patterns to determine which population(s) may be most impacted by dislodged material (Purcell et al. 2025b). More information is needed on the duration of reproductive capabilities, dispersal range, genetic population structures, and other biological factors of macroalgae species to assess the opportunities or limits of success for potential colonization of dispersed propagules or blade fragments. The cultivation method, whether through sexual spore production or asexual fragmentation, presents different risks to natural populations (Purcell et al. 2025b). Biological criteria for reproductive and colonization success include having sufficient male and female gametes for fertilization (although not relevant for spore or vegetative fragment dispersal), suitable substrate for settlement, low grazing pressure, appropriate temperature and light levels, ample nutrients, and the right current and wave exposure (Mooney et al. 2020).

Intra- or inter-specific impacts for space may occur, and could increase competition for space with wild populations, especially if GMO-cultivated species were developed for better settling in the high energy offshore environment. Settled or dislodged, floating macroalgae blades may also help the transport of biofouling organisms, as well as larval shellfish and fish species. See Chapter 3, Section C.ii. (Wild Fish Stocks for more of a discussion on fish-related impacts). The prevention of pest species for crop loss and the introduction of non-native species that settle or travel on macroalgae are the primary biosecurity concerns for macroalgae aquaculture (Rhodes et al. 2023a, b).

The release of genetic material from shellfish aquaculture is also possible, in the form of sperm, eggs, or larvae from shellfish operations. The release of genetic material could occur during seeding and harvest, or if cultivated organisms break free and are carried in ocean currents from the system during grow-out. The release of genetic material from macroalgae or shellfish aquaculture could cause changes in community health, abundance, diversity, distribution, or dispersal. Maladaptive genes could reduce fitness and genetic diversity within a population (McGinnity et al. 2003, Waples et al. 2016, McDonald et al. 2023). Individuals could compete for food and space, or introduce disease (Fleming et al. 2000, Green et al. 2012). Intra- and inter-specific competition for space may occur for space between cultivated and wild populations (CDFW 2010). The dispersal of cultured organisms/macroalgae could have adverse ecological impacts on wildlife populations, although in some circumstances, there may be a positive impact on wild populations through supplementation or restoration of declining populations and ecosystem services. For example, the reproductive potential of nursery-conditioned abalone has been shown to be much greater than that of abalone conditioned under natural conditions (Ault 1985). If genetic management of commercially cultured populations can maintain genetic diversity and avoid

domestication selection, similar to the approach of a restoration-focused breeding program, then escaped abalone or dispersed larvae from an aquaculture facility may benefit natural populations that have experienced significant reductions due to disease and overharvesting in the SCB (Gruenthal et al. 2014, Purcell et al. 2025a). Cultivation of declined shellfish species could serve a dual purpose by providing marketable products and contributing to the replenishment of wild stocks; however, declined natural populations are at a high risk for negative genetic impacts from culture opportunities (Gruenthal et al. 2014). If hatcheries were able to meet a relatively high-bar to manage culture populations to avoid these negative genetic impacts, offshore aquaculture might mitigate adverse effects of dispersed larvae/escaped individuals, and potentially benefit natural populations (Purcell et al. 2025a).

Purcell et al. (2025a, b) reviewed and synthesized knowledge on potential species for shellfish and macroalgae aquaculture in California, specifically focusing on potential cultured-wild interactions, and the genetic effects these interactions may have on wild populations. Generally, for the species they explored, there was a high likelihood that cultured individuals, larvae, or reproductive material would escape/disperse into natural populations. The likelihood of escaped/dispersed organisms genetically impacting wild populations varied by species, but was predicted to be low or moderate in risk for approximately two-thirds of the species explored (Purcell 2025a, b).

Ecosystem services of shellfish aquaculture in coastal waters are well-described in the literature, particularly nutrient removal and habitat provisioning services (Alleway et al. 2019, Gentry et al. 2020, Stenton-Dozey and Broekhuizen 2019, Parker and Bricker 2020, and Von Thenen et al. 2021). Natural shellfish habitats provide important high-value ecosystem functions through filtration, denitrification, and the creation of habitat for associated species – all of which may be realized in the offshore environment around a shellfish facility as well. Shellfish aquaculture may even generate habitat for a higher volume of fish and invertebrates than natural shellfish reefs (TNC 2021). In a literature review of seaweed and bivalve aquaculture, wild fish abundance and diversity were higher and in association with aquaculture facilities than nearby reference sites (Theuerkauf et al. 2021). There is a potential trade-off with released larvae, as they could provide a new food source for certain species, but compete with others (Lloyd 2003). Other potential ecosystem services include protection of coastlines from storm surge and waves, reduction of shoreline erosion, and increased biodiversity.

There can be potential deposition of organic matter if shellfish are dislodged or crushed and break free from growout gear. Species diversity in crustaceans, echinoderms, and fishes are observed to be greater around shellfish aquaculture in coastal waters, compared to coastal areas adjacent to operations (see studies listed in Lloyd (2003). In the offshore environment, at depth, the influence may not be as measurable in benthic species, but may be similar for fishes. The offshore environment, with consistent water flow and deep waters, is thought to mitigate the potential impacts of nutrient enrichment on benthic sediments (Price and Morris 2013, Fujita et al. 2023). Species diversity and abundance for benthic species may show beneficial impacts due to the exclusion of trawl activities from under the gear (Inglis and Kross 2000, Whitmire and Clarke 2007, Clark et al. 2016, and Goode et al. 2020). The risk of habitat changes acting as a benefit or adverse impact would depend on the carrying capacity of the surrounding environment, the facility size, and rate of development (VPD 2018, CDFW 2019, and TNC 2021).

Disease transmission between cultured and wild macroalgae is poorly understood and requires significant additional research on the potential impacts of macroalgae culture on wild populations (Rhodes et al. 2023a). In the case of mussel aquaculture in New Zealand, although parasites of cultivated shellfish may be spread during transfer or growout, it is not thought that they are unrelated taxa; however, other pathogens could spread to wildlife surrounding a facility (Lloyd 2003).

b) All Types of Commercial Aquaculture

Ecosystem services from finfish aquaculture could include habitat enhancement, increased fishing opportunities, or potential enhancement of wild populations, depending on cultivated species. Physical structure from an offshore system can serve as a location for wildlife aggregations and provide novel

habitat for fouling organisms. This aggregating effect can have positive impacts on fisheries landings, both in the immediate vicinity and at a regional scale (Gentry et al. 2020). Additional potential impacts of wildlife aggregations are discussed in Chapter 3, Sections C.i (Federally Protected Species and Habitat) and C.ii (Wild Fish Stocks)). More on population restocking potential is discussed in Section C.iv. (Potentially Farmed Species). A global literature review of effects on benthic communities is provided in Table 8 on p. 83 of Price and Morris (2013). Of the studies summarized in Table 8, the majority found decreased abundance and species diversity generally, but an increase in opportunistic, generalist species.

An examination of the average depths for the AOA alternative areas indicate that most are deep enough to sustain low benthic impact from a facility (Rhodes et al. 2023a). Saba and Steinberg (2012) studied the rates of sinking fish pellets from wild fish populations in the Santa Barbara Channel, and described detailed estimates of vertical flux of particulate matter in the region. In observed salmon net pens in Puget Sound, benthic impacts, when present, were most intense under and immediately adjacent to the pens; and the distance of the impact zone varied from zero to more than 61 m (200 ft.) (EPA 1991). As a worst-case temporal example, in the 1970s, degraded conditions and the loss of major benthic taxonomic groups were shown to extend more than 15 km (8.1 nm) away from a large outfall system operated by the County of Los Angeles; but by 1990, conditions had improved to the extent that the most severe effects were absent, strong impacts were restricted to an area within 5 km (2.7 nm) of the outfall, and communities typical of undisturbed areas were present within the monitoring zone (Schiff et al. 2000). Invertebrate community impacts were observed several years after finfish operations were removed up to 0.3 km (0.16 nm) from the area (Kraufvelin et al. 2001). FGC has a requirement for potential finfish marine aquaculture sited in state waters that applicants provide baseline benthic habitat and community assessments of a proposed lease site to the applicable RWQCB or SWRCB, and monitor the benthic community during operations (FGC §15400(b)(5)). Benthic community impacts have been considered to be minimized if sited consistently with this state requirement (CDFW 2019). Potential aquaculture facilities sited in Federal waters, with deeper depths, may follow similar predicted impacts.

Similarly, nutrient enrichment of the water column is generally not detectable beyond 100 m (328 ft.) of a finfish facility (Clavelle et al. 2019). Lost feed from the OREHP facilities has been considered minimal and not thought to contribute significantly to surrounding organic matter (CDFG 2010). However, the scale of OREHP facilities are much smaller than what may be sited in an AOA. Even at larger scales, there is little evidence of a direct link between open-ocean finfish aquaculture and harmful algal blooms (Price et al. 2015). Pitta et al. (2009) demonstrated that grazing around in and around net pens plays a key role in regulating phytoplankton biomass, keeping chlorophyll-a at very low levels, and effectively transferring nutrients up the food web, in both cultivated and wild populations of fish. The effects of new areas of wildlife aggregations on higher taxonomic groups are covered in Chapter 3, Sections C.i (Federally-protected Species and Habitat) and C.ii (Wild Fish Stocks). Genetic impacts and disease risks are also covered under those sections, as well as in Section C.iv (Potentially Farmed Species).

IMTA impacts in an AOA would likely occur as a result of multiple operations near each other that support complementary species (e.g., a fish farm near a shellfish operation near a seaweed farm). Ecological scenarios that could occur as an indirect impact of IMTA would vary depending on the chosen integration system designs, distance between systems, and production sizes. A large-scale model that covered a pelagic bay that is used for seaweed, shellfish, and finfish aquaculture in the Yellow Sea showed that when seaweed and shellfish systems are integrated, there are local impacts on water chemistry, eutrophication, and phytoplankton levels that can influence neighboring areas (Sun et al. 2020). Growing seaweed near shellfish could also slow flow rates, increasing the amount of planktonic and larval filtration from the water column by the integrated, cultivated shellfish. Growing seaweed adjacent to finfish could slow flow rates, amplifying any decreased oxygen in the surrounding water column; however, if grown at an appropriate distance down-current, it may help assimilate nutrients into the food web (Rensel and Forster 2007). The IMTA model in Sun et al. (2020) found cultivated finfish impacts remained close to the farm footprints even when seaweed and shellfish systems were integrated

nearby. Nutrient input from finfish could stimulate nearby seaweed growth from added nutrients; but if it reaches an amount that causes a plankton bloom that decreases light penetration, it could have adverse effects on vegetation, invertebrate, and fish communities. Growing shellfish near finfish may mitigate nutrient enrichment impacts to the surrounding pelagic and benthic habitat. Growing crustaceans near finfish can alleviate some of the pressures of parasitic organisms that could infect wild populations (Rensel and Forster 2007). Growing any combination of trophic levels may encourage an increase of local biodiversity and species abundance, enhancing the local food web (Rensel and Forster 2007).

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Most of the benthic monitoring in southern California has examined the mainland shelf up to 100 m (328 ft.) depth (Schiff et al. 2000). The majority of the AOA options within Alternative 3 are inclusive of 100 m depth, but the maximum depth of CN1-A reaches 145.6 m (478 ft.). The mean depths of the AOA options within Alternative 2 range from 66.6 to 98.9 m (218.5 to 324.5 ft.), so they may include benthic communities typical of the upper continental shelf. Mapped hard bottom, rocky reef, other EFH, and deep sea coral observations and mapped hard bottom habitat relative to Alternative 3 are shown in Figure 3.86 on p. 175 of the Results section of the Atlas (Morris et al. 2021). The remaining areas are either unmapped, or soft-bottom. Soft-bottom habitats in Santa Monica Bay and San Pedro Bays are monitored due to historic pollutants that were dumped in the region, run-off, and busy harbor activities near Los Angeles and Long Beach (CINMS 2010, LARWQCB 2011). Most of the soft bottom habitat is considered in fair to excellent condition because it supports healthy benthic infaunal communities similar to those present within reference areas (except for in the sediments around the JWPCP outfall on the Palos Verdes Shelf) (LARWQCB 2011). The Palos Verdes Shelf is located south of Alternative 3 and is effectively separated biogeographically by a submarine canyon and prevailing currents. The pelagic habitat is considered fair to good based on algal blooms, phytoplankton and zooplankton, fish and mammal assemblage and population, contaminant burdens, and commercial and sportfish catch efforts. Offshore areas appear in better shape than nearshore areas due to distance from human activities (LARWQCB 2011).

a) Shellfish and Macroalgae

Kelp beds in Santa Monica Bay are often found in hard bottom areas at depths of 6 to 21 m (20 to 70 ft.), west of Malibu and around the Palos Verdes Peninsula (LARWQCB 2011). Extensive kelp beds near Palos Verdes were dramatically reduced since the 1950s (Schiff et al. 2000). The recovery of kelp canopy has been considerable but its current extent is still less than 25% of the highs recorded one hundred years ago (LARWQCB 2011). There is one mapped and monitored kelp bed within 0.5 km (0.27 nm) from both AOA options within Alternative 3 (Protected Seas 2022). Based on time series satellite data from 1984 through 2023 on KelpWatch.org, the total emergent kelp area in Santa Monica Bay was estimated roughly at about 67 acres (27 ha) from the Ventura-Los Angeles County line south to Griffith park, extending to the shelf (Bell et al. 2023, 2024). Using only data from the most recent season, 2022 to 2023, the estimated emergent kelp in the Bay was estimated at about 119 acres (48 ha). The increase in emergent kelp appears to be concentrated near Palos Verdes Estates. There is no way to predict what projects in an AOA would decide to grow and the size of production, but the potential to increase the amount of kelp habitat is pronounced in acreage options ranging from 500 to 1,500 acres (202 to 607 ha) that could potentially be sited for macroalgae aquaculture, which could dramatically increase the amount of comparable habitat in Santa Monica Bay, and change the majority of habitat from nearshore to offshore waters.

The remaining information used to discuss ecosystem services and ecological impacts of macroalgae and shellfish aquaculture in Alternative 2 is also the best available information to predict and describe potential impacts in Alternative 3. However, a higher risk of water quality concerns exist related to seafood harvest in Santa Monica Bay (see Chapter 3, Sections B.iv (Water Quality), C.iv (Potentially

Farmed Species), and D.viii (Public Health and Safety). Alternative 3 may be an area to highlight opportunities for user-environment-beneficiary interactions in planning decisions (TNC 2021, Von Thenen et al. 2021). These interactions may be especially-relevant in Alternative 3, where ecosystem services related to water quality, water transparency, and nutrient extraction could still be realized during those time periods if and when potential runoff plumes or HABs limited seafood harvesting. There are commercial applications for fertilizer, biofuels, and restoration that could be taken advantage of instead of food products.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section. A higher risk of water quality concerns exist related to seafood harvest in Santa Monica Bay (see Chapter 3, Sections B.iv (Water Quality), C.iv Potentially-Farmed Species, and D.viii (Public Health and Safety).

The remaining information used to discuss ecosystem services and ecological impacts of finfish aquaculture in Alternative 2 is also the best available information for Alternative 3, and is not repeated here. In order to realize some of the potential ecosystem services from aquaculture, the surrounding waterbody should be able to benefit from improvement or increased resilience in ways that can be provided by the species being grown. For example, the culture of these species would not be considered restorative for water quality if the water body could not benefit from water quality improvements and/or the resilience or productivity of the water body could not be increased (TNC 2021). IMTA may have the potential to provide more benefits in Santa Monica Bay than in Santa Barbara Channel, where historic contamination from pollutants is not as pronounced, and current run-off concerns are not as much of a concern in the watersheds that drain into Santa Barbara Channel as the highly urbanized greater Los Angeles area's watersheds which drain into Santa Monica Bay.

Alternative 4: Combination of Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified. Generally, the potential impacts to benthic and pelagic biological communities and habitat of future offshore aquaculture may be greater in Alternative 4 than in Alternative 2 or 3, assumed as a result of more identified AOAs. Benthic environmental health effects from finfish aquaculture are thought to be relatively consistent across the entire SCB. The potential adverse impact to benthic communities have been estimated to increase linearly with each additional site developed for finfish aquaculture in the region (Lester et al. 2018b). However, if Alternative 4 provided multiple discrete areas for finfish facilities to be sited further from one another across Alternative areas the linear growth associated with potential adverse impacts to benthic communities could be mitigated. Although good management and modern operating conditions are thought to largely eliminate the potential impacts of aquaculture on surrounding water quality in deep offshore waters, and on benthic and pelagic communities, the additive impacts of multiple projects sited near one another or across a whole region may change observed impacts and associated risks.

An indirect potential community-level benefit of siting multiple AOAs would be additional ocean spaces that may functionally exclude and restrict bottom trawl activities. Trawl components that contact the seafloor have the potential to snare, undercut or topple emergent structures, and are considered more harmful to the physical and biological components to bottom habitat than longline and pot/traps (Morgan and Chuenpagdee 2003, PFMC 2019, and Whitmire and Clarke 2007). While it is acknowledged that the structure and materials of fisheries gear and aquaculture gear differ, the shape and footprint of aquaculture gear may be compared to longline and pot gear in this prediction. Benthic disturbance per fishing gear

type summarized in Table 3.3 of Whitmire and Clarke (2007). This potential ecological benefit to benthic communities would create a trade-off, at the cost of potentially-excluding more commercial fishing activities.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

iv. Potentially-Farmed Species

Affected Environment

The U.S. Department of Agriculture's Animal and Plant Health Inspection Service (USDA-APHIS) and veterinary services is the lead federal agency for animal and plant health. USDA APHIS, authorized under Animal Health Protection Act (AHPA, also known as the Animal Welfare Act), oversees the prevention, detection, control, and eradication of animal diseases in aquaculture (7 U.S.C. § 8322 and 10401). AHPA also regulates the treatment of animals in research, teaching, testing, exhibition, transport, and by dealers (USDA 2023). Additional laws that provide a framework for protecting animal health domestically and internationally are described on USDA's APHIS website, available online at https://www.aphis.usda.gov/laws-regs (USDA 2024b). USDA APHIS also collects data for reportable diseases nationwide for submission to the World Organization for Animal Health (WOAH). Other federal agencies involved in aquatic animal health are the U.S. Food and Drug Administration (FDA) Center for Veterinary Medicine, NOAA, USFWS, and delegated authorities to the state. There are reciprocal agency evaluations and oversight, depending on enforcement authorities and expertise (FDA and NOAA pers. comm. February 2021). The U.S. states in which facilities are located or to which organisms are transported also have animal health authorities, defined by each state's legislative codes, regulations, and policies (Rhodes et al. 2023a). This section of the PEIS focuses on the animal health aspects of aquaculture. For human aspects related to seafood safety, see Chapter 3 Section D.viii (Public Health and Safety).

Among the major growing areas for shellfish in California, the Santa Barbara Channel ranks fifth for oysters, second for mussels, in annual production value by weight (CDFW 2020a). California is also home to seven native abalone species; but the green and pink abalone, with more southern distributions, are particularly suitable for aquaculture in Southern California due to their tolerance for higher water temperatures (McBride and Conte 1996, Purcell et al. 2025a). Southern California is considered an ideal region for rearing marine fish in the U.S. because of its mild climate and ocean conditions, and high value species that are native or established (CDFW 2010). Yellowtail and white seabass are expected to benefit from warmer temperatures of 72 to 77°F (22 to 25°C) that would be more typical off Mexico; Cabezon are coastal groundfish that perform best in cooler waters of 53 to 58°F (12 to 14°C); California halibut, and striped bass are found in brackish water as juveniles and, therefore, are generally tolerant of changing temperature and salinity (CDFW 2010).

Market interest, economic and biological viability, and regional policies influence the likelihood of which species are thought to be pursued by future offshore aquaculture. Seafood product diversity in the future is not thought to come necessarily from the next new species market; rather, market expansion is

predicted to come from the same species with a new preparation, sauce, product form, or image (Rubino (ed.) 2008). NOAA does not have the authority to authorize specific species, or combination of species, that future aquaculture projects may choose to grow in an AOA, if identified. Discussion of any potentially-farmed species in this PEIS or consideration in OMEGA modeling (Purcell et al. 2025c) is not an endorsement, recommendation, or approval by NOAA Fisheries. However, using the best information available on industry interest, the following native or naturalized species are thought likely to be pursued in the SCB for commercial production (USDA and NCCOS pers. comm. September 2023, Dealy et al. 2024, Purcell et al. 2025a, b, c).

- Macroalgae/ seaweed: Sugar kelp (*Saccharina latissimi*); Ribbon kelp (*Alaria marginata*), Giant Kelp (*Macrocystis pyrifera*), Bull Kelp (*Nereocystis luetkeana*), Bladderwrack (*Fucus distichus*), Kombu (*Laminaria setchelli*), Sea Palm (*Postelsia palmaeformis*), Sea Cabbage or sweet kombu (*Hedophyllum sessile* (formerly *Saccharina sessilis*)), Nori (*Pyropia* spp.), Sea spaghetti (*Gracilaria andersonii*), Turkish Washcloth (*Mastocarpus papillatus*).
- Shellfish: Olympia oyster (*Ostrea lurida*), Pacific oyster (*Magallana gigas*), Purple-hinged rock scallop (*Crassadoma gigantean*), Manila clam (*Venerupis philippinarum*, *Tapes* spp.), Pismo clam (*Tivela stultorum*), California mussel (*Mytilus californianus*), Mediterranean mussel (*Mytilus galloprovincialis*), Abalone (*Haliotis* spp.).
- Finfish: California yellowtail (*Seriola lalandi*), Longfin yellowtail (*Seriola rivoliana*), white seabass (*Atractoscion nobilis*), Striped Bass (*Morone saxatilis*), Sablefish (*Anoplopoma fimbria*), California Halibut (*Paralichthys californicus*), Olive flounder (*Paralichthys olivaceus*).

Purcell et al. (2025a, b, c) provide species descriptions, cultivation methods, range and other life history descriptions of potentially-farmed shellfish, macroalgae, and fish, respectively. According to the State of California's most recent Status of Commercial Marine Aquaculture in California report, the species of shellfish, seaweed, and macroalgae that are currently cultivated in California as of 2019 include Pacific oyster (*Crassostrea gigas*), Kumamoto oyster (*Crassostrea sikamea*), Olympia oyster (*Ostrea lurida*), Eastern Oyster (*Crassostrea virginica*), European Flat oyster (*Ostrea edulis*), Manila clam (*Venerupis philippinarum*), Mediterranean mussel (*Mytilus galloprovincialis*), Bay mussel (*Mytilus trossulus*), California Sea mussel (*Mytilus californianus*), Red abalone (*Haliotis rufescens*), Green abalone (*Haliotis fulgens*), Ogo (*Gracilaria* spp.), Sea Lettuce (*Ulva* spp.), Dulse (*Palmaria palmata*), Giant kelp (*Macrocystis pyrifera*), Bladderwrack (*Fucus* spp.), Nori (*Porphyra* spp.), Kombu (*Laminaria farlowii*), and Turkish Towel (*Chondracanthus exasperates*) (CDFW 2020a).

Stressors

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- the use of native versus naturalized species;
- the use of genetically-modified stock in cultivated organisms;
- the use of antibiotics and/or other husbandry materials/therapeutics (e.g. antifoulants, probiotics);
- exposure to, and interactions with, existing pollutants or harmful algal blooms that may occur in the SCB;
- the translation and adoption of surveillance and eradication programs, biosecurity guidance, import controls, and emergency response and planning from land-based and coastal systems to the offshore space; and
- increased biomass and related topics for animal welfare in artificial containments.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a

result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Aquaculture operations in an AOA could increase logistical demands on permit compliance and enforcement. Animal health measures are already well established in the U.S. and in California for wild-harvested species, international aquaculture imports, and domestic nearshore aquaculture products. The biosecurity measures described in this PEIS are existing regulatory mechanisms that establish strategic and integrated approaches into U.S. policy and regulatory frameworks aimed at analyzing and managing risks relevant to human, animal and plant life and health, including associated environmental risks. Industry members have expressed the need for research that individual facility producers may not be able to execute on their own, including heat tolerance and disease resistance (USDA 2020). Any aquaculture projects sited in an AOA would need to coordinate with state and local agencies for appropriate transport, testing, and other established regulatory requirements. The new amount of product from large-scale, offshore operations would likely be much greater than the current small operations in the region and WCR. Initially, this could cause bottlenecks in transport, testing, or other stages of regulatory systems for seafood safety. Bottlenecks in regulatory processing may impact product viability, and business costs. However, over time, increased demand for biosecurity logistics in the U.S., as well as potential increased demand for products produced under U.S. biosecurity controls, could stimulate increased market supply and private investments to support efficient production.

Section 312 of the Clean Water Act (CWA) prohibits vessel discharge of pollutants, including sewage, in areas designated as “no discharge zones” (NDZ) (33 U.S.C. § 1322, EPA 2023). These policies and regulations are jointly enforced by the EPA and USCG (40 C.F.R. § 140, 33 C.F.R. § 159). If an offshore aquaculture facility is not positioned in an NDZ, cultivated animals could potentially be exposed to pollutant discharges from vessels (Rhodes et al. 2023a). Cultivated organisms may experience pollution from passing vessels and existing nearby offshore infrastructure.

Non-infectious diseases, infectious diseases, and parasites are all risks to organisms being grown in an aquaculture facility. See Chapter 3, Section C. (Federally-protected Species) and C.ii (Wild Fish Stocks) for a discussion on the potential impacts of disease to wild populations. This section of the PEIS focuses on the cultivated populations. Pathogens may be associated with growing species, interstate transport, or with potential invasive species already found in the marine environment (FDA and NOAA pers. comm. February 2021). Disease transfer principles between cultivated and wild populations are summarized in Table 1 of Rhodes et al. (2023a). Disease risk at an individual facility could vary based on ambient water temperature and salinity fluctuations, seasonal changes to algae concentrations, and worker activity at the site (Rhodes et al. 2023a). Organisms that are more stressed due to culture density, predation patterns, handling or other movement such as inclement weather conditions may be more susceptible to disease (Rhodes et al. 2023a). Disease transmission between facilities would be concentrated in areas where ocean currents generate high levels of connectivity among potential aquaculture sites (Lester et al. 2018b). Organism stress and death may be direct impacts; disease may also have broader indirect impacts on surrounding ecosystems, public perceptions, demands for cultured products, and policy decisions (USDA 2020). Potential mitigation measures to reduce occurrence of disease, including best management husbandry practices, are discussed in Appendix 1.

Biofouling would likely occur at any growout facility. Suspended culture sites may facilitate introduction or spread of biofouling organisms and/or invasive species. Biofouling can contribute to stress and disease occurrence in cultivated organisms by reducing water flow and survival, while increasing crowding and potentially harboring pathogens. The composition of fouling communities varies spatially and temporally, depending on factors such as light availability, water flow, and the depth and orientation of a settling surface. The effects of fouling communities on cultivated organisms are primarily determined by the

properties of the fouling surface, the protection and management of those surfaces, and seasonal variations in the physiology of the cultivated species (Fitridge et al. 2012, Redmond et al. 2014b, Purcell et al. 2025a, b, and references therein). Culturing and husbandry techniques are used to manage biofouling, but these methods can have their own potential impacts.

Antibiotic use in aquaculture globally varies depending on production practices and regulations, cultivated species, and pathogens in the surrounding environment (Fujita et al. 2023). In the U.S., the use of antibiotics in aquaculture production is highly regulated and there are currently no antibiotics approved for use in the open ocean environment for warm water marine species. Globally, antibiotic residuals have been shown to occur around marine aquaculture, which can induce changes to water quality and have the potential to be toxic to marine life (Zhang et al. 2023). Disease control for each type of aquaculture is discussed under the appropriate sub-alternative, below. Discussion of the potential impacts on human health associated with potential consumption of aquaculture products is provided in Chapter 3, Section D.viii (Public Health and Safety).

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

a) Shellfish and Macroalgae

This section considers potential impacts on cultured animal health, impacts on macroalgae are not discussed.

Mollusks can be infected by a suite of bacterial, viral, and protist pathogens that can lead to mass mortality events that impact production, and can accumulate in mollusk tissue, creating risks for human consumption. These diseases spread faster compared to in the wild when animals are stocked at the higher densities required for aquaculture (Kunselman et al. 2024). California mussels can be harvested year-round, except for times when a quarantine is in effect because of hazardous levels of biotoxins present in mussels, generally between May and October (CDFW 2020a). Spawning in the California mussel occurs throughout the year at a very low level, with peaks in July and December but reproductive output can be up to eightfold greater for sites south of Point Conception relative to more northerly sites (CDFW 2010). In the case of oysters, there is seasonal elevation of oyster herpesvirus and bioaccumulation of other toxins during warmer months (CDFW 2010, Petton et al. 2021, Rhodes et al. 2023a). Summer mortality of Pacific oysters was first reported in California in the 1960s, and have historically reached mortality levels as high as 65% in adult Pacific oysters (CDFW 2010). Dinoflagellate blooms are also associated with warmer water events, and have impacted abalone aquaculture in State waters by causing gill damage and by also lowering the amount of dissolved oxygen in the seawater (CDFW 2010). Industry members have also cited pest control as an impediment for growth in the coastal environment (USDA 2020, Fujita et al. 2023). Growing shellfish further offshore in AOA may reduce the risk of some of the biotoxin and disease concerns that are typical in nearshore aquaculture.

Free exchange of seawater provides the main disease transmission route to cultivated shellfish. Shellfish diseases are an existing major concern to State resource agencies and the oyster industry; and regulations are established through cooperative agreements between agencies (described under Environment, above). Disease factors and pathogens of concern during invertebrate grow-out vary depending on culture method and life-history biology. Viral, bacterial, and parasitic diseases common in shellfish aquaculture globally can be found in Tables A-1, A-2, and A-3, respectively, in Rhodes et al. (2023a)

In shellfish aquaculture, biofouling impacts may include physical damage to the cultivated species, competition for biological resources and space, and environmental modification. Examples of biofouling

organisms that may occur on shellfish species, globally, with associated literature are listed in Table 1 on p. 650 of Fitridge et al. (2012). Potential biofouling organisms that were analyzed for shellfish offshore of Ventura are described in Dudek (2019). The likelihood of cultivated shellfish to harbor or help spread invasive species depends, in part, on the surrounding substrate (the closer hard bottom habitat occurs to a specific facility location could facilitate spread) (VPD 2018). However, within the cultivated population, competition for space and crowding can cause instability of shellfish masses and could cause biomass loss when coupled with high current speeds or turbulent waters (Ramsay et al. 2008, CDFW 2010). Biofouling may also facilitate introduction or spread of disease and invasive species (Lloyd 2003, McKindsey et al. 2011, Rhodes et al. 2023a, and Purcell et al. 2025a).

Stress can impact shellfish and other invertebrates' susceptibility to infection. Water temperatures and salinities have predictable effects for some diseases (Rhodes et al. 2023a). Oysters started in a hatchery may be stressed and susceptible to infection (CDFW 2010). Studies reviewed in Weilgart (2018) showed that biofouling organisms (e.g. bryozoans, tube worms, barnacles) settle faster in environments with noise than silence, and some species grow larger in noise-stimulated environments. The settling effect also impacts shellfish, including oysters and mussels, but species-specific size impacts may be beneficial or adverse. Biomass density affects oxygen demands, which may put cultivated shellfish at risk of destabilization or hypoxia.

Risk to shellfish also include contamination from fecal coliform bacteria from pinnipeds, which is a documented issue in nearshore operations in British Columbia and Washington from harbor seals (Moore and Wieting 1999). The impact is more due to habitat overlap than pinnipeds being drawn to a shellfish facility (Price et al. 2017). This impact is thought to be mitigated by siting aquaculture in offshore waters where aquaculture would be further from rookeries and haul outs, but may be more effective for sea lions than seals (Moore and Wieting 1999, Wursig and Gailey 2002, Price et al. 2017, and Bath et al. 2023). Bacteria and viruses related to invertebrate diseases have been an issue for species along the West Coast, such as Withering Syndrome in abalone and the Ostreid herpes virus in Pacific oysters (Friedman et al. 2000, Burge et al. 2021).

Disease prevention in shellfish include probiotics, prebiotics, synbiotics, and biofloc technology, but the best way to minimize potential for infection is to maintain proper density management and avoidance of any acute changes in environmental conditions (e.g. temperature, salinity) (Fitridge et al. 2012, de Souza Valente and Wan 2021, and Rhodes et al. 2023a). Because invertebrates lack the adaptive immunity found in vertebrates, traditional vaccination is not possible (Rhodes et al. 2023a).

The Federal waters Shellfish Biotoxin Advisory Board (FWSBAB) serves as a technical advisory group to support the National Shellfish Sanitation Program (NSSP) regarding marine biotoxins and bivalve molluskan shellfish in Federal waters. The FWSBAB is led by the Food and Drug Administration (FDA) and is comprised of representatives from the FDA, National Oceanographic and Atmospheric Administration (NOAA), the Environmental Protection Agency (EPA), and the Centers for Disease Control and Prevention (CDC). The group was established to assist in gathering marine biotoxin data in coastal and ocean waters that may impact shellfish in Federal waters, including:

- identifying the presence of toxic algae/toxins in Federal waters and in any molluskan shellfish grown in Federal waters;
- establishing criteria for determining which geographic areas within Federal waters require a marine biotoxin management plan;
- reviewing marine biotoxin management and contingency plans when submitted;
- providing technical assistance related to selection of marine biotoxin management strategies;
- developing data requirements (including quality assurance/quality control) per marine biotoxin management strategy; and
- review of Federal waters marine biotoxin data generated under marine biotoxin management and contingency plan requirements (FDA pers. comm. December 2023).

If the identification of an AOA and siting aquaculture in AOAs facilitates an increase the growth of shellfish aquaculture, the current research needs of the industry would likely increase. For any emerging molluskan species (those that are not being commercially-grown already), there would be critical research needs to optimize production in all stages, from hatchery through nursery and grow-out (Sea Grant 2016). An increase in grower demand, especially within a defined geographic area of an AOA, could potentially help generate interest and coordinate partnerships for these necessary research topics.

b) All Types of Commercial Aquaculture

Finfish for which rearing techniques have been suitably developed for California marine aquaculture include white seabass (*Atractoscion nobilis*), California yellowtail (*Seriola lalandi*), California sheephead (*Semicossyphus pulcher*), cabezon (*Scorpaenichthys marmoratus*), and striped bass (*Morone saxatilis*).

The concept of biosecurity refers to practices and procedures designed to minimize the risk of introducing and spreading diseases and pathogens in fish populations. It also aims to reduce stress on fish, making them less susceptible to disease, and minimizes economic losses from disease outbreaks. Most species reared in net pens undergo a hatchery biosecurity phase at a land-based facility before stocking on marine-sited facilities. That is considered out of scope for this PEIS. Therefore, the focus is on maintaining biosecurity principles of juveniles and adults in the offshore environment. Important biosecurity risks to closely manage include possible escapes, pathogen exposure and exchange, and waste discharge that may occur during transfer of animals to and from net pens, sharing vessels and proximity to other net pens (Rhodes et al. (2023a)).

Managing for pathogens and parasites is vital in open net pen environments. Several viral and bacterial pathogens and parasites warrant special attention; especially those listed by the World Organization for Animal Health (WOAH), USDA Animal and Plant Health Inspection Service (APHIS) and the state of California.

Managing exposure to these pathogens and parasite is key to prevention. Biofouling growth on fish cages and infrastructure may restrict water flow, increase risk of disease, and impact the gear infrastructure. If cultivated fish are populated in net pens at high density, flushing may also be reduced which could lead to lowered dissolved oxygen levels (Fitridge et al. 2012). Examples of biofouling organisms found globally associated with marine finfish aquaculture are listed in Table 2 on p. 652 of Fitridge et al. (2012). Nets and raceways are usually cleaned in situ and may produce short-term increases in organic matter under the facilities (CDFG 2010).

Other disease prevention and treatment measures for finfish may include vaccination, probiotics, immunostimulatory molecules, antimicrobial peptides, or antibiotics. The safety of the animal and consumers is paramount and these measures should be used in compliance with all regulations (e.g., following the FDA approved use and withdrawal times listed on therapeutic label, application under the oversight of a U.S. licensed veterinarian). In the U.S., antibiotics use in marine environments requires a U.S. licensed veterinary prescription and oversight. Adults may be injected with therapeutic drugs, and juvenile fish may be fed therapeutants at early feeding (Rhodes et al. 2023a). However, the use of antibiotics in finfish aquaculture is not high, and is expected to be even lower in the offshore environment due to improved water quality, fewer interactions with host fish, and less biofouling (Rensel and Forster 2007, Hjeltnes et al. 2019, Fujita et al. 2023). Also, concerns have been raised regarding the overuse of antibiotics and potential impacts on the biodiversity of bacteria in the water column, which may lead to a risk of resistant bacteria; effects on non-target organisms (especially related to parasiticides and antifouling products on invertebrates) (Carballeria Brana et al. 2021, Fujita et al. 2023).

Many countries have robust regulations governing antimicrobial use, with some nations fully phasing out or banning the practice due to concerns regarding antimicrobial resistance and its impacts on human health (Cabello et al., 2013; Sneeringer, 2015; Rhodes et al., 2023a). In the United States, the FDA established Veterinary Feed Directives (VFDs) to ensure antibiotics are administered only under the

supervision of licensed veterinarians. Furthermore, under the Animal Medicinal Drug Use Clarification Act (AMDUCA, 21 U.S.C. § 530), veterinarians are permitted to prescribe approved therapeutic drugs beyond their officially approved uses ("extra-label use") under strict conditions. Administration of antimicrobials and prescription or veterinary feed directive drugs requires a valid veterinarian–client–patient relationship. Although significant efforts have successfully led to drug approvals in aquaculture, these approvals have primarily focused on freshwater species (Rhodes et al., 2023a). Currently, no antimicrobial drugs are explicitly approved for marine aquaculture in the U.S.; thus, all administration in marine systems is performed through extra-label prescriptions by licensed veterinarians.

Vaccines have been shown to be a highly useful and cost effective measure against diseases in finfish, and can greatly-reduce the use of antibiotics (Ma et al. 2019, Barnes et al. 2022, and Rhodes et al. 2023a). There are two types of vaccines that are allowed in the U.S. – those manufactured and marketed and approved by USDA APHS (Center for Veterinary Biologics) and autogenous vaccines that are specifically tailored to the pathogens present on a particular fish farm. Vaccines that have been used finfish aquaculture, globally, are listed in Table 1 on p. 3 of Ma et al. (2019). Public perception of the safety of vaccines for finfish may affect consumer choices.

Non-medical disease may include culling or segregation of diseased fish, site rotation, and fallowing (Fujita et al. 2023, Rhodes et al. 2023a). The State of Maine requires site rotation and fallowing in all nearshore aquaculture leases; but on the west coast in Washington and British Columbia, antiparasitic use to respond to sea lice are the biggest pathogen concern (Fujita et al. 2023). A review of prevention and treatment methods are provided on p. 16 in Rhodes et al. (2023a). Sea lice infections off the coast of Canada showed seasonal increases from April through June, and in higher salinity waters (Foreman et al. 2015). Tuna parasite loads have been shown to be reduced in offshore locations, compared to nearshore counterparts (Kirchhoff et al. 2011). Minimizing stress in finfish is the best preventative measure against infection. (Rhodes et al. 2023a). The presence and active hunting by seabirds and marine mammals could worsen a disease outbreak in fish species by increasing stress levels.

In addition to environmental or biomass stress, finfish may experience other types of stress, related to impacts on animal welfare. Fish handling is defined and described on p. 2-13 of the CDFW Coastal Marine Aquaculture Program Draft PEIR (CDFW 2019). The regulations and conditions in CDFW (2019) apply to public net pens under research permits in State waters, and are therefore different from what may occur in commercial operations in Federal waters. However, it is the best available information of circumstances when fish would be handled through transport and growout phases. Similar to shellfish, the risk of hypoxia, destabilization, or death would depend on biomass density and oxygen demands. Stress from overcrowding has been reported to reduce fertility, increase disease susceptibility, and excessive excretion of toxic levels of ammonia, especially at high pH levels (Aguilar-Manjarrez et al. 2017, Carballeria Brana et al. 2021). In the Pacific Northwest salmon industry, fish losses due to direct predation, fish injury, or escapement have been estimated to account for losses of up to 10% of cultivated fish populations, and can relate to worker or recreational safety associated with human-animal interactions (Nash et al. 2005, CDFG 2010, and Price and Morris 2013). Cannibalism can also occur among younger life stages of marine fish before size grading (moving among pens) is practical (CDFW 2010). The USDA APHIS is the federal agency responsible for animal welfare under the Animal Welfare Act (AWA). However, the AWA currently excludes fish, shellfish, and other aquatic invertebrates, meaning there is no federal animal welfare law specifically.

The FDA (Center for Veterinary Medicine) is also responsible for the approval of new animal drugs and feeds that may be used in aquaculture production. This approval process involves the rigorous scientific evaluation of effectiveness and safety for the aquatic species, humans and the environment, before approval for use. The FDA Office of Surveillance and Compliance is responsible for compliance-related actions, post-approval monitoring, and animal feed safety and medicated feed mill licensing (Rhodes et al. 2023a). Modern feed formulations aim to reduce solid waste through improvements in digestibility, ingredient selection, and nutrient balance (Cho and Bureau 2001). In their sustainability guidance for

aquaculture feeds, Tacon et al. (2022) reiterated the need for continued improvements to aquaculture feed formulations, recommending feed mills establish dedicated research and development programs for in-house testing of feeds, including digestibility of feed ingredients.

IMTA would propagate multiple aquatic species from different trophic levels in complementary facilities sited near each other. The potential benefits of IMTA include operation efficiencies, reduced waste, and ecosystem services. The increased dissolved oxygen, reduced acidification, and temperature buffers created by seaweed aquaculture may be beneficial as effective habitat refugia within a region for calcifying organisms (Xiao et al. 2021, TNC 2021). In this way, growing seaweeds alongside shellfish species may enhance shellfish production. Literature reviewed in Gentry et al. (2020) concluded that seaweed and bivalves can remove nutrients from the water, and some studies show evidence that seabass and other invertebrates can provide the same ecosystem service. Growing an extractive species alongside finfish could counteract any localized adverse impacts within the project footprint to reduce localized impacts. Wastes can be exploited as another profitable output or as feed for a second species, which may result in less environmental contamination and higher economic profits (Carballeria Brana et al. 2021). These benefits could be scaled up if aquaculture facilities of different types were sited near one another within an AOA.

Specific operational practices (e.g., fallowing) can decrease potential benthic environmental impacts from uneaten fish feed and fish wastes. IMTA used with feed-required species may increase retention of aquaculture waste. Nederlof et al. (2021) noted that nutrient removal efficiencies for extractive species vary greatly (2-100%) because of cultivation techniques, waste, measuring methods, production intensity and species cultivated; various biological and environmental parameters may limit the retention efficiencies and affect an IMTA system's bioremediation capability. Nederlof et al. (2021) estimated bioremediation efficiencies of 40-50% could be realistic for open aquaculture systems, demonstrating potential for substantial nutrient retention from fish culture by extractive species in IMTA systems. Buck et al. (2018) and Fujita et al. (2023) noted however that technological advancements are still needed for IMTA to be commercially feasible at a large scale in the offshore environment.

The potential impacts of IMTA specific to the cultivated populations include disease transmission, attraction of wild species, biofouling, mechanical or chemical control, and other impacts associated with more common ocean aquaculture operations (PFMC 2022a). Including cohabiting predatory fishes can remove weak, diseased, or invasive fishes from net pens or ranches (Akiona et al. 2022).There may be trade-offs in IMTA that may not occur in single-species cultivation (Buck et al. 2018, Fong et al. 2023). For example, heavy metals accumulated in seaweeds are higher when grown in association with finfish – this may be an ecosystem service, but could limit the viability of any seaweed products for human food consumption from an IMTA operation (Ratcliff et al. 2016). Antifouling products that may be necessary to use in finfish aquaculture are associated with increased copper levels, which are toxic to marine invertebrates, especially mollusks (Fitridge et al. 2012). In land-based examples from the U.S. and China, rice grown in association with crustaceans have to reduce yields in order to optimize production of both foods (Fong et al. 2023).

These potential impacts may be realized within a single facility, or within the geographic bounds of an AOA if projects of different types were sited near one another. The potential impacts, and the degree of impacts, from IMTA would depend on specific project designs and the potential interactions among projects sited in an AOA.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic

spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section. Higher risk of water quality concerns exist related to seafood harvest in Santa Monica Bay (see Sections B.iv (Water Quality), D.viii (Public Health and Safety)

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section. A higher risk of water quality concerns exist related to seafood harvest in Santa Monica Bay (see Sections B.iv. (Water Quality), D.viii. (Public Health and Safety) Elevated concentrations of several contaminants (including PCBs and DDTs) in fishes have been found in Santa Monica Bay (Schiff et al. 2000, LARWQCB 2011). According to the California Office of Environmental Health Hazard Assessment (OEHHA), a department within the California EPA, potential risks to humans associated with consumption of seafood species taken from the Bay, white croaker is considered to be the most contaminated fish, along with California corbina, queenfish, surfperches, and California scorpionfish (LARWQCB 2011). The higher contamination is assumed to be due to lipid content, and should also be a consideration for choosing potential finfish species for an aquaculture project sited in Alternative 3.

Alternative 4: Combination of Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified. It may be assumed that if multiple AOAs were identified, then more aquaculture may develop in the identified areas. Siting aquaculture projects across the region may increase any potential impacts (beneficial or adverse) from a local scale to a regional scale. Most of the potential impacts to cultivated populations would likely depend on techniques and technologies within individual facilities, and would not likely change depending on if AOAs were identified in more than one Alternative area.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

D. Socioeconomic Environment and Potential Impacts

The ocean and coastal waters of the United States are foundational to the economy, security, global competitiveness, and well-being of the United States. Coastal areas account for less than 10% of the U.S. landmass, but accounts for about 40% of the U.S. population (NOAA 2024b). In 2020, the overall U.S. marine economy contributed $361 billion to GDP, generated $610 billion in sales, and supported 2.2 million jobs. By 2030, global marine economy growth is projected to reach $3 trillion (NOAA 2022). The CCE is integral to the economy, culture, and well-being of the U.S. west coast. The coastal and offshore waters of the SCB provide recreational and tourism activities, commercial fishing, critical routes commerce, and homeland security for millions of Americans.

i. Commercial Fishing

Affected Environment

NOAA Fisheries manages four FMPs along the U.S. west coast (California, Oregon, and Washington), pursuant to MSA. These are the Coastal Pelagic Species (CPS), Highly Migratory Species (HMS), Groundfish, and Pacific Salmon FMPs, see Table 7. Components of the MSA, descriptions of wild fish stocks, and potential impacts related to the biological environment are described in Chapter 3, Section C.ii of this PEIS. This section describes the socioeconomic environment and potential impacts to commercial fishing activity in the SCB. Viable commercial fisheries require not only healthy marine resources and habitat, but also people and businesses to support fishing activities that support the economy. A fishing community is defined under the MSA at 50 C.F.R. § 600.345(b)(3) as a community that is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew, and fish processors that are based in such communities. Areas that may be considered fishing communities in California are listed on p. 365 of the NMFS Community Profiles for West Coast and North Pacific Fisheries (Norman et al. 2007). Federal FMPs that may apply to Federal waters of the SCB and the potential for fisheries groups to occur in the Alternative areas are shown in Table 7. Fisheries groups are considered in this PEIS collectively.

There are both Federal and state commercial fisheries in the SCB. The management of commercial fisheries in the SCB varies between state and Federal authorities for a given fishery depending on species, location, timing, and gear type. California limits participation in state-managed commercial fisheries through permits, monitored use of gear, trip limits, and seasonal closures (PFMC 2013). Harvest rates for federally-regulated species are limited based on fish population status and environmental variables including fishing pressure, habitat degradation, pollution, environmental variation, and disease. The most current status of all Federal stocks under PFMC jurisdiction are provided in Status of the Stocks Reports, which are updated annually (NMFS 2023g). While both Federal and state commercial fisheries are discussed in this PEIS, only Federal FMPs are shown in Table 7. Site- and project-specific NEPA analyses may need to consider the potential for a particular commercial fishery to occur near an aquaculture operation in more detail, including state coordination for potential impacts to resources that may occur in both state and Federal waters.

In 2022, commercial landings from ports in all 50 states totaled 8.4 billion pounds, and were valued at $5.9 billion. This is a decrease in both capture volume (3%) and value (11%) from 2021 (NMFS 2024a). California generated the largest sales impacts ($26.2 billion), value-added impacts ($9.3 billion), and income impacts ($5.6 billion) of the west coast states, despite having the lowest landings revenues (NMFS 2024a). The following are historic landings and revenues of west coast and/or California commercial fisheries:

- West coast commercial fishing described by species groups and landings in Section 3.3.1 and 3.3.2 on pp. 45 through 52 of the NMFS Community Profiles for West Coast and North Pacific Fisheries (Norman et al. 2007).
- Landings and revenues for all west coast states through 2019 are summarized in Section 3.4.2 on pp. 44 through 59 of the PFMC Pacific Coast Fishery Ecosystem Plan (PFMC 2022b).
- Landings and revenues for all west coast states through 2020 are summarized on pp. 38 and 39, and detailed per species groups on p. 44 of the NOAA Fisheries Economics of the U.S. 2020 Report (NMFS 2023h).
- Commercial landings for the state of California from 1916 through 2020 are reviewed in Free et al. (2022).
- Details on the economic contribution to the California seafood industry from commercial fisheries and key species groups are provided on p. 48 of the NOAA Fisheries Economics of the U.S. 2020 Report (NMFS 2023h).

- Trends in California commercial fisheries landings are summarized in data through 2023 in Figure P.3 on p. S-75 of Appendix P in Harvey et al. (2023).
- Trends in California commercial fisheries revenues are summarized in data through 2023 in Figure P.4 on p. S-76 of Appendix P in Harvey et al. (2023).

In data analyzed through 2019, the Channel Islands contributed some of the top consistent commercial fisheries by volume to the state (CDFW 2020b). The four primary port-based fishing communities near Alternative 2 are Santa Barbara, Ventura, Oxnard, and Port Hueneme. Ventura and Santa Barbara are the closest to Alternative 2, between 8.5 and 20.7 km (4.6 and 11.2 nm) (Morris et al. 2021). Port Hueneme and Ventura support relatively larger fisheries, including highly migratory species (e.g. tuna), forage fish and market squid. Santa Barbara and Channel Islands (Oxnard) harbors primarily serve smaller dive, trap and trawl operations including lobster and sea urchin (Sea Grant 2024b). The mix of fisheries and level of activity in each port varies due to factors that change seasonally and annually, including species distribution, market demand, regulations, available infrastructure, and consumers (Sea Grant 2024b). Fishing communities and other coastal communities of the Santa Barbara Channel region are described in Chapter 3, Section D.iii (Ports and Working Waterfronts). Historic and cultural ties to the fishing industry are described in Chapter 3, Section E.

The region near Alternative 3 is supported by 11 port-based fishing communities across Los Angeles, Orange, and San Diego Counties (Sea Grant 2024b). Marina del Rey is the closest to Alternative 3, between 9.8 and 11.3 km (5.3 and 6.1 nm) (Morris et al. 2021). Other ports along the shore of Santa Monica Bay include King Harbor at Redondo Beach and Santa Monica. The leading fisheries by value are coastal pelagic species including market squid, anchovy, and sardine, as well as spiny lobster (*Panulirus interruptu*s) and red sea urchin (*Mesocentrotus franciscanu*s) (Sea Grant 2024b). The tuna fishery and other HMS species are some of the primary fisheries for the region by weight, and are an important fishery to the region historically and culturally. Fishing communities and other coastal of the South Coast region are described in Chapter 3, Section D.iii (Ports and Working Waterfronts). Historic and cultural ties to the fishing industry are described in Chapter 3, Section E.

Commercial landings and fishing activity data were incorporated into the spatial analysis in the Atlas. The following figures from the Results Section of the Atlas (Morris et al. 2021) are relevant to the analysis here:

- Figure 3.7 on p. 66 features navigation activity for fishing vessels carrying Automated Identification Systems (AIS) transponders.
- Figures 3.16 through 3.18 on pp. 78 through 79, and Figures 3.21 through 3.35 on pp. 83 through 97 show aggregated Vessel monitoring system (VMS) data for 15 target fisheries, as well as data with gear not listed, haul out, and long-term departure.
- Figure 3.36 on p. 98 is the suitability submodel considering all fishing data analyzed in the Atlas.

There are limitations in using VMS and AIS data to estimate fishing activity in an area. VMS is used in some fisheries for management and enforcement as a way to track patterns of fishing transits and intensity via satellite data; but is limited by the frequency of transmission and access is restricted for confidentiality (Russo et al. 2016, Shepperson et al. 2018, and Oceana 2021). AIS data is higher resolution and able to be accessed publicly; but it covers less fishing activity (Russo et al. 2016, Shepperson et al. 2018). USCG regulations require AIS on commercial fishing vessels 65 feet or more in length (33 CFR §164.46). AIS data may underestimate the amount of fishing industry vessel traffic in the alternative areas, based on the size of vessels that are used in the area (Morris et al. 2021, PFMC 2022a). The combination of VMS and AIS data analyzed in the Atlas was the best source of information available for the preparation of this PEIS. A gear calendar for all fisheries that may occur in the SCB, both state and Federal, is provided in Table 6.

Stressors

Baseline stressors for the commercial fishing sector include other offshore industries, fishing regulations, marine conservation efforts that exclude fishing activity, variations in stock size and distribution, area closures due to HABs, oil spills or other pollutants, weather, markets, and competition with imports (Russel et al. 2016, Rizman et al. 2018, Moore et al. 2020, and Vizak et al. 2020). Interactions with other offshore industries and marine conservation efforts are described in Chapter 4, Section A. Changes in the administrative environment (discussed in Section 3.A), physical environment (discussed in Section 3.B), and biological environment (discussed in Section 3.C) may impact socioeconomic resources and the commercial fishing sector. In 2020, the COVID-19 pandemic caused commercial fishing landings revenue to decline 15% (down 19% accounting for inflation) and seafood exports declined 23% (NMFS 2023h). The decline was attributed in part to the proportion of seafood that goes to restaurants, which shifted to retail sales during the pandemic (Froehlich et al. 2020). Environmental and market variability may continue to impact commercial fisheries in the SCB and CCE into the foreseeable future.

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- fixed gear and other equipment placement in the water column and surface;
- changes in vessel traffic volume and patterns.
- risk of marine debris; and
- new areas where wildlife aggregations may occur.

Potential market overlap between wild-harvested and aquaculture products is discussed in Chapter 3, Section D.iii (Markets and Regional Food Systems).

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Socioeconomic and ecological interactions between aquaculture and fisheries can be positive, negative, or a combination of both, see Table 2 on p. 377 of Clavelle et al. (2019). Trade-offs between fishing and aquaculture would need to be considered in site-specific NEPA analyses once project-specific sites and designs are known. These interactions have been observed as one of the greatest conflicts for marine aquaculture in Norway, New Zealand, Portugal, Ireland the Mediterranean, and parts of the U.S. (Hoagland et al. 2003, Mikkelsen 2007, Rubino (ed.) 2008, Akyol and Ertosluk 2010, Ramos et al. 2015, Aquarium of the Pacific 2016, Froehlich et al. 2017b, Clavelle et al. 2019, and Rubino 2022). The site suitability model in the Atlas combined over 15 types of available fisheries data to consider potential geographic overlap with commercial fisheries and avoid user conflict in the development of the alternative areas. The information and resources used to consider fishing in the spatial analyses in the Atlas are provided on pp. 29 and 30, in Table 2.9 on p. 38, as well as in Appendix A of the Atlas (Morris et al. 2021). The results are discussed under each alternative, below.

Potential geographic overlap of an AOA with fishing grounds may disrupt or cause other changes to fishing access and fishing practices. Commercial fishing groups may experience changes in fishing access due to safety, transit patterns, other fishing practices that contribute to fishing effort, and fishery productivity (Hoagland et al. 2003, Mikkelsen 2007, Clavelle et al. 2019, and PFMC 2022a). These impacts would likely be adverse. The identification of an AOA would not disqualify commercial fishing across the AOA. However, safety buffers may be set up around project sites during survey operations,

construction, maintenance, active operation, and decommissioning activities. The proportion of each fleet that may be affected by displacement or exclusion due to offshore aquaculture operations may be examined further in project-specific NEPA analysis. More precise, localized data from fishing communities would be needed to ground-truth the high-level predictions in this PEIS. Project-specific NEPA analyses may need to further analyze disproportionate impacts to small, local, and independent businesses which could also lead to greater adverse impacts on fishing communities. More on working waterfronts, social indicators, potential community vulnerability, and community wellness are discussed in Chapter 3, Section D.iv (Ports and Working Waterfronts) and Section E (Cultural and Historic Environment).

In addition to potential changes in access, the distribution of targeted species may change due to the presence of new wildlife aggregations in the offshore space. Whether wildlife aggregations provide a beneficial (i.e. more fishing opportunity) or adverse impact (i.e. displacement), and the severity of impact on fishers, would depend on the specific vessel size and gear types. For example, a small hook and line operation could fish closer to a facility relative to a large trawl operation that may be excluded due to the clearance needed to operate effectively and safely. This may create an advantage for certain vessels over others, changing the existing trends in competition among fleets in the offshore space.

It is important to distinguish potential impacts to the fishery overall, the fleets, and individual vessels. Fish landings in the region may not change enough to show an impact to the fishery overall; but certain vessels could be excluded completely due to new operation costs (e.g. increased fuel consumption by vessels having to avoid facilities in an AOA and higher expenditures on fuel). More detailed analyses of impacts would occur if and when facilities are proposed in the future.

Seafloor disturbance during pre/post-construction environmental monitoring, construction, and operations would likely have a short-term adverse impact on species presence for species like benthic fish, urchin, and sea cucumbers in the direct area; and that disturbance could benefit fishing effort in proximal areas to the disturbance, if targeted species are dispersed there. Other types of targeted species could potentially be adversely impacted by baseline surveys and construction, e.g. squid eggs that may have been deposited. The wild-capture California halibut fishery, and those landing other benthic species, may experience some displacement and/or increased effort in other areas, as many flatfishes use the same soft-bottom habitat that would likely be developed for aquaculture (Lester et al. 2018b). Sea urchins settle on hard substrate associated with kelp beds and brown macroalgae, commonly in depths up to 100 m (328 ft.) but as deep as 160 m (525 ft.) (SiMoN 2024). Sea cucumbers also prefer hard substrate, and are found in depths up to 75 m (249 ft.) (Sea Grant 2024c). All of the surveyed, measured or modeled depths within the AOA options of Alternative 2 are within the deepest range for red sea urchin; and all of the western AOA options within Alternative 2 (those labeled N2 in Figure 1) are within the depth range for sea cucumber (Morris et al. 2021). Anchoring systems could provide novel habitat for invertebrate species, which may benefit some fisheries that are nearby to aquaculture operations if individuals disperse into fishing areas (e.g., the urchin fishery). In contrast, other fisheries like the trawl-based sea cucumber fishery, purse seine fisheries and set net fisheries may not be able to take advantage of any ecological benefit from anchoring systems due to incompatibility of their operations and fixed aquaculture gear, depending on proximity of the resource, extent of buffer zones, or other factors.

A potential benefit to the commercial fleets in the SCB would be a diversification of labor and revenue by participating in offshore aquaculture operations. Diversification can take place in the form of targeting different fisheries, regions, or spreading effort throughout the year. Fishers with more diversified activities tend to have higher total revenue and less revenue variability that can buffer against a changing ocean environments and markets (Rubino 2022, Harvey et al. 2023). Commercial fishers, in particular, might be well-suited to adapt a fishing offseason into a farming season, or for collaborative work involving transportation and vessel maintenance involved with offshore aquaculture, either as a new occupation or one that complements current fishing activities, as they would have detailed knowledge of local oceanic and weather conditions (Valderrama and Anderson 2008, and Rubino 2022). On the west

coast, aquaculture and fishing operations already collaborate on maintaining and improving working waterfronts through new capital investment, siting facilities, establishing markets for local seafood, and advocating for working waterfront infrastructure with a diverse economic base (California Sea Grant 2018, Ventura Shellfish Enterprise 2021, Rubino 2022). Froehlich et al. (2020) point out the two sectors are managed separately, but would share geographic space and markets in feed and/or seed. Furthermore, the seafood supply chain could benefit from having a predictable, increased supply of products which would help maintain these new jobs and potential for year-round income (Rubino (ed.) 2008, Froehlich et al. 2020, McKinley Research Group 2021, Rubino 2022). Species diversification has been trending down since the early 1990s for most vessel groups and seasonal diversification in commercial fishing activity in the CCE has been trending down in all west coast vessels since 2015, thought to be associated with the onset of marine heatwaves and then COVID-19 in 2020 (Harvey et al 2023). Offshore aquaculture could alter this baseline trend, with beneficial impacts to the commercial fleets.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

The site suitability model in the Atlas combined over 23 types of available fisheries data, The modeled suitability for aquaculture given fisheries geographic overlap in Federal waters in Santa Barbara Channel as a whole (including Alternative 2 and additional areas throughout the Channel), is shown below. This fishing and aquaculture suitability submodel shows both commercial and recreational fishing geographic overlap and was only one component of the overall suitability used to develop the AOA options. Alternative 2 overlaps CDFW catch blocks 665 and 666. Catch block 665 overlaps all N2 AOA options, while catch block 666 overlaps N1-A and N1-B. Both 665 and 666 overlap option N1-C.

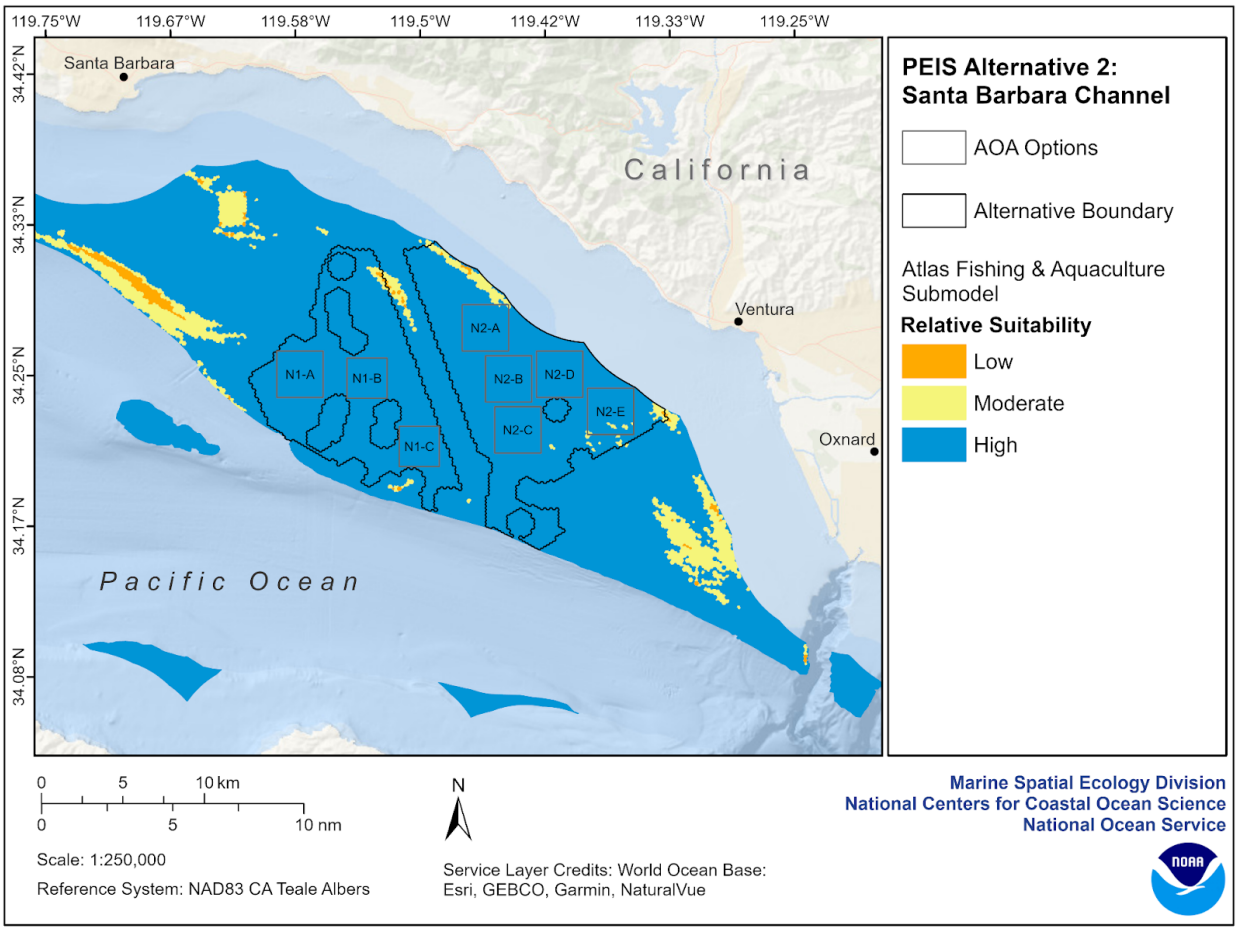


Figure 14: Atlas Fishing and Aquaculture Suitability Submodel Results for Alternative 2

No AOA option within Alternative 2 had more than 30 fishing transits per year from 2015-2020, according to the data considered in the Atlas, and the majority of the AOA options had less than 10 fishing transits each year. According to the spatial analysis in the Atlas, the highest-ranked fishing transits in and around Alternative 2 are sea cucumber and California halibut trawl, prawn and Dungeness crab pot/trap, and gillnet (Morris et al. 2021). According to PFMC estimates, Alternative 2 is located on grounds important to HMS fishers (although it was noted that tuna and swordfish harvesters based in the area would not likely be displaced from fishing grounds), as well as fishers targeting ridgeback prawn, sea cucumber, California halibut and coastal pelagic species (PFMC 2022a). Before the decline of the salmon fishery, the Santa Barbara Channel region was important to salmon trollers, but the commercial salmon fishery in California has been closed for several years due to low stock numbers (PFMC 2022a, Associated Press 2025). The Santa Barbara Channel is also important fishing grounds for deep-set buoy gear (DSBG) and the artisanal harpoon fleet. While these fisheries more commonly occur in waters deeper than the Alternative 2 AOA options, there is possibility for overlap as the minimum fishing depth for DSBG is 90m and the fishery was expanded in 2023 (NMFS 2023i). AOA options N1-A, N1-B, and N1-C all have maximum depths over 90m while all AOA options in the N2 area are shallower. These fisheries may be especially important to analyze during permitting decisions under a site-specific NEPA analysis for potential impacts due to geographic overlap.

According to data from 2010 through 2019, landings from CDFW catch blocks 665 and 666 averaged 964,450lb and 329,875lb of total landings, respectively (Morris et al. 2021). According to the most recent data from CDFW's Fisheries Data Explorer (Ocean Spaces n.d.), the top fisheries by revenue in Santa Barbara County Ports are red sea urchin, rock crab, sablefish, lobster, and sea cucumber, supporting an

estimated 261 fishers and contributing over $12M in gross revenue in 2014 (Ocean Spaces n.d.). Fleets operating from the Port of Santa Barbara take roughly half of the total statewide volume in sea urchin, according to data analyzed from 1980 through 2022 (CDFW 2020b, USFWS 2022,). Ventura's top fisheries were market squid, CPS, shrimp/prawn, and lobster, supporting an estimated 199 fishers and over $14M gross revenue in 2014 (Ocean Spaces n.d.). Port Hueneme-Oxnard's top fisheries were market squid, red sea urchin, CPS, rock crab, and white seabass (Ocean Spaces n.d.). These fisheries may be especially-important to analyze during permitting decisions for a site-specific NEPA analysis for potential landings impacts related to geographic overlap or increased fishing effort.

a) Shellfish and Macroalgae

Much of the potential impacts to commercial fisheries from shellfish and macroalgae aquaculture operations would likely be associated with new areas for wildlife aggregations. The potential impacts to wild fish stock habitat and habitat use are described under Chapter 3, Section C.ii (Wild Fish Stocks), and not repeated here.

Macroalgae aquaculture may affect the amount of fish landings in an area. Preat et al. (2018) modeled potential impacts of large-scale seaweed aquaculture on fish landings in the North Sea, considering Sugar Kelp and European fish and seaweed markets in France and Ireland. Their findings show that while seaweed aquaculture at a large scale may impact fish landings adversely due to cultivated biomass replacing phytoplankton biomass in the food web, the amount was not significant enough to have any market impacts. In addition, the economic benefit added to the markets for seaweed production, including but not limited to job creation, tax revenue, and investment in local businesses, outweighed any adverse economic impacts to fisheries. It should be noted that an overall economic impact to the market may not reflect economic hardship to individual vessels or businesses that rely on certain species. Additionally, macroalgae has been shown to inhibit the growth of known Harmful Algal Blooms (HABs) species, potentially reducing the occurrence of HABs which are known to impact west coast fishing communities (Tang et al. 2014).

The nearest offshore aquaculture operation that could be used as a proxy for analyzing fisheries displacement is a 100-acre (40 ha) shellfish facility (no longer in operation), near the San Pedro Shelf off the coast of Long Beach. In the EA for the operation, it was concluded that squid harvesters would not be impacted since the majority of the fishing effort for squid occurs within one mile from shore; hook and line capture species such as California halibut would not be impacted by longline cultivation methods; and surface fishing effort for swordfish and other HMS species would not be impacted since shellfish is cultivated about 9 m (30 ft.) below the surface of the water (USACE 2012). However, the PFMC has noted that for areas in and around Alternative 2, the squid fishery typically operates around depth contours ranging from 15 – 25 fathoms and there are many locations within the SCB where those depths are well outside one mile from shore (PFMC 2025). The potential displacement or exclusion impacts associated with future shellfish and macroalgae aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity.

b) All Types of Commercial Aquaculture

Rhodes et al. (2023a) analyzed the geographic overlap of the alternative areas with commercially valuable species in the SCB. While the presence or absence of certain species in an area can vary greatly from year to year in the SCB, that analysis does provide a baseline for potential wild species interactions that could be considered in a project-specific NEPA analyses. The potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. In CPUE data from the annual U.S. West Coast Groundfish Bottom Trawl Survey analyzed from 2003 through 2023, 8 out of 14 evaluated fish species show distributions that overlap with AOA options included in Alternative 2, see Appendix D2 on p. 104 of Rhodes et al. (2023a). Building upon Rhodes et al. (2023a), Parrish and Karp (2024) conducted a spatial analysis on wild fish biomass that are of conservation and/or commercial value in the SCB, and physiologically similar or the

same species as those likely to be cultivated in an AOA. Alternative 2 has occurrences of bocaccio, California halibut, Dover sole, English sole, lingcod, Pacific pompano, market squid, northern anchovy, and eulachon (Parrish and Karp 2024).

Fishing activity around aquaculture facilities in an AOA may increase due to new areas for wildlife aggregations, depending on compatibility of gear types. A beneficial biomass effect may result which would benefit commercial fisheries (Arechavala-Lopez et al. 2011b). All types of aquaculture facilities may create new areas of wildlife aggregations, though the effect may be amplified around finfish facilities due to additional factors of feed, waste, and predation opportunities. A survey of 21 finfish facilities around the Mediterranean found the positive effects for fishing due to wildlife aggregations were far greater than from other types of infrastructure in the ocean (e.g. oil rigs, artificial reefs) due to feeding practices (Akyol and Ertosluk 2010, Bacher et al. 2012, Bacher and Gordoa 2016). Accounts from Hawaii also state that finfish cages are more effective at drawing in fish than FADs (NMFS 2022d). The potential impacts to wild fish stock habitat and habitat use, including new areas of wildlife aggregations, are described under Chapter 3, Section C.ii (Wild Fish Stocks), and not repeated here. The PFMC has noted that potential aggregations of marine mammals (e.g., dolphins and/or porpoises) prevent some fishermen from deploying their nets to avoid potential interactions (PFMC 2025). It is likely that projects within an AOA would be sited with some distance between them; so some commercial fishing vessels could take advantage of increased aggregations of fishery species. However, new areas of wildlife aggregations within an AOA could also alter access to favorable fishing grounds. This change may impact the size of vessels and the types of gear that make more or less landings, which could create new competition among fishing vessels, especially between large-scale, industrial operations and smaller, artisanal fishers (Akyol and Ertosluk 2010, Price and Morris 2013, and Clavelle et al. 2019).

The fraction of marine stocks fished globally within biologically sustainable levels decreased to 62.3 percent in 2021, 2.3 percent lower than in 2019 (FAO 2024), continuing a trend downward since 1974. Based on 198 stock assessments in the U.S. as of 2022, an estimated 88 percent of the stocks most targeted by fishermen have a known overfishing or overfished status (NMFS 2023g). Forty-eight U.S. stocks or stock complexes are currently in rebuilding status, and of those, 41 are considered overfished (NMFS 2023g). An ecological benefit associated with finfish aquaculture, globally, is that it may decrease pressure on wild fish stocks (Naylor et al. 2000, Rubino (ed.) 2008, and Clavelle et al. 2019). Conservation hatchery production is an existing example on the west coast where aquaculture has helped wild fish populations. Existing public hatcheries and private population restocking programs on the west coast exist currently for species such as salmon, trout, bass, and halibut (Rubino (ed.) 2008, CDFW 2010, and MacNamara et al. 2022). These species support some commercial landings, as well as Tribal and recreational fisheries (discussed in Chapter 3, Section D.ii). As an example of scale, there are almost 400 salmon hatcheries on the west coast that release about 1.7 billion juvenile salmon per year into the Pacific Ocean (Rubino (ed.) 2008). However, if identifying an AOA resulted in increased finfish aquaculture in the SCB, there may be an increased demand for forage fish for feed. The identification of an AOA and siting aquaculture in AOAs could potentially alter the baseline trends for the forage species; however, it is beyond the scope of this DPIES to analyze if feed would be live, fish-based, from a wild or cultivated source, and the location where it would be sourced. Potential impacts of pressure on forage species are discussed in more detail in Section 3.C.ii.

A trade-off analysis would likely be necessary for a site-specific analysis if a project proposed to cultivate a species currently targeted by commercial fisheries in the SCB. This may impact commercial fishers' ability to participate in the existing market. More on markets and regional food systems is discussed in Chapter 3, Section D.iii.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

The site suitability model of the Atlas combined over 23 types of available fisheries data. The modeled suitability for aquaculture given fisheries geographic overlap in Federal waters in Santa Monica Bay as a whole (including Alternative 3 and additional areas throughout the Bay), is shown below. This fishing and aquaculture suitability submodel shows both commercial and recreational fishing geographic overlap and was only one component of the overall suitability used to develop the AOA options. Alternative 3 overlaps with CDFW catch block 702 (Morris et al. 2021). As noted for Alternative 2, the proportion of each fleet that may be affected by displacement or exclusion due to offshore aquaculture activities may be an indicator of how offshore aquaculture impacts coastal marine fishing communities.

3

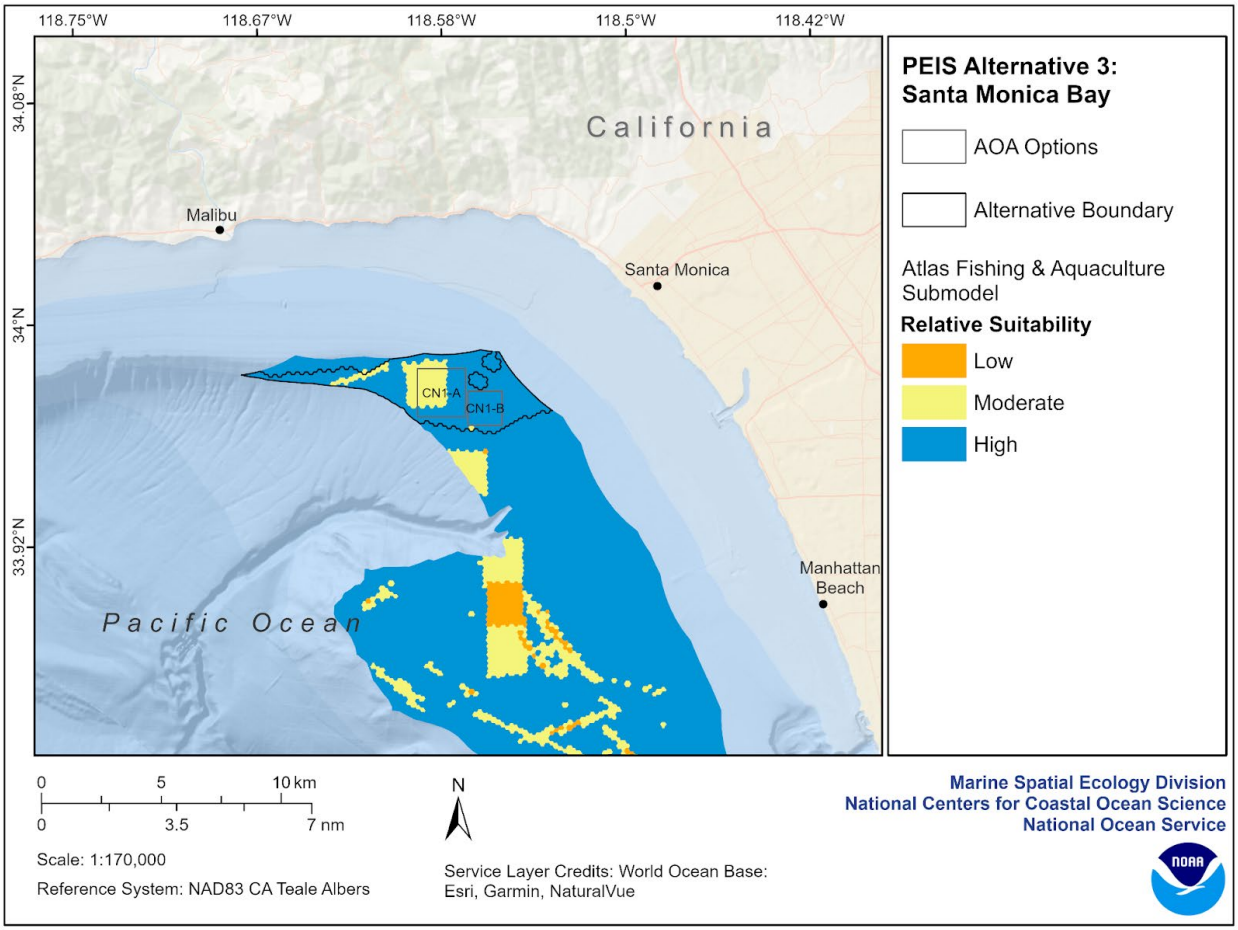


Figure 15: Atlas Fishing and Aquaculture Suitability Submodel Results for Alternative 3

There is very limited commercial fishing in and around Alternative 3 (Morris et al. 2021, PFMC 2022a). No AOA option within Alternative 3 had more than 25 fishing transits per year from 2015-2010, according to the data considered in the Atlas, and in many years there were less than 5 fishing transits in a year. According to data from 2010 through 2019, CDFW catch block 702 brought in an average of 915,038 lb. (Morris et al. 2021). Any impacts to fishing activity in this catch block may have more pronounced impacts to the fleets, if fixed gear adds another barrier to access. Marina del Rey is the closest fishing port in proximity to Alternative 3; but no port group summary was available in the Fisheries Data Explorer. According to the most recent data from CDFW's Fisheries Data Explorer (available online at oceanspaces.org), the top fisheries by revenue in the Los Angeles-Long Beach Area are market squid, CPS and other pelagic species, and red sea urchin, supporting an estimated 215 fishers with over $19M gross revenue in 2014 (Ocean Spaces n.d.).

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

b) All Types of Commercial Aquaculture

Rhodes et al. (2023a) analyzed the geographic overlap of the alternative areas with commercially and recreationally valuable species in the SCB. In CPUE data from the annual U.S. West Coast Groundfish Bottom Trawl Survey analyzed from 2003 through 2023, 5 out of 14 finfish species evaluated overlap with AOA options included in Alternative 3, as shown in Appendix D2 on p. 104 of Rhodes et al. (2023a). While the presence or absence of certain species in an area can vary greatly from year to year in the SCB, the analysis does provide a baseline for wild species interactions that may be considered in site-specific NEPA analyses. Building upon Rhodes et al. (2023a), Parrish and Karp (2024) conducted a spatial analysis on wild fish biomass that are of conservation and/or commercial value in the SCB, and physiologically similar or the same species as those likely to be cultivated in an AOA. Alternative 3 has occurrences of Dover sole, English sole, lingcod, Pacific pompano, and sablefish (Parrish and Karp 2024).

Additional information used to analyze potential impacts to commercial fishing from finfish aquaculture in Alternative 2 is also the best available information for Alternative 3, and is not repeated here.

Alternative 4: Combination of Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

If multiple areas were identified as AOAs under Alternative 4, the potential impacts from geographic overlap may occur across a larger geographic scale. Geographic expansion would not necessarily mean a serial depletion of landings, though, due to the highly variable existing conditions of fisheries and the SCB ecosystem.

Siting aquaculture in multiple AOA options spread across Alternative areas could provide commercial fishers more space and therefore more flexibility to be responsive depending on the season and distribution of their target species biomass from year to year. This potential benefit could be realized if, under Alternative 4, facilities took advantage of more geographic space to site further from one another. This potential benefit would not be realized if, under Alternative 4, the total AOA space was used for aquaculture year-round. The scale of aquaculture practices and adjacent capture fisheries are important modifiers for being able to determine the directionality of nearly all interactions between the two industries (Clavelle et al. 2019). Combined with aggregating effects and opportunity for fishers' income diversification throughout the year, AOAs across the SCB could lead to a net benefit for commercial fishers

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

ii. Recreational Fishing

Affected Environment

Recreational fishing activity encompasses any fishing activity in which the fish is not sold for profit (CDFW 2016c, NMFS 2023g, and NMFS 2023h). It includes businesses of sportfishing, angling, charter fishing, commercial passenger fishing vessels (CPFV), as well as individual vessels that engage in fishing activity for subsistence or fun. These categories of fishing activity are described in Sections 3.3.3 and 3.3.4 on pp. 53 and 54 of the NMFS Community Profiles for West Coast and North Pacific Fisheries (Norman et al. 2007). Recreational fishing in Federal waters is regulated under the MSA (see Chapter 3, Section C.i, C.ii, and Section D.i for statutory information).

The Modernizing Recreational Fisheries Management Act of 2018 (Modern Fish Act) pursues efforts to expand fishing opportunities for recreational fishers, and seeks to better understand the fishing public's vision for management by engaging recreational fisheries stakeholders in a more in-depth discussion of optimum yield and how it can be used to identify and prioritize management objectives that are better suited to the cultural, economic, and conservation goals of the angling community (NMFS 2021e, NMFS 2022d). A National Saltwater Recreational Fisheries Policy (2015, rev. 2023) also guides NOAA Fisheries activities to foster, support, and enhance a broadly accessible and diverse array of sustainable saltwater recreational and non-commercial fisheries for the benefit and enjoyment of the nation. Goals of the policy include promoting sustainable saltwater recreational and non-commercial fishing for the social, cultural, and economic benefit of the nation, as well as enable enduring participation in, and enjoyment of, saltwater recreational fisheries through science-based conservation and management (NMFS 2023j).

Socioeconomics of recreational fishing activity is tracked by expenditures and profits generated by trip and durable good expenditures; by the number of fishing trips; and by the number of licenses in the state or region (NMFS 2023j). There are approximately 350 sportfishing charter vessels licensed in the state, with an estimated 108 operating in the south coast region, 41 in the south-central coast region (CARB 2021). Charter fees for patrons are projected to increase due to State regulatory requirements related to air quality standards and engine upgrades through 2034 (CARB 2021). The regional average expenditure for guide fees (i.e. charter or party vessel tickets and surcharges, etc.) in 2022 was $330 (NMFS 2024f).

According to the Bureau of Economic Analysis, outdoor recreation accounts for approximately 1.9% of total U.S. gross domestic product (2020) with fishing and boating representing the largest conventional outdoor activities in the nation. It is essential to recognize the existence and significance of recreational fishing and acknowledge its role in the overall fishing landscape, shaped not only by markets, but also demographics of coastal communities and ecological shifts. According to the most recent NOAA Fisheries Status of the Stocks report, saltwater angling nationally generated $138 billion in sales impacts, contributed $74.9 billion in value-added impacts, and supported 692,000 jobs as of 2020 (NMFS 2024f). Compared to 2021, these numbers represent an increase for recreational fisheries. Additional information about the economic contribution of recreational fisheries to the U.S. economy from the NOAA Fisheries Economics of the U.S. 2022 Report (NMFS 2024f) and these reports are updated annually:

- The overall economic impact and expenditures for the U.S. is provided on pp. 11 through 13.
- Details for recreational fisheries in all west coast states are provided on pp. 14, 15, and 17.

NMFS WCR, the NWFSC, the SWFSC, and PFMC work together to support West Coast recreational fishing communities, covering 317,690 mi^2 of the eastern Pacific Ocean, and more than 7,000 miles of tidal coastline (NMFS 2023h). In 2018, over 38,000 albacore tuna (*Thunnus alalung*a), 4,000 dorado (*Coryphaena hippurus*), and 4,000 yellowfin tuna (*Thunnus albacares*) were caught and landed by private

recreational fishers along the West Coast. In 2019, recreational fishermen took 4.3 million saltwater fishing trips on the West Coast supporting approximately 10,900 jobs and $1.5 billion in sales (NMFS 2023h).

Recreational fishing contributes to the California economy and culture. Recreational fisheries have historically been a significant proportion of total catch throughout California, particularly concentrated on nearshore and shelf species in the SCB (Miller et al. 2014a). A more detailed report on recreational fishing in California is provided in Section 3.4.2.2 on pp. 53 through 57 of the PFMC Pacific Coast Fishery Ecosystem Plan (PFMC 2022b). In California as of 2020, the recreational fishing industry was estimated to generate $718 million in sales, contributed $302 million to the U.S. economy, and supported 5,083 jobs (NMFS 2023h). Harvey et al. (2023) Appendix P, Section p.1: and Figure p.3 show annual CA landings 1983 through 2023.

Key recreational species found off the coast of California are Pacific and California halibut, salmon, rockfishes and other groundfish, seabasses, tunas and other HMS (PFMC 2013, NMFS 2023g). While unlikely to occur in offshore waters, the recreational harvest of some shellfish, crustaceans, and macroalgae for personal use is permitted in California (14 C.C.R., § 28.60, 29.05, 29.10, 29.80, 29.91, 30, and 30.10). The CPFV fleet operates year round, but has a peak HMS fishing season in spring and summer (NMFS 2024g). Bass species and rockfishes have generally been more important species targeted during the fall to winter season, whereas warm-water HMS migrants are important during the summer season (Schiff et al. 2000). Forage species also support recreational fishing activity in the SCB and forage species may be used as live bait (Schiffet al. 2000, NMFS 2020a). For more information on the potential impacts of siting aquaculture on forage species that is not repeated here, see section 3.C.ii. The most recent recreational landings data in California were analyzed in the 2024-2025 Annual Ecosystem Status Report (Leising et al. 2025), which showed landings had both a decreasing trend and below-average status over the past five years, associated with decreased landings of lingcod and vermilion rockfish in particular. These California current integrated ecosystem assessments are updated every year with the most recent information. Recreational ocean salmon fisheries were closed off California in 2023 and 2024, and only open for a few days in 2025 due to low stock numbers (Leising et al. 2025, NMFS 2023k, Associated Press 2025).

Upwelling, bathymetric features and other geologic components of the marine environment influence popular recreational fishing spots. In historic recreational catch trends from 1980 through 2000, all species trends associated with upwelling were positive (Jarvis et al. 2004). According to a recreational fishing survey in an EA for offshore wind in the SCB, BOEM (2018) found that rockfish particularly are targeted by recreational fishers at the heads of submarine canyons in approximately 90 to 183 m (300 to 600 ft.) of water in the SCB; and recreational users commonly access and transit over the offshore space to rocky areas around Santa Catalina Island. The overlap, or proximity of the alternative areas to some specific bathymetric features, existing FADs, and the Channel Islands are discussed in Chapter 3, Section B.i through B.iii and Section C.ii.

Stressors

Baseline stressors for the recreational fishing sector include those listed for commercial fisheries and are not repeated here. The COVID-19 pandemic caused large-scale disruption to the U.S. economy. In 2020, the impacts to the for-hire fishing trips were immediate, more severe, and more long-lasting than those incurred in most other sectors of the economy (NMFS 2023h). Trip impacts in Southern California were some of the highest in the nation, at a 33% loss (NMFS 2023h). These uncertainties may continue to impact the recreational fisheries in the SCB and CCE in the foreseeable future.

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- fixed gear and other equipment placement in the water column and surface;
- changes in vessel traffic volume and patterns.

- risk of marine debris; and
- new areas where wildlife aggregations may occur.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

This growth of offshore aquaculture within an identified AOA may change recreational fishing activities in the SCB due to geographic and ecological interactions. The ecological interactions listed in Table 2 on p. 377 of Clavelle et al. (2019), for commercial fisheries, would also apply to recreational fishing activity. Socioeconomic interactions with recreational fishing are more likely to be associated with ports and working waterfronts, such as CPFV businesses, tackle shops, boatyards and marinas (Lovell et al. 2016). More on working waterfronts is discussed in Chapter 3, Section D.iv. There is a strong association with recreational fishers to maintain fishing opportunities (i.e., the experience) over catching certain amounts of target species (NMFS 2022d). Therefore, the impacts on individuals who participate in boat-based fishing may be more pronounced associated with socio-cultural interactions in addition to ecological interactions.

Fishing vessel groups may experience changes in fishing access due to safety, transit patterns, other fishing practices that contribute to fishing effort, and fishery productivity (Hoagland et al. 2003, Mikkelsen 2007, Clavelle et al. 2019, and PFMC 2022a). The chance of displacement and the severity of impact on fishers would depend on the compatibility of gear types resulting in coexistence or competition for space. Safety buffers may be set up around project sites during survey operations, construction, active operations, maintenance, and decommissioning activities. These impacts may only affect recreational fisheries temporarily, while work was underway. In the case with existing oil and gas platforms in the SCB, vessels under 30.5 m (100 ft.) are allowed within the safety buffer (BOEM 2018). Most recreational vessels are likely small enough to operate within an AOA and very close to a facility; and most recreational fishers typically use hook-and-line (rod and reel or pole-and-line), which is a hand-held fishing rod with a manually or electrically operated reel attached, though some anglers successfully target HMS and other fisheries using spearfishing gear (NMFS 2024g).

Overall, having new reliable areas of wildlife aggregations could be a benefit to recreational fishing. However, certain vessels could be excluded completely due to new operation practices (e.g. increased fuel consumption by vessels having to avoid facilities in an AOA and higher expenditures on fuel).

Seafloor disturbance during pre/post construction environmental modeling, construction, and operations would likely have a short-term adverse impact on benthic fish and invertebrates in the direct area. That disturbance could benefit fishing effort in proximal areas to the disturbance if targeted species are dispersed there. Anchoring systems would likely provide novel habitat for invertebrate species, which in turn, could attract demersal reef and pelagic fishes which would be a benefit for recreational fishers (Johnston et al. 2022). Although the current recreational effort targeting red sea urchin is thought to be small, there is growing interest (CDFW 2020b, USFWS 2022). Alternative 2 AOA option N2-E is the only option with depths under 25m, where recreational fishing for urchin may occur. However, the anchoring and grow out systems in all potential AOA areas could provide new complex structure and habitat for invertebrates and finfishes that may benefit recreational fishers.

A potential benefit to employees of CPFV and other guided fishing businesses in the SCB could be a diversification of labor and revenue with new opportunities for participating in offshore aquaculture operations. These fishers, in particular, might be well-suited for work involving transportation and vessel maintenance involved with offshore aquaculture, either as a new occupation or one that complements current fishing activities, as they would have detailed knowledge of local oceanic and weather conditions (Valderrama and Anderson 2008, and Rubino 2022). This benefit might apply to charter boats and guides in California, but not necessarily to private anglers that comprise the bulk of the recreational fishery, who may not need or want aquaculture jobs. While a new ocean industry expands ocean-related job opportunities overall, it could create a job competition between aquaculture and boat-based recreation businesses. While this type of ocean-based, skilled employment competition likely already exists between commercial fisheries and recreational fisheries, aquaculture would introduce a new opportunity and diversification of labor for employees. Site-specific NEPA analysis may consider the available workforce, need for seasonal versus year round workers, skilled versus labor-based work, etc.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Spatial data for recreational fishing in the SCB from 2010 through 2019 was incorporated into the Atlas. The data resources used are provided on pp. 29 through 31, in Table 2.9 on p. 38 of the Methods section, as well as in Appendix A of the Atlas (Morris et al. 2021), and include AIS passenger vessel transits, aggregated CPFV activity, and aggregated individual vessel recreational survey data. See Figure 14 in Section 3.D.i above, which included recreational fishing in the overall fishing and aquaculture suitability submodel.

Interactions with recreational fishers are likely in Alternative 2. A survey of recreational target species that compared habitat between oil and gas platforms in the Santa Barbara Channel and rocky substrates in Santa Monica Bay showed higher fish densities, but lower species diversity, near the FADs in the Channel than natural habitat in the Bay (Schroeder and Love 2002). In data analyzed from 2004 through 2011, the estimated recreational catch in the Ventura and Santa Barbara region fluctuated between 1,000 to 3,000 mt annually (PFMC 2013). These estimated catch rates were higher than the south coast. Potential conflicts with CPFV and private boat fishing operations may be pronounced in waters deeper than 100 m (328 ft.); because these areas have become more accessible to anglers lately because of changes in regulations, in addition to improvements in fish finder and fishing gear technology (PFMC 2022a).

a) Shellfish and Macroalgae

The potential impacts on recreational fisheries from shellfish and macroalgae, specifically, would likely be associated with new areas of wildlife aggregations. The potential impacts to wild fish stock habitat and habitat use, including new areas of wildlife aggregations, are described under Chapter 3, Section C.ii (Wild Fish Stocks), and not repeated here. California sheephead *(Semicossyphus pulcher)* provides an example of a species that is recreationally-targeted that could change distribution in association with macroalgae aquaculture. The species occurs nearshore along the California mainland from Point Conception to Palos Verdes Point, highly associated with kelp beds (NCCOS 2005). If the species is drawn to offshore macroalgae aquaculture, that may impact trends within the recreational fishery closer to shore. These facilities could also increase the overall amount of preferred habitat.

The potential impacts of shellfish and macroalgae aquaculture discussed for commercial fisheries (Section D.i) would likely be similar for recreational fishing activity. The potential advantage recreational fishers

may have over commercial operations near fixed gear would not likely be affected by the type of aquaculture. In a recent EA for kelp aquaculture in the Santa Barbara Channel, recreational fishing areas were not thought to be in conflict with the operations, as long as navigational hazards and notice to mariner requirements were followed (discussed in Chapter 3 Section D.vi). On-site gear monitoring at a minimum of twice a month, with maintenance and recovery requirements, were included in the permitting decisions to avoid interactions with derelict gear and risks of marine debris (USACE 2021). More on navigational hazards and marine debris are discussed in Chapter 3, Section D.vi (Transportation and Navigation) and D.viii (Public Health and Safety).

The nearest offshore aquaculture operation that could be used as a proximal example for analyzing fisheries displacement is a 100-acre (40 ha) shellfish operation no longer in operation, near the San Pedro Shelf off the coast of Long Beach. In the EA, it was concluded that the facility would have a net benefit for fishing potential, especially recreational opportunities (USACE 2012). Hook and line capture species, such as California halibut, would not be impacted by longline cultivation methods; and surface fishing effort for swordfish and other HMS species would not be impacted since shellfish is cultivated about 9 m (30 ft.) below the surface of the water (USACE 2012). This operation was known to draw in pelagic game fish (e.g., California yellowtail (*Seriola dorsalis*)), along with the private boaters (hook and line and spearfishing) and CPFVs targeting them.

b) All Types of Commercial Aquaculture

Accounts from finfish aquaculture, globally, show effects from new areas for wildlife aggregations are more pronounced around finfish facilities than around other types of aquaculture (see Chapter 3, Section C.ii (Wild Fish Stocks), sub-alternative b). Cultured fish that may escape have also been shown to be more susceptible to capture by anglers, according to reports reviewed in Purcell et al. (2025c). Long-term impacts from wildlife aggregations around finfish aquaculture during operations would likely benefit recreational fishers. Similar considerations discussed for commercial fishing activity around finfish facilities (discussed in Section D.i) would likely apply to recreational fishers. The potential advantage some recreational fishers may have over commercial operations to operate closer to fixed gear would not likely be affected by the type of aquaculture.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Spatial data for recreational fishing in the SCB from 2010 through 2019 was incorporated into the Atlas. The resources used are provided on pp. 29 through 31, as well as in Table 2.9 on p. 38 of the Methods section, as well as in Appendix A of the Atlas (Morris et al. 2021), and include AIS passenger vessel transits, aggregated CPFV activity, and aggregated individual vessel recreational survey data. See Figure 15 in Section 3.D.i above, which included recreational fishing in the overall fishing and aquaculture suitability submodel.

Aquaculture could change baseline fish distribution between the Santa Barbara and Santa Monica Basins. A survey of recreational target species that compared habitat between oil and gas platforms in the Santa Barbara Channel and rocky substrates in Santa Monica Bay showed higher fish densities, but lower species diversity, near existing FADs in the Channel than natural habitat in the Bay (Schroeder and Love 2002). In data analyzed from 2004 through 2011, the estimated recreational catch in the south coast region (considered Los Angeles County through San Diego County) fluctuated between 900 to just under 3,000 mt annually (PFMC 2013). These estimated catch rates were lower than all other areas in the SCB. Aquaculture may create new considerations for fishing access in Alternative 3, where potentially little to no competition exists with non-commercial vessels, and few artificial FADs exist relative to Alternative 2. Potential conflicts with CPFV gear and private boat fishing operations may be pronounced in waters deeper than 100 m (328 ft.), because these areas have become more accessible to anglers lately because of changes in groundfish regulations, in addition to improvements in fish finder and fishing gear technology

(PFMC 2022a). However, this may also spread effort out between the nearshore and waters of the continental shelf and slope.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

Alternative 4: Combination of Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. CDFG CPFV data from 1998-2002 show high recreational landings in both alternative areas already (NCCOS 2005), which may imply minimal impacts to the activity; but it could change how people access the fishing opportunity. Opportunities for recreational fishing could be greatly expanded, offshore compared to existing nearshore activity, or even favored. For example, a decrease in individual vessels, but an increase in CPFV could be observed to access fishing grounds further offshore. This could have a beneficial impact to local businesses.

Siting aquaculture in multiple AOA options across Alternative areas may mitigate the advantage smaller recreational vessels may gain over commercial fleets due to navigation safety and gear compatibility. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified**.** The potential strategic placement and operations discussed for Alternative 4 in commercial fisheries (Section D.i) may apply similarly to recreational fishing.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

iii. Markets and Regional Food Systems

Affected Environment

This section of the PEIS describes essential aspects of the local, regional, and global seafood distribution systems that link grow-out activities on the ocean to consumers on shore. While it is not yet possible to identify the precise nature, scale, and reach of such linkages for projects that may ultimately be sited in a Southern California Bight AOA, here we use the best available information to characterize key elements of the human environment in which such interactions would occur. It is common for aquaculture businesses in the U.S. to sell directly to restaurants and in doing so they must abide by laws of interstate commerce (Sea Grant 2024a). In accordance with the Lacey Act (16 U.S.C § 3371 et seq., 18 U.S.C. §

42), it is unlawful to import, export, transport, sell, receive, acquire or purchase any plant, fish, or wildlife taken, possessed, transported, or sold in violation of state, federal, or foreign laws or regulations. The Lacey Act may factor into project designs for choices of cultivated species, broodstock sourcing, and proper labeling of aquaculture products. Any importation of what is considered to be "injurious" wildlife into the U.S. or transport of such items between states, the District of Columbia, the Commonwealth of Puerto Rico, or any territory or possession, must be authorized under a permit issued by USFWS. Injurious specimens are listed under 50 C.F.R. 16. In the case of aquaculture products, the Lacey Act may be triggered if such products are distributed in violation of state or federal laws that govern interstate commerce (Rumley 2010) or cultivation of non-native species (CAA 2023).

The growth in global aquaculture production has occurred in parallel with increasing global trade and commerce (Gephart and Pace, 2015). Global trade of fisheries and aquaculture products is described on pp. 91 through 107 of FAO (2022b). Import to export ratios for seven fishery-related species groups is shown in Figure 5 on p. 7 of Naylor et al. (2021). Common global markets and products for macroalgae, shellfish, and finfish aquaculture are discussed under each alternative, below.

According to the most recent report on the marine economy from the Bureau of Economic Analysis (2023), the marine economy contributes an estimated $432B in goods and services to the annual U.S. GDP and about $730 billion in sales related to recreation, utilities, data, and resources. Nationally, it is estimated that the marine economy supports about 2.3 million jobs (BEA 2023). According to the most recent NOAA Fisheries status of the stocks, the total U.S. seafood industry (wild harvest and aquaculture) generated $47 billion in sales impacts, contributed $24.4 billion to the GDP, and supported 588,000 jobs in 2020 (NMFS 2023g). Global and nationwide consumer trends show that the demand for seafood, and specifically aquaculture products, has been steadily increasing over the last few decades. Historical trends in U.S. seafood consumption are provided in the following references:

- data from 1987 through 2006 are described on pp. 195 through 197 of Rubino (ed.) (2008);
- data analyzed through 2015 are shown in Figure 4 on p. 6 of Naylor et al. (2021);
- U.S. per capita consumption of seafood (fish and shellfish) from 1910 to 2022 with 2022 being the all-time high, is available in the Fisheries One Stop Shop database (available at www.fisheries.noaa.gov/foss);
- as of 2022, the imports sector within the U.S. still has the greatest economic impact on the domestic seafood industry nationally (NMFS 2024f).

The majority of seafood consumed in the U.S. is sourced from aquaculture-produced species, implying that domestic wild-capture and domestic aquaculture production do not meet demand for the types of seafood most American consumers desire (Rubino (ed.) 2008, NMFS 2020b, Shamshak et al. 2019, Rubino 2022). It is estimated that 70% of seafood in the U.S. is eaten outside the home, in restaurants (Sea Grant 2024a). Although seafood retail sales increased at the beginning of the COVID-19 pandemic, by 2021 and 2022, data indicate that California consumers had begun to revert back to more normal patterns of food service purchases (Fissel pers. comm. November 2023). This and other information imply some U.S. seafood markets, especially aquaculture products in California, target high-end luxury niche markets (Rubino 2022, CDFW 2022, Dealy et al. 2024).

The west coast marine economy is summarized on pp. 41 and 42 of the NOAA Fisheries Economics of the U.S. 2020 Report (NMFS 2023h). General characteristics of California's ocean-based economy are described on page 13 of the Atlas (Morris et al. 2021). Summaries of the marine and coastal economies of Santa Barbara County (near to Alternative 2), Ventura County (near to Alternative 2), and Los Angeles County (near to Alternative 3) may be found at https://coast.noaa.gov/snapshots/.

California is the highest-ranked state in the U.S. in terms of income and jobs generated by the seafood sector. The state also ranks first in the number of resident seafood retailers, first in wholesale seafood sales, and third in retail seafood sales (NMFS 2023h). With a population of 39.8 million in 2018 (DOF 2018, as cited in CDFW 2019), a conservative estimate of Californian's annual seafood consumption was

617 million pounds (279,850 mt), which is 400 million pounds (74,000 mt) more than the total harvest (2017) from capture fisheries in the state (CDFW 2019). In data analyzed from 2017 to 2022, California's retail seafood sales averaged $967.7M, with $967.7 in sales volume and an average price of $7.02. The retail sales value of seafood in California was roughly $800 million from 2017-2019 and increased to roughly $1.1 billion in 2020-2022. Wild harvest species receive slightly higher prices than farmed species in the state (Fissel pers. comm. November 2023). Still, major fishery resources of the state are exported, while Californians import most of the seafood they eat – including seafood caught in the U.S., exported to be processed, and then imported back for consumption (McGinnis 2006, Wel 2016, Sun 2019, Fong et al. 2022). The number of seafood sector jobs with imports from international markets are estimated around 125,000 in California, whereas the number of seafood sector jobs without imports are estimated to be less than 25,000 (NMFS 2023g).

The overall economic impact of existing aquaculture in California (sales, employment, etc.) has been estimated to be $200 million, with all of the commercial products considered small-volume, high-value niche markets from bivalves (CDFW 2019, CDFW 2022). About 59 percent (5,573 acres) of California aquaculture operations was estimated to occurred in saltwater environments as of 2013 (CDFW 2019). Naylor et al. (2021) estimated California's aquaculture sector recently generated around $102 million in sales and distribution for the state and $1.55 billion in sales and distribution in the U.S. Aquaculture entitlements (including registrations, lease rents and privilege taxes, and permits) all contribute to the state's revenue, estimated at an average of $200,000 annually (CDFW 2022). More resources for seafood and aquaculture in the state of California are provided in the following:

- a summary of aquaculture's contribution to the California economy is provided on p. 1-8 of the CDFW Draft PEIS for Marine Aquaculture (CDFW 2019);
- a summary of market values for commercial aquaculture production as of 2018 (shellfish and macroalgae only) is summarized on pp. 10 and 11 of the CDFW Status of Commercial Marine Aquaculture report (CDFW 2020a); and
- the rank of aquaculture within the state, and its contributions to the national economy compared to other agriculture-based commodities based on cash receipts, is provided in the commodity-ranks Table on p. 14 of the California Agricultural Statistics Review (CDFA 2022).

Stressors

Baseline stressors for markets and regional food systems include variability in the predictability and stability of supply and consumer demands, disruptions to marketing values and practices, and interactions between aquaculture products with wild-capture seafood. Climatic and oceanographic events have also had significant impacts on the economic health of seafood markets. The interactions of economic demand for seafood products with the conservation of marine resources is an important existing stressor to markets and food systems. Along with all marine resources, the expansion of the aquaculture industry is dependent on the maintenance of clean growing areas, a supportive regulatory environment, aggressive marketing and dependable sources (CDFW 2010).

Market values are the value of goods and services that are bought or sold, while non-market values are the value of goods and services that are not bought or sold but still have economic value (Lovett 2022). Market values generated by offshore aquaculture may relate to seafood supply, employment, investments, and revenue in both the aquaculture and wild-capture fisheries sectors, as well as taxes generated for the local communities and state. Non-market values generated by offshore aquaculture may relate to public concern and regulations that limit the scale of both sectors (Froehlich et al. 2017b, Clavelle et al. 2019).

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- introduction of new domestic products;
- increase in the supply of domestic products;

- new or increased interactions with wild-capture seafood products (competition or complimentary); and
- new or increased interactions with existing interstate or international trade markets.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

If an AOA were identified, and aquaculture projects were sited in an AOA, it is likely that there would be economic costs and benefits to local and regional markets, directly and indirectly. Economic benefits may be market and non-market values that impact social well-being positively; and economic costs may be monetary payments and/or changes in the availability of resources that yield a net reduction in social well-being (ERG 2021). Discussion of these costs and benefits is qualitative in this PEIS, since quantifiable measures of change to the demand or sourcing of regional products and supplies cannot be predicted without knowing specific production schemes or targeted product markets. Components of an economic analysis for offshore shellfish operations are summarized on pp. 2 through 5 of Wright (2020), and included estimating economic impacts, fiscal impacts, and downstream impacts. These economic analyses provide examples of what may be incorporated into a site-specific NEPA analysis. It is unknown how the proposed action or siting aquaculture in AOAs would impact these economic trends; but the information here is provided as baseline considerations for any site specific NEPA analysis. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. In addition, important economic concepts that may be applicable to analyze potential impacts of project-specific production include:

- how new products may apply to the existing reliance on imports;
- estimating potential future growth via economic production concepts;
- potential growth margins and interactions with wild-capture fisheries;
- allocative efficiency measures (measures of yield versus conflict trade-offs);
- production externalities (perceived and/or realized adverse effects of a project that may affect investment capital);
- a defined scope of affected economies;
- how competitive, substitute, or complementary market interactions may affect demand, volumes of supply, and prices of products;
- casual interference (a metric that can aid in assessing the effectiveness of a given project for growing the aquaculture industry as a whole);
- economic viability of proposed products; and
- contributions to maintaining working waterfronts (Dealy et al. 2024).

The contribution of aquaculture products potentially grown in an AOA would likely have an overall beneficial impact on regional, state, and U.S. markets. The aquaculture potential for many species have yet to be demonstrated on a commercial basis; but the potential is considered to be very good because there are known markets for fresh and live products (CDFW 2010). According to studies and reports reviewed in Fujita et al. (2023), offshore aquaculture presents opportunities to generate jobs, export earnings, and increase volume of domestically-produced seafood, even though the sector would likely remain small compared to land-based aquaculture systems (CEA 2018, Fujita et al. 2023). The

aquaculture sector has shown globally that it does not just increase global seafood supply, it also reduces uncertainty in supply chains by providing a more consistent high-quality product (Rubino (ed.) 2008). Offshore aquaculture production may provide a substitute for imported seafood products for local, regional, national and international markets, but the extent of those impacts would depend on global and regional markets, prices, volumes of local production and imports, and product quality and availability. While the overall production costs of domestic seafood products are generally higher in the U.S. relative to production costs of seafood produced in other countries that are traded in international markets, transportation costs are diminished when such products are distributed domestically (CEA 2018, Dealy et al. 2024). The most up to date market data may be acquired in a site-specific NEPA analysis to sufficiently analyze market impacts from cultivated species and distributed products. New demands and more profitable operations could be created through effective marketing strategies.

In Southern California, there is existing stakeholder interest in aquaculture production to supply local and domestic markets. Products that may be competitive in regional and domestic markets include fresh, frozen, and tinned products, especially for products that target high-end niche markets (Dealy et al. 2024). Many projects have the potential to contribute significantly to State and local economies based on revenue from registrations, leasing and rentals along the coast, taxes, and permits, as well as some regulatory and management mechanisms (Wright 2020, CDFW 2022). The assumed dependency of offshore operations with coastal auxiliary facilities in regionally-based working waterfronts could help support aquaculture management, and it would likely provide a beneficial contribution to the state's economy associated with existing aquaculture and seafood markets and employment systems (discussed more in Section D.iv (Ports and Working Waterfronts)).

While overall growth in a market may be considered an economic benefit, local or regionally-scaled costs may occur simultaneously. Financial planning needs related to offshore aquaculture investments are summarized on pp. 21 and 22 of the Offshore Aquaculture in the SCB workshop summary (Aquarium of the Pacific 2015). High operating and living costs in Southern California and comparatively lower costs of conducting comparable aquaculture operations in other countries, including nearby Mexico, may also make it difficult to achieve economic viability (Dealy et al. 2024). Offshore projects in the U.S. are estimated to be 15% to 30% higher in cost than nearshore production, barring exponential increases in scale (CEA 2018). Operations sited in an AOA would likely need to focus on high-value products targeted at upscale product markets in order to generate revenues to cover operating costs and provide a positive return on investment (Dealy et al. 2024). Disproportionate adverse impacts on existing businesses and employees associated with aquaculture and with fisheries may occur related to a lack of opportunity to access the potential economic benefits of offshore aquaculture (e.g. startup costs), and market displacement over time. Without thoughtful planning for disproportionate impacts to certain communities, offshore aquaculture could adversely impact the current aquaculture and fisheries industries, which are made up of a number of small businesses in California (Fujita et al. 2023, CDFW 2020a). The high capital investment that would likely be required for start-up including siting surveys, construction, certifications and product-rating schemes, may mean that large, established businesses (domestic or international) would have an advantage over smaller-scale business to benefit from the AOA planning process. While collaborative or vertical business pathways may help achieve economic viability, vertically-integrated pathways may be favored in the offshore aquaculture industry due to cost considerations. Financial impacts on applicants could also accumulate over time, as the first projects sited in an AOA would set prerequisite baseline conditions for siting and monitoring for any following permit applications.

An increase in aquaculture production may change revenue, value, and profitability of seafood products, creating new interactions between wild harvest, existing aquaculture, and potentially new aquaculture products. National price trends analyzed from 1990 through 2005 showed the cost of aquaculture products decreasing steadily, which indicates a beneficial impact for market development and increased market share (Rubino (ed.) 2008). When the price difference between wild and farmed seafood products

increases, consumers tend to purchase more farmed products in California (Fissel pers. comm. November 2023). If the identification of an AOA and siting aquaculture in AOAs facilitates the growth of the aquaculture industry, then this potential impact may increase affordability and therefore accessibility to seafood, and may expand product distribution beyond the existing high-end niche markets. This may increase competition with wild-harvested seafood products, depending on the species cultured and the associated substitution effects.

The difference in the structure of costs between aquaculture and wild fisheries has important implications for how the two sectors may experience price interactions. Wild versus farmed products have unique attributes for biological constraints, competing goods, and sales techniques (Asche and Tveteras 2005, Valderrama and Anderson 2010). In the case of wild-capture fisheries, the primary costs are labor, fuel and fleet maintenance; for offshore aquaculture, the primary costs are feed, fingerlings (for most species), and capital expenditures (Engle et al. 2024). Aquaculture may have more opportunities to reduce costs in production and management than wild-capture fisheries. Aquaculture products may also supply seafood that is more consistent than seasonal wild-capture fisheries. This consistency in the supply of a species may be preferable to processors and distributors, who can make production and marketing decisions throughout the year instead of over a shorter period of time (Rubino (ed.) 2008). However, California market data from 2017 through 2022 show that prices for wild harvested seafood products were more stable compared to aquaculture products, suggesting that farmed products may be more sensitive to inflation pressure and price volatility (Fissel pers. comm. November 2023). Still, regional, wild-harvested species availability is often inconsistent and limited by natural abundance and fishing regulations (CDFW 2010, 2019). Price and consistent supply may be key trade-off factors when considering market interactions in a site-specific NEPA analysis.

In 2020, the COVID-19 pandemic caused large-scale disruptions to the U.S. economy and is an important indicator of how markets and food systems can change suddenly. U.S. seafood producers were impacted by the relationship between imports and export supply: international trade and processing facilities shut down for several months, while wild-capture seafood products normally exported could not get out of the country (NMFS pers. comm. August 2021). Seafood exports declined 23%, compared to baseline data through 2019 (NMFS 2023h). Foodservice seafood sales (e.g. restaurants) fell an estimated 40% in the first quarter of 2020, and remained down about 21% through most of the year (NMFS 2023h). Mollusks (e.g. scallops, oysters, mussels) incurred the highest losses (down 60%) (NMFS 2023h). In contrast, seafood retail sales (e.g. supermarkets) increased significantly in 2020 across all seafood categories: frozen, up 36%; fresh, up 25%; and grocery (canned, pouches, etc.), up 21% (NMFS 2023g). Wild-capture fishers and shellfish growers changed their operational practices, delaying seeding or harvesting based on the changes in buyers and demand (Froehlich et al. 2020). Processors also had to pivot to the product volumes, reliability, cut and sizing, and packaging demanded by retailers instead of restaurants (NMFS pers. comm. August 2021). Smaller, community-supported fisheries focused on selling seafood direct to local consumers, while larger businesses (e.g. farmed finfish imports) shifted from restaurant to retail sales (Froehlich et al. 2020). Operational, processing, and marketing shifts during COVID may provide examples of some of the nontraditional or niche markets that may grow fast, sustain multiple affordable options, and represent an important way to sustain US producers, especially smaller-scale producers (NMFS pers. comm. August 2021). Other industry restructuring examples include ways the existing shellfish industry has responded after the 1990s recession, during shortages of hatchery-produced seed, or closures due to sanitary degradation, HABs, and oil spills (CDFW 2010).

A more competitive U.S. aquaculture industry may support the U.S. economy by combating potential sources of illegal, unreported, and unregulated fishing (IUU) fishing and supporting certification programs in sustainable environmental and social business practices. The U.S. reliance on imports to meet the demand for seafood relates to a global concern for IUU fishing as well as humanitarian impacts associated with some imports (Diana 2009, NOAA 2024c). Aquaculture product market expansion is not expected to come from new species but from product differentiation of existing species, which would

provide consumers with a new opportunity to source products with reliable standards. In increasingly crowded and competitive markets, consumers demand a need to identify the values, context, culture and other factors that shape what activities are associated with business practices (Murray and D'Anna 2015). Imported sources are harder to trace and increase the likelihood for seafood products to be on the market that lack the same level of environmental and social standards as those produced in the U.S. (NOAA 2024c). Monitoring or influencing changes in international regulations can be more difficult compared to making improvements in U.S. seafood reliability. Certification issues for common species groups are presented in Table 1 on p. 31 of Diana (2009). Certification programs that differentiate products according to set standards that relate back to environmental, health, or other relevant production methods are reviewed on pp. 239 and 240 of Rubino (ed.) 2008.

The AOA planning process supports and strengthens the U.S. priorities to combat IUU and recognize robust stewardship of marine resources. If aquaculture sited in AOAs led to an increase domestic production, there would likely be a net-benefit to create jobs and improve Americans' responsibility for existing seafood consumption decisions (Diana 2009, Froehlich et al. 2020, Helvey et al. 2017, and Rubino 2022). Creating domestic jobs in coastal and agricultural communities and growing seafood under U.S. laws and regulations would support management of an industry designed to ensure food safety, protection of the environment, and worker health and safety (Helvey et al. 2017, Knapp and Rubino 2016, Love et al. 2021a, and Smith et al. 2010).

Alternative 1: No Action

Under the no action alternative no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

The geographic space and associated resources needed to create other types of protein sources may also be considered cost components under baseline conditions. Saltwater aquaculture development programs that produce one million mt of seafood for human consumption by 2025 are relatively small in size, compared to freshwater, land-based systems, and other types of agriculture (Nash 2004, Diana 2009). It is estimated that less than 500 km² (less than 0.01% of the U.S. EEZ) would be enough to produce up to 600,000 mt or more of farmed seafood per year (Nash 2004).

It is evident that aquaculture will continue to grow globally. Based on the Fong et al. (2023) review of over 400 aquaculture studies globally, the following three factors indicate that marine aquaculture may be the leading solution for closing the gap between seafood demand and production around the world:

- marine taxa are often cash crops of high value with substantial infrastructure investment, which may motivate and facilitate higher yield;
- the feed for marine farmed fishes may rely more on external inputs to provide adequate nutrition compared to fresh-water aquaculture (e.g., salmon vs. carp); and
- macroalgae may outperform freshwater algae (e.g. spirulina), due to a taxonomic focus on large brown seaweeds and rapidly growing reds (e.g. *Laminaria* spp.).

Competition in food markets may exist with or without domestic aquaculture, and current trends show that the U.S. cannot meet consumer seafood demand through wild-capture fishing activities alone. Trends that may continue without the growth of domestic aquaculture include reduced market prices for U.S. wild-capture and farmed species based on a continued increase in imports of seafood species (Knapp et al. 2007, Anderson and Shamshak 2008). Other forms of protein (such as chicken and beef, or from plant-based sources) would also likely continue to show significant market competition. Modeled data through 2000 for U.S. per-capita consumption of animal protein (grouped by red meat, poultry, and seafood) is portrayed in Figure 11.1, and summarized on p. 232 of Rubino (ed.) (2008).

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

If one or more AOAs were identified in the Alternative, it is likely that at least some, if not the majority, of the economic opportunities would be concentrated in the nearby County of Santa Barbara and County of Ventura, and associated communities of those counties. Summaries of the marine and coastal economies in Santa Barbara County and Ventura County from NOAA's Office of Coastal Management may be found at https://coast.noaa.gov/snapshots/. As of census data through 2021, ocean-based economic activities account for an estimated 4.2% of the total economy (GDP contribution) in Santa Barbara County, employing about 7.5% of the county's workforce, housing 858 businesses and establishments, and about $645.9M in wages (NOAA 2021a). Activities related to living resources (commercial fisheries, processors, seafood markets, hatcheries, and aquaculture) account for 0.6% of the county's total ocean economy, employing an estimated 93 people (NOAA 2021a). Ocean-based economic activities account for an estimated 2.8% of the total economy (GDP contribution) in Ventura County, employing about 5.2% of the county's workforce, housing 1,025 businesses and establishments, and about $577.4M in wages NOAA 2021a). Activities related to living resources (commercial fisheries, processors, seafood markets, hatcheries, and aquaculture) account for 0.9% of the county's total ocean economy, employing an estimated 118 people (NOAA 2021a).

a) Shellfish and Macroalgae

The U.S. is one of over 100 countries that grow seaweed commercially, but over 90 percent of the production occurs in Asia (FAO 2018a, Froehlich et al. 2019, Sultana et al. 2023). Seaweed markets benefit from the many potential applications of seaweed species, including food, feedstock, fertilizer, medicines, cosmetics, biofuel and raw materials for industrial purposes (Moore and Wieting 1999, Rajkumar et al. 2014, FAO 2018a, Sultana et al. 2023, Kite-Powell et al. 2022, and World Bank 2023). Seaweed aquaculture tripled in global output between 2000 and 2019, and makes up approximately half of global marine aquaculture production by volume (World Bank 2023, Rhodes et al. 2023a). The most valuable types of macroalgae for commercial aquaculture are thought to be kelps and a few species of red algae (Sea Grant 2016). All kelp species also have the same life cycles, enabling aquaculture programs to use the same basic cultivation techniques, which may reduce costs (Sea Grant 2016). Marketing and trade information including trends in trade, market outlooks, and certifications are provided in Section 3 on pp. 50 through 64 of FAO (2018). The global market was estimated at 8 million tons of production in 2003, increasing to 35.8 million tons with a world market of US$ 11.8 billion by 2022, with approximately 85 percent of the commercial products being for human consumption (Rajkumar et al. 2014, FAO 2018a, Sultana et al. 2023). The industry is predicted to grow at a compound annual growth rate of 7% through 2031, reaching a total estimated value of $31.1 billion (World Bank 2023). Fertilizer and agricultural applications are the highest value seaweed market globally; but uses in fuel, carbon sequestration, and human nutrition are of high interest in North American markets (USACE 2021, Kite-Powell et al. 2022, and World Bank 2023). The most recent data for total seaweed production in California is summarized on pages 10 and 11 of CDFW (2020a).

Prominent companies like Cargill, CP Kelco, Dow DuPont, and Seasol International dominate existing global seaweed product portfolios, technological advancements, and strategic mergers or acquisitions (World Bank 2023). CP Kelco, the world's largest commercial harvester of kelp, was originally founded in San Diego, but ended up leaving the region due to high costs (Dealy et al. 2024). Giant kelp is of significant commercial value in central and southern California, where historically 100,000 tons have been harvested annually, and a historic peak value estimated at $40 million (NCCOS 2005). Seaweed markets also exist from land-based tanks in California, for human consumption and associated with growing abalone (USACE 2021, Dealy et al. 2024).

The economic cost of land-based seaweed tanks are thought to be higher than marine operations due to water inputs (Dealy et al. 2024). Growing seaweed in the offshore environment could cut water inputs to aquaculture systems completely, reduce operating costs, and may expand the product market. Furthermore, macroalgae does not require any fertilizer or chemical inputs to saltwater systems, and high sugar content and low lignin makes it a more efficient source than terrestrial plants both for potential fuel

and food uses (Rajkumar et al. 2014). Growth in macroalgae markets could have a beneficial impact on energy and water resource use in the region, while potentially adding ecological value to the surrounding marine environment.

Production costs may be considered in site-specific NEPA analyses to accurately estimate economic impacts. Aquaculture operations in an AOA would likely generate economic activity during siting, construction, active operations, and decommissioning (Kumar et al. 2024). At facility scales of 1,000 ha or more, a production model by Kite-Powell et al. (2022) suggests that production costs in waters up to 200 km (108 nm) from associated shore-side facilities would range between $200 and $300 per dry ton; but costs below $100 per dry ton may be achievable in some settings. Input values for the financial model are provided in Table 2 on p. 440 of Kite-Powell et al. (2022). Components to a similar model of seaweed production costs are provided in Table 2 on p. 440 of Kite-Powell et al. (2022). The effect of distance from shore and scale of production are shown in Figure 5 on p. 441 and Figure 7 on p. 442 of Kite-Powell et al. (2022). Spatial data and sector trade-off analyses by Lester et al. (2018b) in the Santa Barbara Channel modeled a potential annuity value (U.S. dollars per year) of $0 to $200,000 for macroalgae offshore aquaculture. Additional considerations to refine in a site-specific NEPA impacts analysis include:

- number of potential harvests in one season;
- detailed biological growth models linked to nutrient dynamics and environmental conditions at specific facility locations;
- optimized planting and harvest schedules based on seasonal variations in growth;
- potential treatment of crop losses due to storms, disease, and grazing; and
- the incorporation of data on yields that may be possible with selective breeding of seaweeds for optimal performance in specific locations/conditions (Kite-Powell et al. 2022).

Shellfish projects in an AOA may grow any species, but mollusks are thought to be the most likely group, based on existing stakeholder interest and product viability in the offshore environment. California growers exist in Agua Hedionda Lagoon (Carlsbad), Morro Bay, Tomales Bay, and Humboldt Bay and offshore in the Santa Barbara Channel, contributing an estimated $1.7 million in local, State, and federal tax revenues and California tideland trust fees in the early 2000s and increasing since (CDFW 2019). The demand for oyster products nationally far exceeds California's production level (CDFW 2010). The oyster market, in particular, exhibits the potential for product differentiation. Environmental factors such as salinity, pH, SST, and ambient nutrients from the water column all can affect the taste and texture of the final product, which producers target for creative marketing (Houcke et al. 2017, Chen et al. 2022). Product differentiation is likely a necessary strategy for economic success in domestic aquaculture product growth on existing markets. Abalone are an example of a high-value shellfish that was once collected along the U.S. West Coast. However, the only commercially available U.S. West Coast abalone species today come from aquaculture producers in the region (CDFW 2010, NCCOS 2005, Purcell et al. 2025a). Abalone represents a positive example of how aquaculture species may help take pressure off of wild populations while still meeting market demands for seafood consumption.

An overview of the shellfish industry in California is provided on pp. 6 and 7 of Wright (2020). The most recent data available for total shellfish production in California is summarized on pages 10 and 11 of CDFW (2020a). Shellfish aquaculture in the SCB is sold in mostly to regional and interstate luxury foods markets and restaurants, as well as in local markets; it does not compete with large commodity markets (Dealy et al. 2024, and Sea Grant 2024a). This existing trend could potentially change if the proposed action and siting aquaculture in AOAs facilitates the growth of the industry and increased production. If this change occurred, it may replace some of the existing shellfish imports, the majority of which come through the Port of Los Angeles or other states along the Atlantic and Pacific Northwest (CDFW 2010, Dealy et al. 2024). With increased production from facilities in an AOA, there may also be new competition with existing local producers. Existing niche producers use their own distributors direct to local markets and restaurants (Dealy et al. 2024). The cost of distributing to large commodity markets

would be more expensive. However, increasing supply may drive prices down. This could benefit overall affordability and accessibility, but may put existing local businesses at risk. Additionally, the introduction of new products to the market would introduce competition and some firms may decide to differentiate their products, providing the consumer with more choices and possibly new options. Employee sectors that may benefit from this new type of market in the region could change from operators to distributors.

The following information provides the best proxy for what could occur in an AOA in the SCB if shellfish were cultivated. Spatial data and sector trade-off analyses by Lester et al. (2018b) in the Santa Barbara Channel modeled a potential annuity value (U.S. dollars per year) of $8.5 to $9.5 million for shellfish offshore aquaculture. According to the economic analysis in Wright (2020) for 2,000 acres (809 ha) shellfish operation in the SCB, it was thought the project would generate $18.4M of economic output and support 53 jobs with $2.5M of annual wages. The business proformas and direct fiscal impacts of the proposed 2,000-acre shellfish operation are provided in Exhibits A1 and A2, respectively, in the Appendix of Wright (2020). The project was thought to generate an overall beneficial impact to the Ventura Harbor District, as well as surrounding cities through direct output, taxes, and consumer purchases (see Chapter 3, Section iv (Ports and Working Waterfronts). According to another growth program described in Nash (2004), market priorities in the U.S. would best aim to rejuvenate the oyster industry to a historic high of 150,000 mt, expand the mussel industry to 80,000 mt, clams to 80,000 mt, and abalone to 5,000 mt. The estimated cost of molluskan aquaculture was $25 to $30 per square meter for rafts and $400 to $450 per km of longline systems (Nash 2004). This estimate of needed capital investment would now be much higher, accounting for increased costs and inflation since 2004.

b) All Types of Commercial Aquaculture

A global literature review of market competition between farmed and wild fish was conducted by FAO (2016). Overall, interactions may occur due to sharing common ecosystems, and seafood pricing based on new supply (FAO 2016). Market interactions also depend on consumer demand (Asche et al. 2001). Globally, positive interactions between wild fisheries and aquaculture may occur if new aquaculture products create additional demand for both farmed and wild species, which has been observed in salmon and catfish production in the U.S (Valderrama and Anderson 2008, NMFS 2009). Another potential beneficial impact on U.S. supply chains for any marine finfish would be to ensure they are free from forced labor and other illegal trade practices, sometimes associated with fisheries in other countries (NOAA 2024c). If products were exported, a potential impact globally would be to support and strengthen the sustainable and legal trade of fish products.

Markets likely to be targeted from finfish aquaculture in an AOA would most likely be for human consumption. If products stayed in the U.S. and in the region, it could increase the consumption of sustainable products consumed in the U.S. and potentially expand the aquaculture seafood market from mainly high-end products eaten at restaurants to a more diverse group of consumers, products, and price points (Dealy et al. 2024). While U.S. commercial finfish aquaculture may have the most opportunity and the greatest domestic impact by replacing imports, it is likely that the impact to international markets from an AOA would be low (Dealy et al. 2024). This is because the scale at which domestic aquaculture production may occur in the foreseeable future is not predicted to be at a large enough scale to affect international prices (Asche et al. 2001, Asche and Tveteras 2005, Rubino 2022, Young 2023, and Dealy et al. 2024). As of 2014, globally-traded fish products account for 37% by volume of the world production traded internationally (FAO 2014). According to 2015 data, finfish dominate the top ten list of preferred seafood in the U.S. (Nelson et al. 2019, NFI 2024). While finfish species account for seven out of the top 10 on the list, shrimp is still the most consumed seafood.

Finfish aquaculture globally is associated with the potential to increase pressure on forage fisheries. The demand for forage species in feed products for aquaculture is predicted to have a negligible market share, compared to livestock feed and other existing markets for fish oil products (despite any increase in fishing pressure) (Asche and Tveteras 2005, Clavelle et al. 2019, and Cottrell et al. 2020). Existing market trends

for forage species are described on pp. 2 and 3 of OIMB (2011). Global forage fish landings for meal and oil have remained around 20 to 30 MMT since the mid-1980s, and the proportion forage fish used in aquaculture feeds is declining, despite steady growth in aquaculture production (Hannesson 2003, FAO 2016, and Clavelle et al. 2019). Despite minimal predicted market impacts in fish feed for aquaculture, continued pressure trends could drive prices up, which may have an indirect beneficial impact to the fishery (discussed in Section D.i (Commercial Fisheries), as well as an adverse impact to the species if not sustainably managed (discussed under Section C.ii. (Wild Fish Stocks). Increased demand for forage fish may also increase competition with the commercial and recreational fishery sectors that rely on these fish as bait, either live or dead.

The market most likely to be targeted by finfish aquaculture in Southern California is also thought to be high-value species such as yellowtail (Fujita et al. 2023, Dealy et al. 2024). Such markets would support only a small number of facilities, or would require substantial effort such as branding and building new consumer relationships to build new or wider markets (Asche et al. 2001, Engle et al. 2022). Engle et al. (2022) analyzed commercial landings data from 1950 through 2019 to show that 17 of the 20 species exhibited declines, potentially offering opportunities for farmed product to capture market share by filling the increasing gaps in supply from capture fisheries. Farmed products could also offer consistency of volume, size, delivery frequency, and quality (Engle et al. 2022). In California, the fishing industry has fluctuated dramatically in recent years, with market values during low-yield years indicating potentially high demand for targeted species for seafood consumption (CDFW 2019). Higher prices for wild fish would tend to occur when supplies are low, so depending on what species may be grown in an AOA, supplies could level out prices in existing regional and domestic markets. Fish currently caught in California fisheries that may be commercially farmed in the future include California halibut, lingcod, various flatfish, sablefish, tuna, snapper, pompano, striped bass, sea bass, and Seriola species (CDFW 2019, Dealy et al. 2024).

If the identification of an AOA and siting aquaculture in AOAs facilitates the growth of marine finfish aquaculture, then there may be more market overlap observed in the region and state. Currently, impacts on the domestic commercial fishery do not come from domestic aquaculture production, but from imported products (Young 2023). Therefore, changes in revenue, value, and profitability of wild-capture fisheries may occur domestically if AOA products create changes in some of the current import market share in the region and in the U.S. Examples from the European Union, Japan, and within the U.S. show that domestic prices for wild species of fish are impacted by the entry of farmed species to a country's market (Valderrama and Anderson 2010, Nelson et al. 2019). Asche et al. (2001) found that in Norwegian markets, farmed fish did not compete with different farmed fish species or other meat products; but there was competition between farmed and wild fish of the same species. If farmed fish in an AOA were assumed to be native species only, this market interaction may be likely to occur.

Aquaculture market share may have an adverse impact on the market share of wild-capture fisheries. As a result, supplies from traditional fisheries would either be expected to remain the same or decline over time (Rubino (ed.) 2008). This potential impact is considered by many stakeholders as high risk, since domestic commercial fisheries already face challenges due to population changes, regulations, environmental variation, and competition for space-use. Any loss of locally sourced, wild-capture seafood may have an adverse impact on the local seafood economies in those areas (PFMC 2022a). Site-specific NEPA analyses based on specific project designs may compare the economic outcomes for business owners and employees between the two sectors, in order to properly analyze and monitor potential disproportionate adverse impacts on existing aquaculture producers and wild fisheries business and employees. Processors and other working waterfront businesses may be associated with both aquaculture and wild-capture businesses (see also Section D.iv Ports and Working Waterfronts).

Production bottlenecks that have inhibited growth in marine fish aquaculture in existing markets include feed production and hatchery methods (Engle et al. 2022). The estimated cost of 12 submersible net-pens as of 2004 was estimated at $1.3M to install (Nash 2004). This estimate of capital investment would now

be much higher, accounting for increased costs and inflation since 2004. Spatial data and sector trade-off analyses by Lester et al. (2018b) in the Santa Barbara Channel modeled a potential annuity value (U.S. dollars per year) of $0 to $10,000 per development site for finfish offshore aquaculture. While the dollar amounts would need to be updated to account for costs and inflation, these estimates provide examples of what may occur if finfish were pursued in an AOA.

Inputs to a bioeconomic model include the costs associated with raising fish to release size, harvest levels, life history parameters, supply schedules, and price trends; outputs may include the costs per fish, value to each market or fishery, and a cost-benefit ratio to evaluate the efficacy (Asche et al. 2001, CDFG 2010). The start-up costs to operate an offshore aquaculture facility may not favor locally-owned, independent businesses in the way many of the current businesses exist in the SCB. Local cost and short-term opportunity versus market growth and more long-term effects may need to be analyzed as trade-offs if and when projects are proposed. Specific market impacts are not quantitatively modeled in this PEIS, without specific project information like species or production levels. However, the following resources describe potential market interactions between wild fisheries and aquaculture finfish:

- econometric models and time series analyses of market interactions between wild fisheries and aquaculture is provided on pp. 193 through 195 of Rubino (ed.) (2008),
- the seasonality of wild-capture fisheries versus year-round production and trade for aquaculture products is summarized on p. 238 of Rubino (ed.) (2008);
- Section 3.2 on pp. 376 through 378 of Clavelle et al. (2019) highlights reduced prices due to increased supply, resilience to market volatility, and potential changes to consumer preferences and marketing;
- methods to test market interactions and integration are described on p. 8 of Asche et al. (2001); and
- predicted market interactions between farmed with traditional goods, and with wild-capture fish, are described on pp. 141 through 146 of Asche and Tveteras (2005).

In conclusion, the overall impact to domestic and international markets would likely be beneficial, but it is unclear how substantial the economic impact may be. The overall impact to consumers at any spatial scale would be beneficial if overall prices of seafood decreased due to higher supply with steady or increasing demand. However, these benefits may come at a cost to local markets, as well as existing aquaculture and fisheries businesses. The potential cost to local markets and businesses may have an adverse impact on regional seafood economies and community wellbeing. The potential economic opportunity of offshore aquaculture projects would require high initial costs for any applicant/operator.

IMTA is currently commercially viable in China and Korea, where systems are set up to grow seaweed, shellfish, and finfish together (FAO 2018a). More commonly, as well as in other parts of the world, seaweed is grown with fish species out of convenience because it naturally occurs in the vicinity of the farm (FAO 2018a). If individual farms that grow one trophic level are sited near enough to farms of another trophic level, an IMTA effect could be realized for the overall geographic space that includes all farms. This is a potential impact that could occur in an AOA. The IMTA effect among farms may benefit production costs and profits (described more in the biological sections of this PEIS), which could have an indirect effect on markets.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

If one or more AOAs were identified in the Alternative, it is likely that at least some, if not the majority, of the economic opportunities would be concentrated in the nearby shore-side County of Los Angeles and associated communities. Summaries of the marine and coastal economies in Los Angeles County from NOAA's Office of Coastal Management may be found at https://coast.noaa.gov/snapshots/. According to Census data through 2021, ocean-based economic activities account for an estimated 1.9% of the total

economy (GDP contribution) in the county, employing about 2.5% of the county's workforce, housing 3,896 businesses and establishments, and about $8.6B in wages (NOAA 2021a). Activities related to living resources (commercial fisheries, processors, seafood markets, hatcheries, and aquaculture) account for 3.2% of the county's total ocean economy, employing an estimated 4,150 people (NOAA 2021a).

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section. The proxy information provided in Alternative 2a is also the best available information for Alternative 3, with the exception of spatial data and sector trade-off analyses modeled by Lester et al. (2018b). Spatial data and sector trade-off analyses by Lester et al. (2018b) in Santa Monica Bay modeled a potential annuity value (U.S. dollars per year) of $8.0 to $9.0 million per developable site for mussel aquaculture, and a potential annuity value of $0 to $200,000 per developable site for macroalgae offshore aquaculture. Sites modeled in Lester et al. (2018) are near to Alternative 3 in the offshore space of Santa Monica Bay.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section. The proxy information provided in sub-alternative (a) of Alternative 2 is also the best available information for Alternative 3, with the exception of spatial data and sector trade-off analyses modeled by Lester et al. (2018b). Spatial data and sector trade-off analyses by Lester et al. (2018b) in Santa Monica Bay modeled a potential annuity value (U.S. dollars per year) of $0 to $400,000 for finfish offshore aquaculture in analyzed sites near to Alternative 3.

Alternative 4: Combined Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. AOAs in both areas may distribute opportunities to more communities, which could reduce conflicts. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

If multiple areas were identified as AOAs under Alternative 4, the potential local and regional market impacts may occur at a broader geographic scale, as areas near the Santa Barbara Channel and near Santa Monica Bay may be used for aquaculture. A greater geographic area could help to coordinate efforts alongside commercial fisheries where certain areas were farmed only during fishing off-seasons, maintaining more steady opportunities for both industries throughout the year, as well as more steady supply for seafood markets. Overall, coordinated and planned development that considers the relative value of each site may be beneficial to all types of aquaculture (Lester et al. 2018b). Identifying AOAs throughout the SCB may help inform and encourage this coordinated way to grow offshore aquaculture. Any impacts to domestic and international markets are thought to be minimal under any Alternative. If AOAs were sited in more than one geographic location, aquaculture projects sited in those AOAs may be more likely to land product or work with other auxiliary coastal facilities throughout the SCB, rather than the activity concentrated in one area. Any potential adverse impacts to local or regional markets may not be as severe if more businesses across multiple communities and counties were utilized to support a growing aquaculture sector. Potential economic opportunities may be greater, and more accessible for more people if the geographic scale of impacts were broader.

Siting aquaculture in multiple AOA options spread across Alternative areas could provide commercial fishers more space and therefore more flexibility to be responsive depending on the season and distribution of their target species biomass from year to year. This potential benefit could be realized if,

under Alternative 4, facilities took advantage of more geographic space to site further from one another. This potential benefit would not be realized if, under Alternative 4, the total AOA space was used for aquaculture year-round. The scale of aquaculture practices and adjacent capture fisheries are important modifiers for being able to determine the directionality of nearly all interactions between the two industries (Clavelle et al. 2019). Scaling operations across multiple geographic areas may help wild-harvest seafood products maintain competitive supply and pricing with aquaculture products in seafood markets.

If under Alternative 4 all 10 AOA options across the Santa Barbara Channel and Santa Monica Bay were sited with aquaculture facilities year-round, commercial and recreational fisheries could be adversely impacted by ecological impacts of facilities sited close to one another (e.g. compounding effects of noise, light, waste, wildlife aggregations). The adverse effect on commercial and recreational fisheries would also affect the seafood markets and seafood-related business those fisheries supply. Again, these effects could be mitigated by siting facilities across a broader geographic context (Gentry et al. 2017, Fujita et al. 2023). Identifying AOAs in both geographic areas under Alternative 4 could have an adverse or mitigating effect on markets and regional food systems, depending on how farms are sited within the AOA spaces. With the assumption that projects would be encouraged to use spatial distribution as impact mitigation and management, wild fish populations may maintain distribution patterns more similar to baseline conditions with facilities spaced farther apart across the SCB, and spacing facilities further apart from one another and away from other concentrations of wild populations would reduce the transmission rates of disease. Using Alternative 4 as a way to mitigate potential adverse ecological impacts would help maintain economic opportunities associated with aquaculture operations and associated working waterfronts (also see Section D.iv Ports and Working Waterfronts).

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

iv. Ports and Working Waterfronts

Affected Environment

The Ports and Waterways Safety Act (PWSA) involves increased supervision of vessel and port operations to reduce the possibility of vessel or cargo loss, or damage to life, property or the marine environment and ensure that the handling of dangerous articles and substances on the structures in, on, or immediately adjacent to the navigable waters of the U.S. is conducted in accordance with established standards and requirements (33 U.S.C. § 1221). The USCG has the authority to establish regulations for vessel traffic for ports, harbors, and other waters subject to congested vessel traffic. More information on vessel traffic and safety is included in Chapter 3, Section D.vi (Transportation and Navigation).

A port complex is composed of one or more port areas that are geographically linked, or because they are dependent on a common transport system (CDFW 2019). U.S. seaports nationwide are estimated to employ 41,000 workers, move $1.8 trillion of cargo annually, and directly and indirectly support more than 30 million jobs across sectors (NOAA 2022). As of 2017, foreign trade through U.S. ports was valued at $1.6 trillion (NOAA 2024d). Many of California's centers of commerce are located on the

coast. California ranks second in the nation for the number of employers in deep sea freight transportation; the state ranks third in the nation for the amount of employment payroll (NMFS 2023h). The state also ranks in the top three for marinas, cargo handling, and ship and boat building (NMFS 2023h). More details on the California marine economy are provided on p. 50 of the NOAA Fisheries Economics of the U.S. 2020 Report. The SCB includes an area of approximately 78,000 km^2 with a shoreline distance of over 300 km (162 nm) (Dailey et al. 1993).

Port groups and names throughout California are provided in Table 9 on p. 29 of Leonard and Watson (2011). In the SCB, there are two major ports (Los Angeles and Long Beach) and two smaller ports (Hueneme and San Diego) in the SCB (CDFW 2019). The ports of Long Beach and Los Angeles form the largest port complex in the nation, managing approximately a quarter of all container and break-bulk cargo traffic in the U.S. (NOAA 2013). The Ports of Long Beach and Los Angeles also represent two of three ports that account for over three-fourths of the fish and shellfish that are received at or shipped from the west coast (Dealy et al. 2024). The main ports in Southern California for commercial and recreational fisheries are San Pedro, Terminal Island, Port Hueneme, and Ventura (PFMC 2013). Data analyzed from 1981 through 2021 show a high geographic concentration of the CPS fishery in the port of Santa Barbara and Los Angeles (Figure T.1 on p. S-94 in Appendix T of NOAA's 2022-2023 CCIEA Report (Harvey et al. 2023)). In addition to ports, coastal counties support harbor districts, public and private marinas, yacht clubs, fuel docks, boat launches, and other boating-related facilities.

Basic maritime economic facts for each shore-side county considered in this PEIS are presented in Table 3.21 on p. 192 of the Results section of the Atlas (Morris et al. 2021). The WCR is ranked second out of eight coastal regions for marine employment. The average wage of marine economy employees in the WCR is $48,831; with marine construction as the highest average wage per employee at $113,449 (NMFS 2023j, NOAA OCM 2024). Trends in businesses, employees, and average wages are all increasing in the region's marine economy. Harbors provide hoists, docks, boat slips and other infrastructure that is critical for offloading harvest and storing vessels or products. Marine supply, electronics, and other businesses are essential for keeping vessels operating safely and effectively. Ports in the SCB have shown substantial investments into more seafood processing and aquaculture facilities in recent years.

A viable seafood industry requires not only healthy marine resources and habitat, but also people and businesses to support fisheries and other associated activities that support the economy. A fishing community depends on the businesses and employees directly and indirectly associated with offshore operations to thrive and to get product to consumers. Fishing communities include economic and social groups whose members rely heavily on fishing activities and fishing culture. They are dependent on one another for their livelihood and well-being. As communities, they are connected to each other socially and economically, both locally and across regions. Community resilience is the capacity of individuals and households to absorb, endure, and recover from health, social, and economic impacts (U.S. Census Bureau 2022). The term is often used to analyze impacts from a disaster, such as an earthquake or pandemic; but may be used to think about a community's ability to withstand the effects of an action or event. Variation in individual and household characteristics can determine the capacity and resources to overcome obstacles over time and potentially brought about by change (Schlosberg et al. 2017, U.S. Census Bureau 2022, Michaelis 2024). Communities and individuals who rely on the ocean may experience higher social vulnerabilities compared to other individuals in the same geographic coastal area (Bennett et al. 2022).

Stressors

Any future aquaculture project sited within an AOA may be required to consider shore-side components to the project and its impacts, which may vary depending on the site, type of aquaculture, species, product, and targeted markets. Potential market overlap between wild-harvested and aquaculture products is included in Chapter 3, Section D.iii (Markets and Regional Food Systems).

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- increased vessel traffic in and out of coastal areas;
- increased vessel demand in and out of ports, harbors, and storage facilities;
- harvested product moving through coastal facilities; and
- the need for shore-side industrial-use infrastructure (e.g. processing, storage).

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors. For the purposes of this PEIS, all shore-side impacts are considered indirect of the potential identification of an AOA in Federal waters. However, any future aquaculture project sited within an identified AOA could be required to consider shore side components to the project and its impacts as part of permitting decisions.

Aquaculture operations in an AOA would likely generate economic activity during siting, construction, active operations, and decommissioning (Kumar et al. 2024). Growing the aquaculture industry in Federal jurisdictional waters would likely contribute to the State and regional economy, assuming products were landed, processed, or sold in coastal facilities in California. The Fishery Economic Assessment Model is a production-oriented input-output model to estimate the contribution of West Coast commercial fishing to the total income of the coastal communities of California (Seung and Waters 2005). This may be useful to analyze aquaculture's contribution, as well as to analyze potential competition among aquaculture and fishery sectors within working waterfronts. In the model, revenues at each stage of the production process are converted into (1) direct income (harvesting sector of the industry); (2) indirect income (regional interest across all industries in response to landings and purchases of a particular species); (3) induced income (expenditures from new household income within the region) (PFMC 2013).

An input-output model in economics is a framework for analyzing the interconnectedness of different sectors in an economy by tracing the flow of goods, services, and money between them. This kind of modeling can help understand how changes in one sector can impact others and could be used in site-specific NEPA to help assess the socioeconomic impact of proposed projects on ports and working waterfronts. One example of this type of model is The National and Coastal State Input/Output Model, which can estimate economic effects (for sales, income or employment) in the seafood sector directly affected by an activity under consideration. That model has not been used historically to address activities associated with fish aquaculture operations (Kirkley 2009). A recent study by Kumar et al. (2024) using an input/output model quantified the economic contribution of U.S. aquaculture farms and found that the industry contributed to 525 of the 546 economic sectors and marine aquaculture had an economic output of $1.17 billion in 2022. Additionally, marine aquaculture had an economic multiplier of 1.78 and an employment multiplier of 1.48 meaning that for every $1 or job spent or hired in aquaculture, an additional $0.78 is generated and 0.48 jobs are supported in the broader economy (Kumar et al. 2024). Primary inputs to these types of models can include products harvested and landed within the area considered and the foreign imports of seafood into the area considered (PFMC 2013). Differences between landings values and landings volumes may need to be defined for species that are either low-value/high-volume, or high-value/low-volume. Product flow within the model for landed product to processors, purchases, consumers, and exports may need to be described, see Leonard and Watson (2011). Once the type of aquaculture, target species, and production volumes are known when a project is

proposed, site-specific NEPA analysis may consider using an input/output model to provide the following outputs for economic analysis in a working waterfront:

- employment impacts estimate total full-time and part-time or seasonal jobs produced;
- income impacts that consist of wages and salaries and include self-employment income to business owners;
- sales impacts that estimate the total sales revenues made by businesses within each sector category; and
- Value added impact is an estimate of sales revenues minus the cost of the goods and services needed for production. It is the estimate of the industry or industry sector's overall contribution to the U.S. GDP (PFMC 2013).

Tax revenue may increase from increased production and exports. In 2022, marine aquaculture generated $10.9 million in local taxes, $15.4 million in regional taxes, and $38.7 million in federal taxes (Kumar et al. 2024). California budget metrics as of July 2021 indicate that the overall aquaculture program in the state (which includes both marine and over-land regulatory management) is operating at 43% of mission level and a staff capacity near 22% of mission level (CDFW 2022). These numbers may indicate room for growth and potential economic benefits if offshore aquaculture in Federal waters contributed to existing aquaculture-associated facilities and employment systems shore side in California. Many projects have the potential to contribute significantly to State and local economies based on revenue from registrations, leasing and rentals along the coast, taxes, and permits, as well as some regulatory and management mechanisms (CDFW 2022). The way taxes may be factored into an economic analysis on vessel-related industries is summarized in Section 3.2.2 of the NMFS Community Profiles for West Coast and North Pacific Fisheries (Norman et al. 2007). An example of how tax revenue was estimated for an offshore shellfish operation in the SCB is provided in Wright (2020).

Employment impacts among all aquaculture-dependent industries, such as aquaculture support industries, processing, markets, restaurants that potentially specialize in a particular aquaculture product, are expected to be greater when compared with the number of new jobs within the facility itself (NMFS 2021a). Economic participants that benefit from the growth of aquaculture may include growers, consumers, investors, businesses in technology, services, supply and transport, as well as exports (Wright 2020, Rubino 2022, and Sea Grant 2024a). An example of how an aquaculture project may support jobs directly associated with the project as well as "upstream" or "downstream" related jobs through product flow is provided in Exhibit 5 on p. 5 and exhibit 10 on p. 16 of Wright (2020). The seafood supply chain could benefit from having a predictable, increased supply of products which would help maintain these new jobs (Rubino (ed.) 2008).

Aquaculture could be a new pathway for sustainable seafood to reach consumers and economic opportunity to coastal communities. Demographics and existing economic patterns in fishing and related waterfront activities may act as indicators for the potential level of impacts in employment or participation in economic benefits from an AOA. For example, workforce readiness (including existing local knowledge, need for skilled labor, safety training, or education qualifications) could indicate if new job opportunities would be supported by adjacent communities, or if employment opportunities would draw in new workforce populations outside the region or even internationally. Demographic factors that could be used to analyze workforce readiness are summarized in the introductory table in NCCOS (2022). Additional social dimensions identified by the UN that can provide context-specific social variables related to aquaculture are summarized in Table 2 on p. 4 of Krause et al. (2020). These could be analyzed for potential waterfront communities once areas to land product were determined.

The term "social carrying capacity," as defined by Aguilar-Manjarrez et al. (2017), calls for aquaculture planning and development to occur in a manner that does not disenfranchise people or result in net economic loss to local communities. Some of the components to measure impacts to livelihoods include ecological degradation, exclusion from decision-making, business practices, creation of opportunities for

local communities along the aquaculture value chain from manufacture and supply of inputs through to processing, transport and marketing (Aguilar-Manjarrez et al. 2017). There is a persistent connection between industrial ocean activities and marine debris, and ongoing economic costs associated with waterway and beach cleanups, as well as impacts on boat engines, marinas and ports, which are often borne by coastal communities and individual businesses rather than by the producers of marine debris and pollution (Bennett et al. 2022). In addition, NOAA Fisheries has developed social vulnerability indicators for coastal communities engaged in fishing activities to characterize community well-being and resiliency to disturbances (e.g. oil spills, extreme weather events, regulation changes, economic disruption) (Jepson and Colburn 2013, Michaelis 2024). Table 1 on p. 4 of Michaelis (2024) describes the details of these indicators. The communities identified through the use of the NOAA social indicators are described under each alternative, below.

Indicators for a wide geography may be necessary to evaluate where and why certain communities may be impacted by aquaculture that may be sited in an AOA (NCCOS 2022). Communities are often analyzed as geographic places, but communities dependent on seafood production or fishing (commercial, recreational, or subsistence) also may be defined by shared occupation or interest (Sea Grant 2024b). Krause et al. (2020) defines "local" as the direct aquaculture production site and its direct neighboring communities and "regional" as combining several adjacent municipalities. Criteria of less than 46 km (25 nm) and access to a port have been used in spatial analyses to define cost effectiveness of offshore aquaculture (Kapetsky et al 2013, Morris et al 2021). Stakeholder recommendations during the development of the Atlas additionally suggested that planning should focus on aquaculture development at depths from 10 to 150 m (33 to 492 ft.) with a maximum distance from shore of 46 km (25 nm) (Morris et al. 2021). While unlikely, it is possible that cultured products could be processed at sea and/or landed outside the SCB region, or even outside of California. Growers may shop between multiple processors and distributors before landing a product. Additional factors extrapolated from case studies in NCCOS (2022) that indicate new aquaculture would be integrated into the SCB region include:

- existing support businesses (high number of processors and retailers, as well as a high number of dealers for existing seafood products);
- high commercial fishing engagement;
- high maritime job presence; and
- high number of ports.

The Regulatory Flexibility Act (RFA) RFA requires government agencies to assess potential effects that regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those effects (PFMC 2016). The proposed action to identify an AOA is a planning effort only; it is not a regulatory action. However, cost-benefit procedures provided by the RFA, and other economic thresholds defined by federal and state laws, could inform impacts to certain businesses in regional waterfronts, once identified in a site-specific NEPA analysis:

- Under the RFA, if the projected direct or cumulative impact is estimated to exceed $100 million, it may be subject to consider certain procedures for cost benefit analyses.
- The North American Industry Classification System (NAICS) U.S. industry size standards for finfish aquaculture, fish hatcheries, shellfish aquaculture, and other aquaculture, classified a small business as having maximum annual receipts of $3.75 million (13 C.F.R. § 121.201).
- The small business size standards for wild harvest finfish, shellfish, and other marine fishing as having maximum annual receipts of $25 million (13 C.F.R. § 121.201).
- The RWQCB, responsible for NPDES permits for the State's OREHP, considers a small versus large facility as less than versus greater than 45 mt fish per year, respectively (CDFG 2010).
- A fish-harvesting business is considered a "small" business by the Small Business Administration if it has annual receipts not in excess of $4.0 million (PFMC 2016).
- For fish-processing businesses, a small business is one that employs 500 or fewer persons (PFMC 2016).

- For wholesale businesses, a small business is one that employs not more than 100 people (PFMC 2016).
- For marinas and charter or party boats, a small business is one with annual receipts not in excess of $6.5 million (PFMC 2016).

Additional economic considerations that could inform site-specific NEPA analyses in working waterfronts include, but are not limited to:

- disproportionate impacts to small and large business entities;
- disproportionate impacts to certain communities;
- direct food source, direct income source;
- ports' abilities to participate in a new commodity based on existing investments and plans; and
- existing concentration of different fleets/landings amongst ports to predict higher/lower risk of competition.

Competition for space and investment resources for coastal development could occur with the growth of offshore aquaculture, but is considered out of scope for this PEIS. All future aquaculture-associated development would be regulated by the local jurisdiction's discretionary review process which would require consistency with land use regulations, zoning requirements, any provisions of a habitat conservation plan (HCP) or NCCP, and other applicable policies (CDFW 2019). The California Coastal Act (CCA) protects the public's right to access the shoreline. Aquaculture development is protected in Article 3 Section 30222.5 of the CCA, but it cannot infringe on the rights of other coastal-dependent industries or interfere with coastal access (Nelson et al. 2019). Any aquaculture expansion on land would likely occur on private property or granted state lands (e.g., often administered by ports and special harbor districts) (CDFW 2022). With consideration to and compliance with existing lease requirements, rules and regulations of local jurisdictions, the expected impacts of aquaculture-associated development in working waterfronts would likely be less than significant on the physical and biological environment (CDFW 2019). Coastal community characterizations and available baseline socioeconomic conditions within those communities are included in this PEIS to help inform overall implications to be considered in project-specific NEPA analyses.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

The identification of one or more AOAs in the Santa Barbara Channel could encourage aquaculture developers to focus on that area for proposed projects and result in a higher concentration of aquaculture in the AOA(s) than would occur otherwise. The use of AOAs to create a predictable area for aquaculture development may have a beneficial impact on communities in creating predictability and focusing aquaculture in an area that has been evaluated and assessed to be the most suitable in Southern California (Morris et al. 2021) in the context of minimizing use conflict and impacts to wildlife and habitats that are important to communities.

Alternative 2 is nearest to Santa Barbara and Ventura Counties. Santa Barbara County covers a total land and state water area of just under 9,810 km^2 (4,000 mi^2), with nearly 30% of the county represented by coastal waters (NOAA 2013). San Miguel Island, Santa Cruz Island, Santa Rosa Island and Santa Barbara Island are offshore components to Santa Barbara County. Ventura County, including Anacapa Island and San Nicolas Island offshore, covers a total area of just over 5,720 km^2 (2,000 mi^2), with 16.5% of the county represented by coastal waters (NOAA 2013). The four primary ports and harbors near Alternative 2 include Santa Barbara Harbor, Ventura Harbor, Channel Islands Harbor, and Port Hueneme. Five of the

eight AOA options are closest to Ventura Harbor, with the closest (N2-E) located just 8.5 km (4.6 nm) offshore. The others range from 11.7 to 27.6 km (6.3 to 14.9 nm) offshore of Ventura Harbor. Alternative 2 could also be accessed from the harbors of Santa Barbara and Hueneme with distances ranging from 13.9 to 33.2 km (7.5 to 17.9 nm) (Morris et al. 2021). Six of the eight AOA options in Alternative 2 are located within (18.5 km) 10 nm of fishing docks.

Thirteen communities within 25 km (13.5 nm) of Alternative 2 were identified for potential vulnerability profiles, see Michaelis (2024). Considerations included natural hazards, gentrification, environmental variation, and existing fishing engagement and reliance. Potential vulnerabilities included:

- Santa Barbara, Oxnard, Port Hueneme, and Ventura's existing high reliance on commercial fishing could lead to higher risk of adverse impacts with the introduction and potential competition by offshore aquaculture.
- Oxnard, Port Hueneme, El Rio, and Saticoy indicate a large number of households in these communities that may be limited by resources in various ways (e.g., income, education, English language skills), and therefore may be less able to adapt to some types of community changes, like potential gentrification, brought on by a developing new industry such as offshore aquaculture.
- Oxnard, Port Hueneme, El Rio, Channel Islands Beach, Meiners Oaks, Mira Monte, Montecito, Oak View, Ventura, Summerland, and Toro Canyon all experience existing pressures from gentrification and/or urban sprawl.
- Montecito, Summerland, and Toro Canyon show low existing opportunities in the workforce, which could lead to relatively more positive impacts with the introduction of a new industry to those areas, though this benefit could apply to some demographic components of all these communities.

The results for the eastern portion of AOA options within Alternative 2 (those labeled N-2 in Figure 1) are detailed on pp. 10 through 12 of Michaelis (2024). The results for the western portion of AOA options within Alternative 2 (those labeled N-1 in Figure 1) are detailed on pp. 16 through 19 of Michaelis (2024). More precise, localized data from these communities would be needed to assess potential impacts; but these may provide a starting basis for where to focus efforts in a site-specific NEPA analysis.

The Ventura Port District has entered an agreement with the Port of Hueneme to receive $16 million in grants as part of a Commercial Fish Landing Modernization Project to assist in the relocation of Port of Hueneme's commercial fishing facilities to Ventura Harbor (Port of Hueneme 2024). These funds will be used to increase the offloading capacity in Ventura Harbor and update older infrastructure. Aquaculture operations proposed in Alternative 1 could benefit from these infrastructure improvements. Additionally, the Ventura Port District has stated that it will, "continue to actively seek opportunities to collaborate with the aquaculture industry to establish sustainable aquaculture farms that can land product in Ventura Harbor" (VPD2021).

a) Shellfish and Macroalgae

Seaweed aquaculture can be attractive and beneficial to coastal communities due to lower initial capital investments, lower production costs, harvests as fast as six weeks, and drying/processing that can be done naturally (FAO 2018a, Sultana et al. 2023). The general economic benefit that would fulfill the expected public economic interest as predicted from a recent kelp EA in the Santa Barbara Channel provides the most specific examples for port and harbor interactions within the region for seaweed production (USACE 2021). A topic specifically addressed for a seaweed analysis (but would apply to all aquaculture projects) was energy needs. The operation of a vessel and other equipment during construction, monitoring, and decommissioning would increase fuel consumption at coastal access points, however, it was concluded unlikely to change the local availability of fuel (USACE 2021). In addition, future seaweed projects that may be developed to expand the U.S. energy supply could be considered a potential long-term benefit to ports and waterfronts.

The predicted impacts analyzed by VSE for Ventura represents the best available information for the region of what could be considered or predicted from offshore shellfish operations in the SCB. Economic impacts to the Ventura Port District from a proposed 2,000-acre (809 ha) offshore shellfish operation, including expenses and revenues were analyzed for the Port of Ventura, and provide an example of what may be expected from siting aquaculture in Alternative 2 (VSE 2017). Direct revenue to the port was estimated from slip fees, landing fees, and compliance from approximately $130,000 at 500 acres in year one to $1.8M at 2,000 acres by year 10 (Wright 2020). The cumulative tax revenue over the 10-year period was estimated to be approximatively $653,000 (Wright 2020). Employment benefits in a working waterfront of the 2,000-acre shellfish operation included processors, wholesale distributors, restaurants and other food services, and final customers, thought to have a total value of approximately $74M of downstream impacts to the local economy (Wright 2020). During the VSE project, feedback from shellfish and seaweed aquaculture companies indicated that shallower water depths were preferred, and the Ventura Port District has noted that AOA sites N2-D and N2-E may therefore be subject to greater commercial interest if identified as AOAs (see Appendix 7).

Using global examples from mussel longline production, Krause et al. (2020) found that shellfish aquaculture has a beneficial local impact on employment and community resilience, since most operations can employ people and keep waterfronts open year-round. Krause et al. (2020) found that impacts from mussel aquaculture rarely go beyond local. The scale of production would determine the scale of this potential impact; and AOAs may influence larger geographic scales of impact, within the region or the state.

b) All Types of Commercial Aquaculture

Community profiles for fishing communities are described in Section D.iv (Ports and Working Waterfronts). Site-specific NEPA analysis of impacts from offshore aquaculture activities on fishery resources may consider the effects of the proposed action on the sustained availability of fishery resources to fishing communities near any identified AOA, and on the sustained participation of those fishing communities in fisheries. California communities that are considered fishing communities under the MSA at 50 C.F.R. § 600.345(b)(3) may be especially vulnerable to impacts from finfish or IMTA aquaculture. Fishing communities in California are described in the NMFS Community Profiles for West Coast and North Pacific Fisheries (Norman et al. 2007) and are consistent with the communities identified with high fishing engagement in Michaelis (2024). While the Norman et al. (2007) study was based on 2000 census data, it provides a detailed template on the information that would inform project-specific analyses. Information would need to be updated based on the most recent census data available. Community profiles from the Santa Barbara Channel region, within Santa Barbara and Ventura Counties are:

- Oxnard, pp. 485 through 489;
- Port Hueneme, pp. 497 through 500;
- Santa Barbara, pp. 526 through 529; and
- Ventura, pp. 573 through 576.

A summary of offloads to Port Hueneme is provided on p. 12 of PFMC (2022a). Ventura Harbor and Port Hueneme accept offloads from large commercial fisheries, including CPS, market squid, and tuna (Morris et al. 2021). Santa Barbara Harbor and the Channel Islands Harbor serve smaller trap, dive, and trawl operations (Morris et al. 2021). Figure 5.1 on p. 27 of NOAA's 2022-2023 CCIEA Report (Harvey et al. 2023) shows that three out of the top five fishing communities in Southern California that are reliant on commercial fishing (defined by engagement per capita in commercial fishing landings, revenues, permits, and processing through 2020) are located along the coastline near Alternative 2. Despite high reliance on commercial fishing, the data show that the communities in Santa Barbara, Summerland, and Avalon would experience relatively low community vulnerability if there was a downturn in the fisheries. The higher resilience conclusion is based on demographics, poverty, housing, labor force structure, and other factors. A similar analysis shows slightly different conclusions for commercial fishing engagement in

coastal communities: Figure R.1 on p. S-90 in Appendix R of NOAA's 2022-2023 CCIEA Report (Harvey et al. 2023) shows Santa Barbara, Oxnard, and Ventura as three out of the top five communities with the most engagement. Oxnard shows the highest of the three, but still below average, social vulnerability if there was a downturn in commercial fisheries engagement.

More precise, localized data from these fishing communities would be needed to ground-truth the high-level predictions in this PEIS. Methodologies for organizing an analysis on fishing communities are provided on pp. 34 through 38 of Clay and Colburn (2020). In addition, economic benefits would need to be analyzed in comparison to any social and cultural costs.

Using global examples from salmon production, Krause et al. (2020) also found the finfish industry has positive impacts on local household income and housing; and while limited, new education and training opportunities became available indirectly from university or other public-private partnered programs associated with the industry. Siting finfish aquaculture and IMTA operations in an AOA may bring additional jobs and income protection to ports and working waterfronts through diversification and access to new markets. In the face of declining wild catches and increasingly restrictive fishery regulations, finfish aquaculture production may help keep waterfronts, docks, processing facilities, and cold storage units operating for both industries (Rubino (ed.) 2008). This observed share of economic value chains can be viewed as means of increasing productivity and competitiveness while also holding the potential of affecting local labor markets, mainly by affecting demand for different skills groups (Buck et al. 2018). These impacts may create beneficial long-term economic outcomes for waterfronts.

In analyzing IMTA, it has been estimated that, for each person employed in aquaculture production, about three others are employed in secondary and related activities (Buchholz et al. 2012; Krause et al. 2015). Information on IMTA aquaculture is limited, but public perceptions exist about its potential beneficial and adverse socioeconomic impacts. Food safety, risk of disease transfer, and unknown management for potential cumulative impacts are among the potential adverse impacts perceived in literature and stakeholder interviews; whereas new income diversity, employment opportunities, ecological and waste mitigation are viewed as potential benefits of IMTA (Alexander et al. 2016). IMTA may be a higher financial risk, associated with higher start-up costs, due to the lack of information available for permitting evaluations.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

The identification of one or more AOAs in the Santa Monica Bay could encourage aquaculture developers to focus on that area for proposed projects and result in a higher concentration of aquaculture in the AOA(s) than would occur otherwise. The use of AOAs to create a predictable area for aquaculture development may have a beneficial impact on communities in creating predictability and focusing aquaculture in an area that has been evaluated and assessed to be the most suitable in Southern California (Morris et al. 2021) in the context of minimizing use conflict and impacts to wildlife and habitats that are important to communities.

Alternative 3 is nearest to Los Angeles County. Los Angeles County covers a total land and state water area of just over 10,510 km^2 (4,000 mi^2), with about 15% of the county represented by coastal waters (NOAA 2013). The ports of Long Beach and Los Angeles form the largest port complex in the nation, managing approximately a quarter of all container and break-bulk cargo traffic in the U.S. (NOAA 2013). The Ports of Long Beach and Los Angeles also represent two of three ports that account for over three-fourths of the fish and shellfish that are received at or shipped from the west coast (Dealy et al. 2024).

The nearest two harbors are Marina del Rey and Redondo Beach (King Harbor). AOA option CN1-B is the closest option, located just 9.8 km (5.3 nm) from Marina del Rey, whereas CN1-A is approximately 11.1 km (6.0 nm) away from the same harbor. Redondo Beach is 19.4 km (10.5 nm) from CN1-B and 20.9 km (11.3 nm) from CN1-A. Marina del Rey primarily supports private vessel boat slips for the

greater Los Angeles metro area. Similarly, Redondo Beach is primarily a harbor for pleasure and sailing vessels. These two harbors already support some commercial fishing landings; but it is uncertain if either location could support expansion of aquaculture-related shore-based infrastructure (Morris et al. 2021). It is more likely that shore-based infrastructure may be considered farther south within the Port of Los Angeles complex, even though this area is nearly 55 km (30 nm) from Alternative 3 (Morris et al. 2021). Los Angeles County provides an estimated 16% of marine jobs in the WCR, and produces 24% of the regional contribution to the marine economy's GDP (NOAA OCM 2023).

Twenty-one communities within 25 km (13.5 nm) of Alternative 3 offshore were identified for potential vulnerability profiles, listed in Table 7 on p. 24 of Michaelis (2024). Considerations included natural hazards, gentrification, environmental variation, and existing fishing engagement and reliance. Potential vulnerabilities included:

- Los Angeles existing high reliability on commercial fishing could lead to higher risk of adverse impacts with the introduction and potential competition by offshore aquaculture.
- Los Angeles, Del Aire, Howthorne, Inglewood, Ladera Heights, Lawndale, Lennox, and View Park-Windsor Hills all indicate a large number of households in these communities that may be limited by limited resources in various ways (e.g., income, education, English language skills), and therefore may be less able to adapt to changes brought on by a developing new industry such as offshore aquaculture.
- All communities except Topanga experience existing pressures from gentrification and/or urban sprawl.
- Topanga was heavily affected by the recent Palisades fire.
- Hidden Hills shows low existing opportunities in the workforce, which could lead to beneficial impacts with the introduction of a new industry to those areas.

The results for Alternative 3 are detailed on pp. 20 through 23 of Michaelis (2024). More precise, localized data from these communities would be needed to assess potential impacts; but these may provide a starting basis for where to focus efforts in a site-specific NEPA analysis.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

b) All Types of Commercial Aquaculture

California communities that are considered fishing communities under the MSA at 50 C.F.R. § 600.345(b)(3) may be especially vulnerable to impacts from finfish or IMTA aquaculture. Fishing communities in California are described in the NMFS Community Profiles for West Coast and North Pacific Fisheries (Norman et al. 2007). While this study was based on 2000 census data, it provides a detailed template on the information that would inform project-specific analyses. Information would need to be updated based on the most recent census data available. Community profiles from the South Coast region and within Los Angeles County are:

- Culver City, pp. 399 through 402;
- Long Beach, pp. 443 through 446;
- Los Angeles, pp. 447 through 454;
- Tarzana, pp. 553 through 557; and
- Torrance, pp. 558 through 561.

Figure 5.1 on p. 27 of NOAA 2022-2023 CCIEA Report (Harvey et al. 2023) shows one of the top five fishing communities in Southern California that are reliant on commercial fishing (defined by

engagement per capita in commercial fishing landings, revenues, permits, and processing through 2020) is located along the coastline near Alternative 3. Despite high reliance on commercial fishing, the data show that the communities in Marina Del Rey would experience relatively low community vulnerability if there was a downturn in the fisheries. The higher resilience conclusion is based on demographics, poverty, housing, labor force structure, and other factors. A similar analysis shows slightly different conclusions for commercial fishing engagement in coastal communities: Figure R.1 on p. S-90 in Appendix R of NOAA's 2022-2023 CCIEA Report (Harvey et al. 2023) shows Oxnard and Los Angeles as two out of the top five communities with the most engagement. Los Angeles is the higher of the two, but still remains average on the social vulnerability scale if there was a downturn in commercial fisheries engagement. More precise, localized data from these fishing communities would be needed to ground-truth these predictions.

Alternative 4: Combined Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. AOAs in both areas may distribute opportunities to more communities, which could reduce conflicts. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

If multiple areas across both Santa Barbara Channel and Santa Monica Bay were identified as AOAs under Alternative 4, the potential local and regional market impacts may occur at a broader geographic scale. As discussed in Sections D.i-iii, overall, coordinated efforts to farm different areas throughout the year to minimize overlap with commercial fishing seasons, as well as growth that considers the relative value of each site would be beneficial to all types of aquaculture. Identifying AOAs throughout the SCB may help inform and encourage this optimal way to grow offshore aquaculture that would indirectly impact markets and working waterfronts by sustainably integrating aquaculture into the existing seafood markets. If AOAs were sited in more than one geographic location, aquaculture projects sited in those AOAs may be more likely to land product or work with other auxiliary coastal facilities throughout the SCB, rather than the activity concentrated in one area. Any potential adverse impacts to waterfronts or fishing communities due to economic disruption may not be as severe if more businesses across multiple communities and counties were utilized to support a growing aquaculture sector. Potential economic opportunities may be greater, and more accessible for more people if the geographic scale of impacts were broader.

Adverse ecological impacts of facilities sited close to one another (e.g. compounding effects of noise, light, waste, wildlife aggregations) that may have downstream effects on ports and working waterfronts could also be mitigated by siting facilities across a more broad geographic context (Gentry et al. 2017, Fujita et al. 2023).

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

v. Tourism and Other Recreation

Affected Environment

The CZMA (described under Chapter 3 Section A.i.) encourages states to provide public access for recreational purposes in coastal areas of environmental, recreational, historical, esthetic, ecological, or cultural value (16 U.S.C. § 1452 (2)(E)). Generally, waters below the high tide line are held in trust for the public, open to all for dedicated or customary use such as swimming, fishing, and other recreational uses. E.O. 13840 states that it is the policy of the United States to expand recreational opportunities; in support of that policy, expanding tourism and recreation opportunities in America's oceans is one of the lines of effort in NOAA's Blue Economy Strategic Plan (NOAA 2021b). According to the most recent Bureau of Economic Analysis report, tourism and recreation was the marine sector with the largest contribution to annual US GDP compared to other marine sectors, at an estimated $231.8 billion (BEA 2023).

The AOA options in each Alternative are located between various ports/harbors and the nearby Channel Islands National Marine Sanctuary (CINMS) and Channel Islands National Park (CINP). Recreational use on federal lands and waters in and around the Channel Islands is protected and managed by a variety of statutes and regulations including the National Marine Sanctuaries Act, The National Parks and Recreation Act, Federal Lands Recreation and Enhancement Act, and CINP and CINMS' implementing regulations. E.O. 13287 also promotes preservation through heritage tourism. There are listed historic properties in the CINP that may attract tourism and recreation, for additional discussion on historic properties, see Chapter 3, Section E. Potential impacts on tourism and recreation associated with the Chumash Heritage National Marine Sanctuary are not expected due to distance, and are not discussed further.

Management of the coastal zone requires consideration of stakeholder interests and science-based recommendations to determine the best option for development within the marine environment (Nelson et al. 2019). Other CA statutes recognize marine resources for their public use benefits, aesthetic value, and recreational enjoyment (Marine Life Management Act) and seek to increase California's share of the national travel and tourism market (California Tourism Marketing Act).

Tourists are drawn to coastal communities to explore diverse outdoor environments. Attractions include marine reserve sites, ecotourism, the seascape, historical ports, lighthouses, mission sites, art galleries, shopping, fishing, diving, sailing, boating, and local seafood. Many West Coast communities promote their maritime and commercial fishing history to help attract visitors (Norman et al. 2007). The SCB has many important elements beneficial to tourism and recreation, including relatively mild climate and water temperatures for activities such as year-round boating, diving, and whale watching excursions, and proximity to the Channel Islands. In general, most recreational activities occur relatively close to the shorelines of the mainland and the adjacent islands. Recreation activities in open and offshore waters are more limited to those accessed by marine craft, including boats, jet skis, kayaks, and surfboards because of the distance from shore. The activities, therefore, are limited primarily to fishing, surfing, kayaking, canoeing, snorkeling, scuba diving and sightseeing from watercraft (CDFW 2019). Whale watching and other types of wildlife viewing are very popular attractions along the coast of California. Trips are offered year-round with different peaks of activity for different species. Generally, using recreational vessel movement as a proxy, there is more activity in the summer and less in the winter (USCG 2023).

Stressors

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- fixed gear and other equipment placement in the water column and surface;
- increased vessel traffic in and out of coastal areas;
- new areas where wildlife aggregations may occur; and
- changes in ecosystem services that support tourism and other recreational activities.

Further details on how the proposed action and siting aquaculture may have an indirect impact on tourism and recreation via ecosystem services that support recreation and tourism (e.g. marine debris impacting

the value of the seascape, entanglement risk for whale species targeted by whale watching tours, the need for shore side industrial-use infrastructure, viewscape analysis, etc.) is provided throughout other sections of this chapter. For example, recreational SCUBA divers care about water clarity and visibility in kelp forest and rocky reef ecosystems, but a detailed discussion of potential impacts to water quality is not repeated here.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

The growth of offshore aquaculture within an identified AOA may impact tourism and other recreational activities in the SCB due to geographic, ecological, and aesthetic interactions. Impacts may be adverse and beneficial, direct and indirect. The identification of an AOA would not disqualify tourism or other recreational activities. However, recreational ocean users may experience changes in transit patterns and/or access due to increased vessel traffic or safety restrictions around fixed gear and other equipment placed in the water column or surface. Safety buffers may be set up around project sites during survey operations, construction, maintenance, active operations, and decommissioning activities. Nuisance impacts may include aesthetics, dust emissions, water quality degradation, and increased traffic that disrupt the recreational experience (CDFW 2019). Offshore facilities would be identified with appropriate markings for safety of navigation to identify facilities to other ocean users in the area and avoid potential conflicts, for more detail see Chapter 3, Section D.vi (Transportation and Navigation). With the exception of permanent restricted access zones that may be established, many of these impacts would likely only affect tourism and other recreational activities temporarily while work was underway. There are disagreements in the literature regarding how the visual impact of aquaculture operations interacts with the tourism sector (Agular-Majarrex et al. 2017); for additional discussion of visual impacts see Chapter 3, Section B.v (Air Quality and Aesthetics).

Wild fish aggregate around aquaculture facilities (Rhodes et al. 2023a). Having new reliable wildlife aggregation locations could create new opportunities for tourism and other recreational activities; for example, snorkel and scuba tours get close to aquaculture facilities in Hawaii to view aggregating wildlife (DLNR 2007). Considering the interaction of oil and gas platforms in the SCB with recreational fishing activities as a proxy, vessels under 30.5m (100 ft.) are allowed within the standing, long-term buffer (BOEM 2018). Most recreational vessels are likely small enough to operate within an AOA and very close to a project footprint, in order to take advantage of wildlife aggregations that may occur. However, certain vessels could be excluded completely due to new operation practices (e.g. increased fuel consumption by vessels having to avoid project footprints in an AOA and higher expenditures on fuel). New types of tourism and recreation could develop associated with aquaculture, like festivals or aquaculture tours (Marcus 2022), however aquaculture facilities generally attract little tourism (CDFW 2019).

The chance of displacement/disruption and the severity of impact on tourism and recreational activities would depend on how changes in traffic and/or access interact with existing recreational areas and with ecosystem services that attract dynamic recreation. The timing and location of many tourism and recreational activities may be variable across the SCB because they respond to dynamic ocean conditions. Aquaculture projects may vary in terms of size, complexity, location and operational patterns, therefore

impacts are expected to be variable and highly localized, and would be considered in site-specific NEPA analyses. It is likely that projects sited in an AOA would be subject to the same or similar conditions applied in other aquaculture projects adopted to minimize spatial and temporal overlap and user conflicts, see Table ES-1 CDFW (2019). Given the size of these facilities in comparison to the available space for offshore recreation, and patterns of historical recreation estimated via vessel movement, the risk of adverse effects that displace, impede or disrupt tourism and other recreation is low.

Socioeconomic interactions between the aquaculture sector and the tourism/recreation sector are generally associated with ports and working waterfronts, for more detail see Chapter 3, Section D.iv (e.g. potential economic costs and benefits to shore side businesses). All of the activities discussed in this section contribute to the local economy and employment (Sea Grant 2023). Tourism and recreation is estimated to employ 64% of the WCR marine economy (NOAA OCM 2023). The extent to which potential changes in ecosystem services, experience, and patterns of access or transit may impact patterns of business or have direct or indirect effects on the economic value associated with tourism and recreation would be considered in site-specific NEPA analyses. The tourism and recreation sector includes a wide range of businesses that attract or support marine-based tourism and recreation, such as eating and drinking establishments, hotels and lodging, scenic or wildlife viewing tours, aquariums, parks, marinas, boat dealers, recreational vehicle parks and campsites, and associated sporting goods manufacturing. Many of the activities associated with this sector, such as hotels and restaurants, are not always directly marine dependent (Sea Grant 2023). Considerations include, but are not limited to:

- travel and opportunity costs;
- disproportionate impacts to small and large business entities; and
- disproportionate impacts to certain communities.

Recreation can also contribute to community well-being and the maintenance of historic ties, and constitute a traditional or cultural use for both tribal and non-tribal communities (see also Chapter 3, Sections E.i and E.ii).

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Spatial data for tourism and other recreation was captured via recreational vessel movement in the SCB from 2010 through 2019 and incorporated into the Atlas (Morris et al. 2021). The data resources used are provided on pp. 60 through 73, and on p.27 of the Methods section, as well as in Appendix A of the Atlas (Morris et al. 2021). Smaller vessel types important for recreation and tourism that are not required to use AIS (e.g., small pleasure and sailing vessels) may be under-represented, but it is reasonable to assume the vessel activity observed likely represents where those vessels primarily operate and that unsuitably high-use areas have been avoided, minimizing impacts on tourism and other recreation (USCG 2023; Morris et al. 2021).

The tourist business is of prime importance to the economy of the area. Of the total ocean economy for Ventura County as measured by GDP, tourism and recreation made up 56.5%, or $677.5 million, with an average of $44,600 GDP per employee in 2018 (BOEM 2022). Tourists are drawn year-round by the mild climate and ocean-side location. Beaches, fishing piers, marinas and shoreline parks are available and the harbor area of the city of Santa Barbara is a popular center for boating, deep-sea fishing, and other water sports (BOEM 1971).

The nearby Channel Islands are used by the public for tourism and recreational purposes (e.g., various kinds of boating, diving, tourism, surfing, swimming, hiking, and camping, and wildlife viewing). These

activities originate from harbors, coves, and marinas along the mainland coast, generally by ferry or boat from Ventura, Santa Barbara, or Channel Islands Harbors. Whale watching occurs year-round, but is more extensive in the region in the spring and summer (during the annual gray whale northward migration and peaks for humpbacks and blue whales); bird watching and marine mammal observation are popular year-round. Recreational diving at shipwrecks and natural areas around the Channel Islands is also popular (NPS 2017b). The Santa Barbara Channel is one of the best spots in the world for boat-based blue whale watching (O'Connor et al. 2009) and has been designated as an international Whale Heritage Area by the World Cetacean Alliance (WCA n.d.).

The chance of displacement or disruption to the recreational experience and the severity of impact on tourism and recreation would depend on the site-specific and variable interactions between changes in access, transit, and ecosystem services that attract tourism and recreation. Passenger transit routes from Ventura and Oxnard have been avoided, but more detailed information on site-specific areas of interest for recreation, including whale-watching routes, would be considered via project-specific planning and site-specific NEPA analyses. Data gathered in the Atlas show the highest number of vessel transits in the area from the "other" category, which may actually encompass some tourism and recreational uses, followed by "passenger", then pleasure and sailing transits (Morris et al. 2021). For a detailed description of potential impacts on vessel traffic, see Chapter 3, Section D.vi. (Transportation and Navigation).

Each AOA option within Alternative 2 ranges from 1,500 to 2,000 acres (607 to 809 ha) and the total combined acreage in Alternative 2 is 15,000 acres (6,070 ha), or 60.7 km^2 (23.4 mi^2), see Table 2.Given the size of these facilities in comparison to the available space for offshore recreation, and patterns of historical recreation estimated via vessel movement, the risk of adverse effects that displace, impede or disrupt tourism and other recreation is low.

a) Shellfish and Macroalgae

Kelp aquaculture is a winter crop, and peaks of operational activity could coincide with generally seasonally lower vessel traffic and tourism/recreation. Aggregations of marine mammals, seabirds, predatory fish and schooling fish are observed near marine aquaculture worldwide, regardless of the species farmed (Rensel and Forster 2007, Bath et al. 2023, and Rhodes et al. 2023a). In addition to aggregating effects, shellfish and seaweed aquaculture may provide ecosystem services that benefit regional tourism and recreation activities (clean the water, protect and stabilize shorelines, provide habitat for wild marine species, etc., Nelson et al. 2019). Each of these benefits indirectly improves the ability of these areas to be used for tourism by allowing for cleaner, more stable, and more productive habitats that provide services that are desirable for visitors. Kelp and mussel farms, while offering potential benefits like wave attenuation and ecosystem restoration, can also impact surfing conditions. Kelp farms can alter wave patterns, potentially creating less desirable waves for surfing, especially if they are large.

b) All Types of Commercial Aquaculture

There may be less seasonality and more frequent vessel operations associated with aquaculture operations targeting finfish that may displace or disrupt tourism and recreation compared to Alternative 2a, and different impacts to ecosystem services that support tourism and recreation (see Chapter 3, Section B.iv. (Water Quality).

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Santa Monica Bay, offshore of Greater Los Angeles, provides crucial habitat for marine life. The bay and its beaches attract residents and visitors alike. More than 45 million people visit the bay's beaches each year, helping to support a regional tourism industry of $10 billion annually (USGS 2003). Santa Monica Bay is used for fishing, sailing, swimming, diving, and many other recreational activities. The abundant recreational facilities (including 22 public beaches, a 22-mile-long beach bike path, six piers, small craft

harbors with 6,000+ slips, and nine artificial reefs) make the area attractive for a wide range of water-dependent activities (CRWQCB 1997). Tourism and recreation targeting the Northern Channel Islands, which include the bulk of CINP and CINMS, are less likely to depart ports and harbors in Santa Monica Bay compared to Alternative 2, however there is a ferry from Santa Monica to Santa Catalina Island in the southern Channel Islands, and some multi-day cruises that visit the Channel Islands depart from LA.

Spatial data for tourism and other recreation was captured via recreational vessel movement in the SCB from 2010 through 2019 and incorporated into the Atlas (Morris et al. 2021). The data resources used are provided on pp. 60 through 73, as well as on p.27 of the Methods section, as well as in Appendix A of the Atlas (Morris et al. 2021). Smaller vessel types important for recreation and tourism that are not required to use AIS (e.g., small pleasure and sailing vessels) may be under-represented, but it is reasonable to assume the vessel activity observed likely represents where those vessels primarily operate and that unsuitably high-use areas have been avoided, minimizing impacts on tourism and other recreation (USCG 2023, Morris et. al 2021). Additionally, USCG has noted an increase in traffic over the last decade that appeared to be predominantly associated with pleasure craft near the port of LA and concluded that it may be indicative of increased voluntary carriage of AIS on these boats, but not necessarily an actual increase in traffic volume (USCG 2023). The Harbor Safety Plan for the Ports of Los Angeles and Long Beach has recommended for small craft to carry AIS equipment (MESC 2023).

Based on AIS data analyzed in Morris et al. (2021), there are less than 100 transits by pleasure, sailing, and fishing craft through the area in a year. The two AOA options within Alternative 3 are 500 and 1,000 acres (202 and 405 ha), for a combined total of 1,500 acres (607 ha), or 6.1 km^2 (2.4 mi^2), see Table 3. Because there is less recreational vessel traffic in the Alternative 3 area overall and the potential total footprint is smaller, impacts to tourism and recreation may be reduced compared to Alternative 2.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

Alternative 4: Combined Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. AOAs in both areas may distribute opportunities to more communities, which could reduce conflicts. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

Impacts under Alternative 4 assume that if multiple AOAs were identified across both the Santa Barbara Channel and Santa Monica Bay, then more aquaculture may develop in the identified areas. If aquaculture increased in scale, so would vessel traffic volume and operations that may displace or disrupt recreation. It is possible that more geographically broad operations would interfere with the efficient movement of dynamic wildlife viewing tours compared to siting in a more concentrated area. If facilities were to be sited more broadly throughout the SCB or west coast, the range and scope of impacts on tourism and other recreation may also be more broad and unpredictable. Alternatively, ecological impacts of facilities sited close to one another that may have direct and indirect effects on tourism and recreation (e.g.

compounding effects of noise, light, waste, wildlife aggregations) could be mitigated by siting facilities across a more broad geographic context (Gentry et al. 2017, Fujita et al. 2023).

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

vi. Transportation and Navigation

Affected Environment

Section 10 of the Rivers and Harbors Act prohibits the creation of any structures that may alter the navigable capacity of any of the waters of the US. Section 4(f) of the OCSLA (described under Section B.iii. (Seafloor Characteristics)), and extends the jurisdictional authority of USACE under Section 10 throughout the outer continental shelf within the EEZ (43 U.S.C. § 1333(e)). The USACE issues a Section 10 permit for any activities in the OCS that would result in obstructions to navigation (33 C.F.R. Parts. 320, 322, 325, 329, and 330). Aquaculture facilities sited in an AOA would likely need a Section 10 permit for any moored structures or other fixed gear.

USCG is responsible for safeguarding navigation on the high seas and navigable waters of the U.S. (33 C.F.R. Part 1) and administers the U.S. Aids to Navigation System (33 C.F.R. Parts 60-76). All US flag vessels must adhere to the international and inland "Rules of the Road" for navigation in the International Regulations for Preventing Collisions at Sea (72 COLREGS, as amended), and the U.S. Inland Navigation Rules (33 CFR 83). USCG has the authority to establish vessel traffic service/separation schemes for ports, harbors, and other waters subject to congested vessel traffic, and enforce port safety and security regulations. Permission to build any structure requiring personal aids to navigation (PATONs), as well as permission to place PATONs in navigable waters, is required from the USCG (33 C.F.R. 66, 14 U.S.C. 542, 543, 544 and 43 U.S.C. 1333). A PATON is a buoy, light, or beacon that is owned and maintained by any individual or organization other than USCG. The need for and type of PATON is reviewed by the USCG; installation and maintenance of the PATON is the responsibility of the owner or operator. To gain a PATON permit, an applicant would need to submit a CG-2554 Private Aids to Navigation permit application after obtaining the Section 10 permit from USACE. The USACE permit number is required as part of the USCG application. USCG consults local resources in the permit review process ensuring that a permitted aid is not creating a hazard to mariners using that water way (USCG pers. comm. May 2023).

Overall, the SCB has a high volume of vessel traffic, ranging from sailing and pleasure craft to major shipping, oil tankers, and military vessels. Southern California has two of the largest and busiest commercial marine ports in the United States (Los Angeles and Long Beach), and Newport Beach is a popular recreational boating area, which creates significant vessel traffic around the Santa Barbara and Santa Monica alternative areas of analysis. There are a variety of vessel routing measures adopted to ensure safety of navigation that shape existing traffic patterns, including traffic separation schemes, fairways, and corridors (Morris et al. 2021). Vessel traffic data are collected in real time by USCG using very high frequency maritime-band transponders called the automatic Identification system (AIS); this system is capable of handling over 4,500 reports per minute and updates every two seconds (USCG

2020). Generally, the majority of vessels in the SCB are recreational vessels, followed by cargo vessels; cargo vessels tend to follow typical routes 25-40 NM offshore while passenger and recreational vessel transits are more dispersed (Morris et al. 2021, USCG 2023). There is seasonal variability in the number of vessels, number of transits, and distance traveled, while generally high traffic is in the summer and the lowest traffic in the winter (USCG 2023). There is a voluntary 10 knot or less speed reduction zone to reduce air pollution, ocean noise and whale strikes that encompasses most of the SCB; it is in effect from May to December each year, targeted towards vessels 300 GT or larger, and is incentivized in some zones near ports (USCG 2024).

Since the completion of the Atlas, USCG published an updated Pacific Coast Port Access Route Study (PACPARS, Docket Number USCG-2021-0345), examining vessel traffic data from the past decade to determine whether new or modified vessel routing measures were needed to ensure safety of navigation along the U.S. Pacific Coast due to evolving demands for use of coastal waters. The analysis found that fishing, recreational, passenger, 'other' ship types, and vessel traffic overall off the Pacific Coast had increased over time, and that Los Angeles/Long Beach showed the most noticeable increase of any port area (USCG 2023). None of the updated routing measures that resulted from this effort should cause any significant changes to traffic or traffic density considered in the spatial planning process; new voluntary fairways were designed to encompass past and current vessel traffic. While both the Atlas and the PACPARS used AIS data to characterize vessel traffic and not all vessel types (fishing, recreational, etc.) are required to broadcast AIS, it is reasonable to assume that the vessel activity observed likely represents where those vessels primarily operate (USCG 2023). Generally, more detailed and up to date site-specific navigational risk assessments, including vessel traffic analyses, are likely to be part of the permitting process for future projects.

Stressors

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- Fixed gear, other equipment in the water column and surface; and
- Changes in vessel traffic volume and patterns.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Only potential impacts on transportation and navigation at sea are considered here; shore-side impacts are not considered.

If an AOA were identified and aquaculture projects were sited in an AOA, there could be potential for direct adverse impacts on transportation and navigation associated with the potential introduction of new structures, obstructions, or hazards to navigation. Interactions with other vessels could include buoy/marking misinterpretation, allision, collision, and entanglement with fixed gear or derelict gear that has separated and become loose and potentially unmarked. See Figures 2-3 through 2-7 in CDFW (2019) for examples of nominal gear configurations and information about the types of lines and anchors used for different types of aquaculture operations. Vessel interactions may also lead to damaged gear, loss in revenue, and human health and safety risks. However, all future aquaculture facilities would be required to comply with federal regulations adopted to ensure safe marine vessel movement, including appropriate

marking (PATONs). In data analyzed from 2015 through 2018, nine out of 16 marine mammal entanglements with gear from an unknown source still had buoys attached (NMFS 2023d). There is no alternative location that could avoid the risk of a line or anchor separating. Projects sited in an AOA would be subject to the same or similar conditions designed to minimize impacts (e.g., requirements for gear maintenance, remote monitoring, response time and recovery, etc.) as those required for other aquaculture projects, see CDFW 2019, USACE 2021. Assuming all permit conditions are followed and no lines or anchors separate, the risk of vessel interaction is low. Site-specific NEPA analysis of impacts from offshore aquaculture activities on fishery resources may consider the effects of the proposed action on fishing vessel safety of navigation and safety of human life at sea.

The growth of offshore aquaculture within an identified AOA could disrupt established navigational patterns of marine vessels and increase vessel traffic volume, both offshore and near ports and harbors. Factors that may influence the extent of impacts AOA-associated vessel traffic may have on transportation and navigation include vessel speed, the number of vessel trips needed to install and tend to gear, distance traveled, existing volume and density of vessels in the area, and seasonality or timing of vessel operations. These factors and the impact they may have on existing transportation and navigation would vary by operation and location relative to ports, processing, and shipping infrastructure, and would likely be considered and minimized in permit conditions for in-water work. Safety buffers, speed reductions and exclusion zones may be implemented near and within project sites during certain kinds of work or permanently. The actual surface footprint of an aquaculture facility that may impact transit patterns is expected to be smaller than the lease area, see Figure 2-2 and Table 2-2 of CDFW (2019).

An environmental assessment for twenty 100-acre (40 ha) aquaculture sites (2,000 acres (809 ha) total) offshore of Ventura estimated a vessel increase of 20 to 40 small boats traveling to lease sites on an average of 3 times per week to daily (VPD 2018), and the navigational risk assessment determined that this amount of added vessel traffic would not be a significant increase given the existing vessel traffic coming in and out of Ventura Harbor (VPD 2020). See Tables 4-8.3 and 4-8.4 in CDFW (2019) for an estimated number of vessel trips associated with various kinds of aquaculture facilities and operational phases. If all the AOA options were selected and 3-5 projects operated at each site, thousands of additional vessel trips could be added to the SCB annually, plus more during periods of installation/decommissioning. However, all AOA-associated vessels would comply with all navigation and vessel regulations, including vessel traffic service/separation schemes for ports, harbors, and other waters subject to congested vessel traffic. For additional discussion on individual AOA option proximity to and expected impacts on particular ports and working waterfronts, see Chapter 3, Section D.iv. Site-specific navigational risk assessments would consider if the increase in vessel traffic in and out any port/harbor would constitute a meaningful change from baseline conditions or post a significant risk beyond what can be safely handled by the port/harbor.

The quantity and impact of future vessel traffic and new structures, obstructions, or hazards to navigation are unknown at this time, and impacts on transportation and navigation would be highly localized. Overall, impacts to transportation and navigation are minimized because the AOA options that were selected as a result of spatial modeling in the Atlas avoid conflicts with established shipping lanes/fairways, traffic separation schemes, routes frequently traveled by other commercial and recreational vessels, and other important sites like harbor pilot boarding areas. Fixed gear in the water would not change the navigable capacity of the water space as long as compliance measures for navigation are followed, discussed in Chapter 3, Section D.vii (Offshore Energy and Public Services), below. Enforcement of navigation and vessel regulations and permit conditions would ensure that hazards to navigation and impacts on vessel traffic patterns are minimized to the extent feasible. Safety concerns associated with accidents or noncompliance are discussed in Chapter 3, Section D.viii (Public Health and Safety). For discussions on the potential impacts of vessel strikes on protected species, see Chapter 3, Section C.i. For discussions on water quality, air quality, and noise concerns associated with vessel

traffic, see Chapter 3, Section B.iv through B.vi, and for discussion of the cumulative impacts of all vessel traffic in the Action Areas, see Chapter 4, Section B.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Spatial data for vessel movement in Alternative 2 from 2015 through 2020, divided by AOA option and vessel type, are summarized in Tables on pp. 130, 133, 136, 156, 159, 162, 165, and 168 of Morris et al. (2021). Generally, the majority of transits through the AOA options are from the "other" and "passenger" vessel categories. Smaller vessels that are not required to use AIS may be under-represented in the Atlas, but it is reasonable to assume the vessel activity observed likely represents where those vessels primarily operate and unsuitably high traffic areas have been avoided. Smaller commercial passenger and recreational vessels may be piloted by less experienced operators who are less adept at spotting and avoiding aquaculture operations compared to licensed Captains with extensive experience piloting large commercial vessels like cargo ships.

Each AOA option within Alternative 2 ranges from 1,500 to 2,000 acres (607 to 809 ha). The total combined acreage in Alternative 2 is 15,000 acres (6,070 ha), or 60.7 km^2 (23.4 mi^2). Depending on the number of AOA options selected, this could result in many projects, with their associated vessel traffic and infrastructure. Upon receiving the PATON permit application for a project, USCG could determine if a site-specific Navigation Safety Risk Assessment (NSRA) is required. The USCG may also require a navigation risk assessment when they see a public or agency notice from USACE.

Alternative 2 overlaps with a military training route for activities at the Point Mugu Sea Range (PMSR). In coordination with the DoD clearing house, the Point Mugu Sea Range and other national security areas were assigned a score of 0.5 in the spatial modeling (a score of zero meant not compatible with aquaculture). It is not anticipated that this interaction may cause conflict, because consultation with the Navy during the spatial analysis process suggests that the AOA options in Alternative 2 may be compatible with military operations, though they may be subject to certain stipulations and final design review (e.g. aquaculture facilities may have height restrictions and lighting requirements). Even with this overlap, there was minimal military vessel transit in Alternative 2 over the 2015-2020 period considered, with only one transit noted through AOA options (Morris et al. 2021). While it does not overlap, the AOA option closest to Ventura harbor is also 0.5 km (0.27 nm) from a corridor used by service vessels for nearby oil and gas platforms. Since the publication of the DPEIS, the Navy released a Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for the next period of Hawaii-California Training and Testing, with an expanded study area and scope of activities (U.S. Navy 2024). Future project applicants that may potentially-overlap with a military use area would also need to go through the DOD clearinghouse to ensure the most up to date information was applied to permitting decisions and any site-specific NEPA analyses.

a) Shellfish and Macroalgae

In addition to the general impacts discussed above, different types of aquaculture operations may have different requirements for vessel speed, the number of vessel trips needed to install and tend to gear, seasonality or timing of vessel operations. These factors would likely be incorporated into permit conditions for in-water work. Kelp aquaculture is a winter crop, and peaks of operations could coincide with generally seasonally lower vessel traffic. The risk of impacts on transportation and navigation would depend on the number and operational tempo of vessels associated with a project and its associated

infrastructure. The type of aquaculture may be less of a consideration relative to project footprint and production size.

b) All Types of Commercial Aquaculture

In addition to the general impacts discussed above, there may be less seasonality and more frequent vessel operations associated with aquaculture operations targeting finfish compared to Alternative 2a. It is estimated that finfish operations would require more vessel trips during general operations, possibly daily, compared to shellfish and macroalgae operations, but less during installation and decommissioning (CDFW 2019).

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Spatial data for vessel movement in Alternative 3 from 2015 through 2020, divided by AOA option and vessel type, are summarized in Tables on pp. 188 and 191 of Morris et al. (2021). The AOA options in Alternative 3 have less existing vessel traffic than AOA options in Alternative 2 and the vessel traffic that does occur is done by smaller vessel types; no cargo, military, or other large vessel types were reported. Based on AIS data analyzed in Morris et al. (2021), there are less than 100 transits by pleasure, sailing, and fishing crafts through the AOA options in a year. Smaller vessels that are not required to use AIS may be under-represented in the Atlas, but it is reasonable to assume the vessel activity observed likely represents where those vessels primarily operate and unsuitably high traffic areas have been avoided. Because there is less vessel traffic in the Alternative 3 AOA options overall, impacts to transportation and navigation may be reduced compared to Alternative 2. The two AOA options within Alternative 3 are 500 and 1,000 acres (202 and 405 ha), for a combined total of 1,500 acres (607 ha), or 6.1 km^2 (2.4 mi^2). Depending on the number of AOA options selected, this could result in several projects and their associated vessel traffic and infrastructure, which is less in aggregate than Alternative 2. Upon receiving the PATON permit application for a project, USCG may determine if a site-specific NSRA is required.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

Alternative 4: Combined Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

AOA options areas across Santa Barbara Channel and Santa Monica Bay may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified. If aquaculture increased in scale, so would vessel traffic volume and the introduction of new structures, obstructions, or hazards to navigation. Choosing one AOA option from each area, the nearest to shore, could enable the most efficient transportation between offshore sites and coastal facilities and further reduce potential impacts on transportation and navigation. Enforcement of navigation and vessel regulations and permit conditions would ensure that impacts on vessel traffic patterns and hazards to navigation are minimized to the extent feasible.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

vii. Offshore Energy and Public Services

Affected Environment

This section provides a brief background and discussion of the potential impacts of the Proposed Action on offshore energy and public services not addressed in other portions of the EIS, including offshore oil, gas and wind energy, marine minerals, submarine utilities (cables and pipelines), direct ocean-outfalls, and scientific research and surveys, which would result from the Project, action alternatives, and ongoing and planned activities in the geographic analysis area.

Oil and Gas

The Bureau of Ocean Energy Management (BOEM) is responsible for managing and regulating offshore activities in the Outer Continental Shelf (OCS), such as oil and gas, alternative energy, and marine minerals operations. The Agency's mission is to manage and regulate development of energy, mineral, and geological resources in an environmentally and economically responsible way. BOEM manages the energy resources in the OCS under the authority of the Outer Continental Shelf Lands Act (OCSLA). The OCSLA implemented federal regulatory control of the OCS, defined as all submerged lands beyond the lands reserved to the States up to the edge of the United States' jurisdiction and control. In addition to the OCSLA, the Submerged Lands Act (SLA) was passed to give individual states the right to the natural resources of submerged lands from the coastline to 5.6 km (3 nm) into the Atlantic, Pacific, the Arctic Oceans, and the Gulf of America, except off Texas and the west coast of Florida, where state jurisdiction extends from the coastline to no more than three marine leagues 16.2 km (9 nm) into the Gulf of America. In 2005, the Energy Policy Act amended the OCSLA to extend BOEM's authority to manage marine renewable energy projects on Federal offshore lands, and other projects that make alternative use of existing oil and natural gas platforms. Besides this jurisdiction and regulatory authority, BOEM also relies on other Federal mandates to manage offshore energy structures and the environment, such as the Oil Pollution Act, NEPA, and CZMA.

The OCS is a significant source of oil and gas for the Nation's energy supply. In FY 2020, offshore Federal production reached about 641 million barrels of oil and 882 billion cubic feet of gas, almost all of which was from the Gulf of America (BOEM 2021). The current assessment of undiscovered oil and gas resources estimates most of the potential energy resources are in the Gulf of America and Alaska regions; however, the Pacific (U.S-Canada border to U.S-Mexico border) ranks third for gas potential and fourth for oil (BOEM 2021). Most of the resources in the Pacific are predicted to be in the Southern California Planning area (north of Point Sal to the U.S-Mexico border). In fact, only the Southern California OCS Planning Area has oil and gas leases and development (Argonne National Laboratory 2019). Currently, there are 38 existing Federal leases and 23 constructed platforms in the Southern California OCS Planning Area (BOEM 2021). Among these lease areas, 14 oil and gas fields are actively producing energy from 21 platforms (20 producing and 1 processing platform); 13 platforms are located offshore of Santa Barbara County, four platforms offshore of Ventura County, and four platforms offshore Long

Beach, near the boundary of Los Angeles and Orange Counties (Argonne National Laboratory 2019). The 23 platforms are located 6-17 km (3.2-9.2 nm) from shore. There are oil and gas platforms within 5 km of all of the Alternative 2 AOA options except N2-D (see Figures 3.47 and 3.64 in the (Morris et al. 2021)). The last new platform installed was in 1994, so most of the platforms are near their operational lifespan; seven structures are being considered for decommissioning (BSEE 2020). In state waters, California prohibited oil drilling in 1969 and the authority was reinforced under the California Coastal Sanctuary Act in 1994.All existing platforms have been avoided in the spatial planning process, however BOEM has the right to lease the outer continental shelf at any time in the future.

Alternative Energy

The development of alternative energy is a relatively new industry in the U.S despite its long history outside the country. In 2016 and 2018, BOEM began evaluating potential wind energy development in the OCS and announced the designation of the Humboldt Wind Energy Area (WEA) and the Morro Bay WEA in 2021. The Humboldt WEA is located approximately 32 km (20 mi) offshore the northern California coastline and encompasses 132,369 ac (206.8 mi^2). The Morro Bay WEA is located approximately 32 km (20 mi) offshore the central California coastline and comprises around 240,898 ac (376 mi^2). BOEM held a lease sale in 2022. Currently, BOEM has federal oversight authority on five WEA leases in the OCS off California, two in northern California off Humboldt County, and three in Central California near Morro Bay. BOEM is currently doing programmatic environmental planning to analyze potential impacts of offshore wind energy development activities on the five offshore wind lease areas, which includes funding numerous studies to collect information about the marine environment to support decisions concerning offshore renewable energy development. The active five WEA leases are outside and away from the Alternatives and there are no other WEAs being considered at this time.

Marine Minerals

The OCSLA provides the Secretary of the Interior the authority to manage other minerals besides oil, gas, and sulfur on the OCS. The Department of the Interior's (DOI's) jurisdiction over exploration, leasing, and recovery of non-energy marine minerals, or hard minerals, extends to the subsoil and seabed of all submerged lands seaward of state boundaries to the OCS (except where modified by international law or convention or affected by the Presidential Proclamation of March 10, 1983, regarding the Exclusive Economic Zone [EEZ]). Under this authority, BOEM developed the Minerals Program to address erosion on coastal beaches, dunes, barrier islands, and wetlands. The Marine Mineral Program (MMP) identifies large sand resource areas and then partners with USACE, states, and local authorities to designate sand borrow areas. Based on the Marine Minerals Information System, there are no active OCS lease areas for marine minerals within or in the vicinity of the AOA options. There are only two marine minerals offshore study areas in Southern California; one is near Oceanside and the other is off San Diego. Both sand resource areas are away from all AOA options.

The Agency also responds to commercial requests for valuable OCS minerals, such as gold, manganese, or other hard minerals. Pursuant to Executive Order 13817, the MMP and the U.S. Geological Survey are collaborating to determine which 35 critical minerals are located on the OCS. In international waters, outside of U.S jurisdiction, companies funded by international countries are proposing to mine nodules in the central Pacific Ocean over the next 5 to 7 years under the governance of the International Seabed Authority. In the United States, the Deep Seabed Hard Mineral Resources Act (30 U.S.C. Chapter 26 – Deep Seabed Hard Mineral Resources) establishes an interim domestic licensing and permitting framework for deep seabed hard mineral exploration and mining in international waters pending adoption of an acceptable international regime. The U.S. has two active exploration licenses (USA-1 and USA-4), both held by Lockheed Martin for five-year terms, that were last reissued for 2022-2027. Currently, there are no ongoing or proposed mineral mining activities within or adjacent to any of the AOA options.

Submarine utilities

Submarine cables have been used to transport telecommunications data over great distances for over 150 years. Cables transport information and power (electrical) under the seabed often connecting countries around the world. Despite the importance of satellites, undersea cables are still essential for the internet, global financial markets, and military applications, especially fiber optic cables. Undersea cables are scattered off every coastal state along the east and west coasts of the United States, including Southern California. Fiber optic cables provide high speed data transmission connecting California cities, California to Hawaii, and the U.S. to other countries across the Pacific Ocean, while submarine power cables provide shore-based power to several offshore oil platforms. The laying and placement of submarine cables requires coordination, and the installation, maintenance, repair, and removal of cables in certain areas may have an adverse impact on the marine environment and other valuable resources. To help ensure the coordination of cable placement and minimize potential adverse impacts, several federal (NOAA, USACE, BOEM, FERC, and FCC) and state agencies (within state waters) have legal authority to regulate the laying and maintenance of cables under various laws, such as the OCSLA.

Industrial pipelines and direct commercial and public point source (publicly owned treatment works [POTW]) ocean outfalls are also found along the coast in many regions, including the offshore waters off Southern California, which contribute to local nutrient (phosphorus and nitrogen) loads. In Southern California, pipelines are generally associated with oil and gas operations, while outfalls are primarily associated with public treatment plants. Regulated point source pollution includes numerous permitted outfalls from industrial (oil and gas operations) and commercial sources, including six POTWs that discharge into the Santa Barbara Channel (Argonne National Laboratory 2019). These structures are found on the seafloor and function to transport and diffuse treated wastewater from onshore treatment plants.

Various types of submarine utilities infrastructure are present on the seafloor near the Alternatives, which includes submarine cables (fiber optic and power), oil and gas pipelines, and ocean outfalls (see Table 3.3 and Figure 3.5 in Morris et al. (2021)). The SoCal Cable and Commercial Fishing Committee publishes an annual cable awareness flyer with the most updated known locations for submarine utilities (SBCFLC 2024). There are no oil and gas pipelines found within any of the AOA options. Similar to oil platforms, a 500 m (1,640 ft.) setback from cables and pipelines was established for potential future aquaculture operations and the nearest pipeline is 0.8 km (0.4 nm) from AOA option N1-C. The setback distance for all outfall pipes and diffusers was at least 5.5 km (3 nm).

Ocean Research and Monitoring

Various federal, state, and educational organizations regularly conduct scientific research, including aerial-and ship-based scientific surveys, within the geographic analysis area. Marine surveys are conducted from federal and state vessels, chartered fishing vessels, planes, and autonomous vehicles using a variety of techniques and gears. These oceanographic surveys include long-term and seasonal scientific surveys conducted by NOAA for several regional programs, such as the California Current Ecosystem Survey and marine mammal population assessment surveys. The California Cooperative Oceanic Fisheries Investigations (CalCOFI) also conducts quarterly surveys off southern and central California to collect environmental and marine ecosystem data. Researchers use these data to study the California Current, manage its living resources, and monitor the indicators of El Niño and environmental variation. Under a partnership with NOAA and Scripps Institution of Oceanography, CalCOFI conducts quarterly surveys from north of San Francisco Bay to San Diego, which extend 500 km (300 mi) offshore, spanning state, national, and international waters. Historically, various marine research projects have been conducted within and around the Channel Islands National Marine Sanctuary. The proposed Alternatives off Santa Barbara and Santa Monica are nearby existing state, federal, and academic oceanographic research study sites.

Stressors

The main offshore activities that are introducing stressors (air and water pollutants) to the local marine environment within or vicinity of the Alternatives are primarily associated with oil and gas operations, pipeline (direct ocean outfalls), and vessel traffic. It should be noted the largest contributor of hydrocarbons are naturally occurring oil and gas seeps found in Southern California, including within the SCB (~ 26 tons/day). Produced water (water, oil, and gas mixture from extraction) from oil and gas operations represents the greatest discharge of petroleum-related chemical constituents followed by well completion and treatment fluids (Argonne National Laboratory 2019). Drilling and liquid (e.g., cooling water and fire control system water) waste is also discharged into the local waters from oil and gas operations. Despite these discharges, offshore oil and gas operations are considered a minimal contributor of pollution in the Santa Barbara Channel, but the amounts of hydrocarbon pollutants are higher than other anthropogenic sources (Lyon and Stein 2010); discharges from oil and gas platforms are smaller in volume and constituent mass then POTWs (Argonne National Laboratory 2019). There are six POTWs that discharge into the Santa Barbara Channel; however, they use secondary treatment and discharge less than 25 mgd (Continental Shelf Associates 2005). All discharges are restricted to uncontaminated or properly treated effluents that require best management practice or numeric pollutant concentration limitations as required through the US EPA National Pollutant Discharge Elimination System (NPDES) permits and USCG regulations. Another significant ongoing stressor is pollutants from marine vessels, which are responsible for contributing to GHG. It is well-documented that marine vessels with diesel engines emit pollutants contributing to GHGs, especially large ocean-going vessels (See Chapter 3 Section B.v).

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- Fixed gear, other equipment in the water column and surface; and
- Changes in vessel traffic volume and patterns.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Offshore energy (oil, gas and wind), marine minerals, submarine utilities (cables and pipelines), direct ocean-outfalls, and scientific research and surveys could be impacted by the proposed action, action alternatives, and ongoing and planned activities in the geographic analysis area. The potential impacts could vary in severity and magnitude. For instance, potential impacts could vary from an accidental anchoring issue along an oil and gas pipeline to impeding a scientific research survey.

In general, oil and gas operations, marine mineral operations, submarine utilities, and direct ocean-outfalls are not anticipated to be impacted by Alternatives 2-4 given the geographical distance to the structures and standard setbacks. Also, the offshore activities in the BOEM Wind energy areas may not be impacted by the Alternatives 2-4 given the closest WEA is offshore Morro Bay, which is more than 150 km (81 nm) away. The growth of offshore aquaculture within an identified AOA could disrupt established navigational patterns of marine vessels and increase vessel traffic volume that may have indirect impacts on operations associated with offshore energy and public services; for detailed discussion see Chapter 3 Section D.vi. (Transportation and Navigation). It is possible that oceanographic surveys could be impacted by the Proposed Action, but marine vessels operating in the area are used to spotting and avoiding structures/equipment and transiting vessels, such as commercial fishing gear and vessels. Any

future offshore aquaculture structure (e.g., submerged cages) may need to use visible floats and lights as required by BOEM and USCG, which may reduce potential risk. Future oceanographic surveys may need to alter or adjust the sampling locations. Although the risk is low that Alternatives 2-4 may impact ongoing offshore activities in the region, there is potential risk that offshore activities could impact aquaculture operations. For instance, an oil and gas pipeline could accidentally rupture and release oil impacting aquaculture species or a marine vessel traversing near the area could collide with the aquaculture equipment destroying it and releasing the harvested species. Overall, the risk is low but the magnitude would be severe. In addition, inclement weather or unexpected aquaculture mooring system failure could cause aquaculture equipment to break away and potentially impact ongoing and planned offshore activities, such as becoming entangled with a random vessel traversing through the area.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

The Santa Barbara Channel AOA options are located between 10.02 and 19.72 km (5.41 and 10.65 nm) offshore of Santa Barbara and Ventura Counties. Existing oil and gas operations, marine mineral operations, submarine utilities, ocean disposal, and direct ocean-outfalls are not anticipated to be impacted by Alternative 2 given the geographical distance to the structures. Offshore activities in the BOEM Wind energy areas may not be impacted by Alternative 2 because the closest WEA is more than 150 km (81 nm) away, offshore of Morro Bay. Alternative 2 (AOA options N1-A, N1-C, N2-C, and N2-E) overlaps with active BOEM lease blocks where leases could occur in the future. A 500 m (1640 ft.) setback was used for existing oil and gas platforms because aquaculture operations and oil and gas operations in the same space are not expected to be compatible.

Since potential aquaculture equipment would be anchored and stationary, ongoing and planned oceanographic surveys may need to alter or adjust their sampling locations, such as the CalCOFI survey. The nearest CalCOFI site is 0.7 km (0.4 nm) from AOA option N2-D. Derelict gear could potentially impact ongoing and planned offshore activities, such as becoming entangled with a vessel traversing through the area.

Overall, it is probable the potential impacts on offshore energy and public services associated with Alternative 2 would be minimal. Offshore activities could also impact aquaculture operations. For instance, an oil and gas pipeline could accidentally rupture and release oil impacting aquaculture species or a traversing vessel could collide with the aquaculture equipment destroying it and releasing the harvested species. Future oil and gas leases could create incompatible use conflicts. Overall, the risk is low but the magnitude could be severe.

a) Shellfish and Macroalgae

There is most likely no difference between shellfish and macroalgae and finfish operations since impacts on offshore energy and public services are mediated solely by geography, for discussions on differing impacts between different types of aquaculture operations on vessel traffic, see Chapter 3, Section D.iv.

b) All Types of Commercial Aquaculture

There is most likely no difference between shellfish and macroalgae and finfish operations since impacts on offshore energy and public services are mediated solely by geography, for discussions on differing impacts between different types of aquaculture operations on vessel traffic, see Chapter 3, Section D.iv.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

The Santa Monica Bay AOA options are located between 8.06 and 8.82 km (4.35 and 4.76 nm) offshore of Los Angeles County. Similar to Alternative 2, existing oil and gas operations, marine mineral operations, submarine utilities, ocean disposal, and direct ocean-outfalls are not anticipated to be impacted by Alternative 3 given the geographical distance to the structures and standard setbacks. The offshore activities in the BOEM Wind energy areas may not be impacted by Alternative 3 since the closest WEA is offshore Morro Bay. There are no active lease blocks in Alternative 3. Potential impacts to oceanographic research and monitoring may be reduced compared to Alternative 2, because there are no current CalCOFI sampling sites within 5 km (2.7 nm).

Overall, potential impacts associated with Alternative 3 would be negligible to minimal.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

Alternative 4: Combined Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. AOA options in both areas may result in fewer impacts than either alone should this alternative encourage more dispersed aquaculture activities. Alternatively, effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

Similar to Alternatives 2 and 3, oil and gas operations, marine mineral operations, submarine utilities, and direct ocean-outfalls are not anticipated to be impacted by Alternative 4 given the geographical distance to the structures and standard setbacks, however the growth of offshore aquaculture within an identified AOA could disrupt established navigational patterns of marine vessels and increase vessel traffic volume that may have indirect impacts on operations associated with on-going offshore activities. Implementing Alternative 4 would probably have the same risks associated with potential storms and equipment failures as the other Alternatives.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

viii. Public Health and Safety

Affected Environment

Public health and safety may be thought of in a few different ways in the context of offshore aquaculture. Safety may relate to human welfare at sea, including homeland security and military defense; it may include work over water, exposure to rough conditions or gear interactions, and navigation safety. Public health may relate to marine debris, seafood safety, and nutrition. Without knowing what type of aquaculture or product markets may be pursued in potential aquaculture projects, it is difficult to speculate on the impacts of these topics. However, background information and a discussion of risk is provided since any site-specific NEPA analyses would likely need to analyze the following topics if and when projects are proposed.

Human Safety and Welfare at Sea

The Code of Federal Regulations Title 32 contains laws and regulations pertaining to national security and military readiness, including the Armed Forces, intelligence, and defense logistics (32 C.F.R. § 6). Guidance on compatibility of aquaculture operations with DOD activities was provided through consultations with the Military Aviation and Installation Assurance Siting Clearinghouse (Morris et al. 2021). The way in which national security was incorporated into the Atlas is described in the following portions of the Atlas (Morris et al. 2021):

- Methods section Table 2.6 on p. 36 and Table 2.12 on p. 48;
- Results section pp. 51 through 55;
- Results section Figure 3.8 on p. 67;
- Results section p. 100; and
- Appendix A, p. A-1.

Since the publication of the DPEIS, the Navy released a Draft Environmental Impact Statement/ Overseas Environmental Impact Statement for the next period of Hawaii-California Training and Testing, with an expanded study area and scope of activities (U.S. Navy 2024). Future project applicants that may potentially-overlap with a military Operating Area (OPAREA) or other type of military use area would also need to go through the DOD clearinghouse to ensure the most up to date information was applied to permitting decisions and any site-specific NEPA analyses.

The USCG is responsible for homeland security and emergency services anywhere within the U.S. EEZ in accordance with international conventions to which the U.S. is a signatory party. Examples of international conventions that may apply to offshore aquaculture facilities include the following:

- the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) establishes safety at sea training and certification standards including radio communications, emergencies, and watchkeeping (USCG 2020);
- the International Convention on Maritime Search and Rescue establishes coordinated efforts, resources, trainings, and developed common search and rescue (SAR) plans for the safety of life at sea (USCG 2016); and
- the United Nations International Convention on Prevention of Pollution from Ships (MARPOL), the international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. In the United States, the convention is implemented through the Act to Prevent Pollution from Ships (APPS) (33 U.S.C. § 1905-1915).

The USCG assists other Federal and State authorities in the performance of their activities for the protection of the marine environment, as well as the enforcement of U.S. laws for the safety of life and property at sea (14 U.S.C. §2, 141). Under its authority in both the Ports and Waterways Safety Act (PWSA) and the Maritime Transportation Security Act (MTSA), the USCG may assess and regulate measures to address access control within territorial waters, defined as 0 to 12 nm from shore. Under the PWSA, USCG may control vessel traffic if it is warranted by hazardous conditions, and establish minimum safety equipment standards for structures located in, or adjacent to, territorial waters (33 U.S.C. § § 1225(a)). Under the MTSA, USCG may conduct security evaluations and vulnerability assessments,

and enforce customs laws (46 U.S.C. § 70103). Permission to build any structure requiring private aids to navigation (PATONs), as well as permission to place PATONs in navigable waters, is required from the USCG (33 C.F.R. 66, 14 U.S.C. 542, 543, 544 and 43 U.S.C. 1333). PATON and other navigational safety considerations are included in Section D.vi. (Transportation and Navigation).

The USACE decision to issue a Section 10 permit is based on an evaluation of impacts and the proposed activity's intended use on public interest, so that decisions reflect national concern for both the protection and utilization of resources. All aquaculture projects proposed in an AOA that would require a Section 10 permit from USACE would also be required to evaluate the public interest factors written in 33 CFR 320.4(a). The action to identify an AOA does not require a permit from any Federal agency; therefore public interest factors are not detailed explicitly in this PEIS. However, the information provided in the impacts analysis and appendices of this PEIS would help future applicants and the USACE in project-specific evaluations.

Seafood Safety

There is potential that aquaculture sited within an AOA would be for human consumption. The U.S. has a rigorous process for ensuring seafood products are safe for human consumption. There are seafood safety and sanitation programs, as well as therapeutic and drug approval systems established that relate to public health and animal health (see Chapter 3, Section C.iv (Potentially-Farmed Species) for animal health topics). The FDA is the regulating body for ensuring food for human consumption is safe under the Federal Food, Drug, and Cosmetic Act (FDCA) (21 U.S.C. § 301). It is of note that the Minor Use and Minor Species Animal Health Act of 2004, which modified FDCA to make more medications for animal species and uncommon diseases legally available for veterinarians and animal owners, is not used for animal species that are used as food for humans or other animals (FDA 2024). Additional FDA frameworks for regulating food are described on pp. 80 through 83 of Janasie (2023). FDA regulations that apply to aquaculture facilities are described on pp. 23 through 25 of the federal Guide to Permitting Marine Aquaculture in the United States (NMFS 2022a). FDA works to ensure consumer safety in conjunction with the NMFS Seafood Inspection Program (Nelson et al. 2019). The Seafood Inspection Program assures compliance with all applicable food regulations in fishing or transport vessels, at processing plants, and at retail facilities under the authority of the Agricultural Marketing Act, amended 2016 (50 C.F.R. § 260). The USDA Animal and Plant Health Inspection Service Veterinary Services (USDA APHIS VS), authorized under the Animal Health Protection Act (AHPA), oversees the prevention, detection, control, and eradication of animal diseases in aquaculture (7 U.S.C. § 8322 and 10401). The California Department of Public Health and the California Office of Environmental Health Hazard Assessment (OEHHA), a department within the California EPA, also have regulatory responsibility over seafood product safety in conjunction with the USDA and Federal EPA (CDFW 2010). Existing programs and protocols for biosecurity and seafood safety further discussed in Appendix 1 (Possible Mitigation for Offshore Aquaculture Facilities).

Public Health Topics Related to Seafood Nutrition

The global human population is currently estimated at 7.9 billion people, and that number is expected to steadily climb to 8.5 billion by 2030 (UNEP 2019). Aquatic foods make a significant contribution to improve and diversify dietary intakes and promote nutritional well-being among most population groups (Brugère et al. 2010). Seafood comprises nearly 20% of animal protein consumed around the world, providing vital nutrition across developing countries and growing middle-class communities (Gephart et al. 2017). Modern human health sciences have recognized seafood for a myriad of health benefits to sustain and optimize human well-being and nutrition (Kromhout et al. 1985; Mozaffarian and Rimm 2006; Costello et al. 2020, Morris et al. 2021). The policy drivers described in Section 2 on pp. 2 and 3 of Rubino (2022) incorporate topics of public health including access to nutrients, access to protein, and climate resilient food systems. Public health topics related to nutrition and food security are likely to affect seafood consumption, and the drive for aquaculture, in the U.S. (Rubino (ed.) 2008).

Consumers seek out seafood products due to their associated health benefits. Seafood is an excellent source of high quality proteins and long chain omega-3 fatty acids that can contribute to good cardiovascular health, improved cellular function, and overall brain and nervous system function (Seierstad et al. 2005; Kris-Etherton et al. 2002; Guallar et al. 2002; Connor, 2000; Kromhout et al. 1985, Morris et al. 2021). Possible relationships between omega-3 fatty acids and disorders such as Alzheimer's disease, arthritis, depression, and asthma are also being studied (Nelson et al. 2019). Fish in the diet of pregnant women may also contribute to better brain and neural system development (FOA 2010). Using recommendations from doctors and nutritionists, the USDA and FDA 2020-2025 dietary guidelines for Americans encourage Americans to eat more seafood, and include seafood as one of the core elements of a healthy dietary pattern to maintain good health (Mozaffarian and Rimm 2006, Institute of Medicine 2006, Steinberger et al. 2016, FDA 2023a). Advances in aquaculture production would be required to meet this expected demand (Rubino (ed.) 2008, CDFW 2019).

Plastics in the marine environment can enter the food web through leaching or through ingestion. Microplastics have been found in drinking water, and in marine and terrestrial organisms that humans consume (Coffin et al. 2022, Unuofin and Igwaran 2023, Milne et al. 2024). Seafood is a potential exposure pathway for humans to consume microplastics in the tissues of organisms. Aquaculture operations can be a source of plastic pollution (Skirtun et al. 2022, Lin et al. 2022). Smith et al. (2018) summarizes potential human exposure to contaminants from plastics through seafood in Table 2 on p. 378 of the study.

Stressors

Existing human health and seafood safety issues facing U.S. aquaculture, as identified in Sea Grant (2016), include:

- maintaining existing or developing new regulatory requirements to ensure a safe and sustainable seafood supply for export and import;
- developing rapid, affordable and FDA-approved tests to detect human pathogens and toxins;
- identifying and reducing impacts from existing and emerging contaminants and biotoxins;
- enhancing product quality and consumer confidence; and
- managing a sustainable resource.

The SCB is a busy ocean space with existing concerns for public health and safety. Stressors in the baseline conditions include vessel traffic, water quality concerns related to pollutants and marine debris, and associated health risks for seafood consumption harvested from such waters. The potential human health effects from the presence of microplastics in seafood associated with ocean litter are largely unknown (CalOPC 2018). Health risks from consumption of seafood organisms in the SCB have been historically-linked to petroleum, DDT, and PCBs in fish tissues, as well as harmful biotoxins in shellfish tissues (Schiff et al. 2000, LARWQCB 2011, Klasing and Brodberg 2015, McLaughlin et al. 2021). Globally and nationally, there are also existing perceptions about human health related to the potential consumption of bioengineered, genetically-modified products that may be produced from aquaculture.

Stressors that may be introduced to the baseline conditions if aquaculture was sited in an AOA include:

- fixed gear and other equipment in the water column and surface;
- more people working overwater in offshore environment;
- challenges for offshore monitoring and compliance, oversight and enforcement;
- challenges for seafood safety oversight; and
- changes to consumer trends and public health topics related to seafood.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed

here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Human Safety and Welfare at Sea

Aquaculture operations in an AOA could increase demand on offshore regulation compliance enforcement, and demand on emergency services. This could affect public health and safety in the offshore environment. During the development of the Atlas, DOD affirmed that offshore aquaculture in the SCB could be compatible with certain military training and operations, but projects would be subject to certain stipulations and final design review, depending on the most up to date military activities and information (Morris et al. 2021). Specific military-related information for each alternative area are provided below. Projects sited in an AOA would benefit from having this information ahead of project applications, potentially saving time and resources during permit consultations. However, due to the nature of military activities to vary over space and time, additional formal DOD clearinghouse coordination would likely be necessary at the time of permitting decisions in regard to aquaculture compatibility.

Restricted access zones may have an impact on new fixed gear and construction areas in the offshore space for the safety of human life and to prevent interactions with gear. Restricted access may be reserved during certain construction or maintenance activities, or for the lifespan of a project, depending on the activity and project design. Concerns about private property (e.g. aquaculture gear and the cultivated species) intruding on public space in the open ocean may arise.

During construction, operations, and decommissioning, there may be fixed gear and increased vessels in an area. All types of aquaculture operations may create safety concerns due to submerged gear and surface markers if proper awareness and prevention measures are not followed. Aquaculture gear in the offshore environment would likely have an array of anchors, lines, and moored structures or vessels. Structures may also include submerged pipelines, cables, and water intakes. Risks include a vessel colliding with a structure, vessel collision, structural damage due to environmental factors, or exposure to hazardous materials in the case of accidental spills or gear loss, and risk of marine debris. Vessel propellers may get caught in derelict gear, which could pose high health and safety risks. Public safety concerns may apply to occupants of structures as well as vessel passengers and crew. Incidents could also potentially involve commercial vessels and recreational vessels passing through the area.

Consideration would need to be given to the impact of the project on the safety of navigation in the immediate vicinity of the project, as well as other portions of the waterway or safety fairway that may reasonably be impacted by the project. As part of the USCG and USACE review of any moored structure, aids to navigation, or other changes to navigable waters, a risk assessment would be required to identify primary threats to waterway safety as well as to determine if a more extensive, technical risk analysis is necessary. Public interest factors that must be considered by the COTP are limited to reducing the possibility of personnel injury or loss of life; damage or loss of vessels, cargo, or structures in, on, or immediately adjacent to the navigable waters of the United States; and, damage to the marine environment (U.S.C. § 1221(c)).

Offshore waters provide certain benefits for aquaculture related to public health and safety. There is more space and depths relative to coastal environments for aquaculture to expand capacity and production while reducing social conflict, and lower exposure to terrestrial-sourced pollution (Bath et al. 2023). However, the design and engineering would also have to have advanced capabilities to withstand dynamic offshore environments. Gear loading and integrity may depend on the level of stocking, material

buoyancy, and submerged depths; environmental exposure factors include wind, waves, and currents. Offshore aquaculture facilities would be located in areas that could experience large storms or tsunami waves, potentially resulting in damage, generating debris, or uncontrolled discharge of pollutants (CDFW 2019). These environmental factors may increase the risk of vessel and structural damage that could result from mishaps, or due to wear and tear over time. Engineering design factors would need to be analyzed to account for environmental-related uncertainties in the offshore environment. The parameters that were selected to conduct spatial modeling for AOAs were high level and meant to encompass all types of aquaculture. The spatial planning and analysis conducted for the Atlas identified environments that align with the tolerances in offshore commercial-scale aquaculture farming practices worldwide. Successful development of individual sites for commercial production is anticipated to require appropriate site-specific assessments and evaluations if and when a specific aquaculture project is proposed. These assessments are essential to account for localized factors such as wave climate, currents, and seasonal wind events, particularly during winter storms. To analyze safety factors, a component's capacity for failure would need to be compared to the design response (Fredriksson and Beck-Stimpert 2019). Failure occurs when the strength of a component is less than that experienced from the environmental loading, and depends on the gear's ability to withstand or resist stress (e.g. materials' ability to withstand UV exposure, line tension under different current conditions, or ability of a net pen to maintain shape under impacts from waves) (Fredriksson and Beck-Stimpert 2019). Biofouling would likely occur at any growout facility. Biofouling, if left unmanaged, can increase the weight and drag of aquaculture gear which may be a concern for gear integrity (Fitridge et al. 2012).

Marine debris presents a number of public health and safety concerns, including navigational hazards. Marine debris accidentally dispersed from aquaculture projects may also have costs to shipping, recreation and tourism, and fishing (Mouat et al. 2010). Interactions with marine debris at an aquaculture facility may result in higher safety risks and in economic losses to aquaculture producers as a result of damage to vessels and equipment, time and resources spent for the removal of debris, and staff downtime while incidents or removal are reconciled (UNEP 2009). If marine debris became tangled in aquaculture gear, it may require divers to clear the debris and depending on the sea state, the work may be highly risky (Macfadyen et al. 2009). A study from Scotland that attempted to quantify the cost of dealing with marine debris at aquaculture facilities found that on average one hour per month was spent removing debris and disentangling fouled propellers could cost up to £1,200 (approximately $1,500 USD) per incident, costing the industry an estimated average of € 155,548 ($169,248 USD) per year, nationally (Hall 2000).

Seafood Safety

Seafood safety measures are already well established in the U.S. and in California for wild-harvested species, international aquaculture imports, and domestic nearshore aquaculture products. There are seafood safety and sanitation programs, as well as therapeutic and drug approval systems established to protect public health. A primary food safety hazard of concern in aquaculture products is animal drug residues and the development of antibiotic-resistant bacteria; the use of animal drugs in aquaculture is strictly regulated. The FDA is the regulating body for ensuring food for human consumption is safe and the USDA-APHIS veterinary services oversee the prevention, detection, control, and eradication of animal diseases in aquaculture. The FDA Center for Veterinary Medicine regulates the manufacture and distribution of food additives and drugs that may be given to aquatic animals. All FDA-approved antibiotics for use in animals require a veterinary feed directive if administered in feed or a veterinary prescription if administered by other routes (80 FR 31708, 2015; Rhodes et al. 2023a). However, at present, there are no antibiotics approved by the FDA for use with any marine fish or shellfish species. Any future use of antibiotics in U.S. aquaculture would require rigorous oversight, including FDA approval, veterinary supervision, and strict adherence to withdrawal periods to ensure seafood safety. Modern aquaculture practices emphasize preventative health strategies such as improved genetics, optimized nutrition, and enhanced site management to reduce disease risks without relying on antibiotics.

The biosecurity measures described in this PEIS are existing regulatory mechanisms to minimize risk of disease by establishing strategic and integrated approaches into U.S. policy and regulatory frameworks aimed at analyzing and managing risks relevant to human, animal and plant life and health, including associated environmental risks. Any aquaculture projects sited in an AOA would need to coordinate with state and local agencies for appropriate transport, testing, and other established regulatory requirements. Biosecurity and seafood safety measures are specified under each sub-alternative, below.

Water quality issues can also interact with public health concerns, e.g., most algal species that cause HABs are also associated with producing poisoning syndromes and HABs can prompt shellfish closures to protect human health. Toxins and chemical contaminants in the marine environment have also been found to enhance the rate of emerging diseases in people and wildlife, relating water quality issues to human health (Keller et al. 2005, Braaten 2007, Price et al. 2013, Webb 2014, Mashkour et al. 2020, Klasing and Brodberg 2015, Rhodes et al. 2023b). Areas where known water quality issues may have posed a concern for public health, like dumping/ocean disposal sites, oil spills, or wastewater treatment plant outfalls, were avoided in the MSP process. For emergent water quality events like large sewage spills or wildfires and associated runoff of wildfire retardants that contain heavy metals, the U.S. has rigorous and responsive processes for ensuring seafood products are safe for human consumption that would be expected to reduce the potential impact on public health and safety. For example, the California Department of Public Health establishes an annual quarantine, the dates of which vary depending on monitoring results, prohibiting the public from harvesting mussels for human consumption due to potentially dangerous levels of biotoxins that may be present in shellfish due to naturally occurring seasonal algae blooms. The annual mussel quarantine is put in place to protect the public against paralytic shellfish poisoning and domoic acid poisoning. All commercial shellfish harvesters in the state are required to submit frequent shellfish samples to CDPH for toxin testing. If any sample exceeds the federal alert level for the PSP or domoic acid toxins, then that area is immediately closed to harvesting until conditions become safe (CDPH 2022). Fire retardants are a known contaminant of concern and are tested for in monitoring programs (Swam et al. 2023). There are a variety of on-going and long term water quality monitoring programs (e.g., NOAA's Mussel Watch program that monitors the nation's coastal waters for chemical contaminants and biological indicators of water quality, state, local, and regional water monitoring programs, etc.). Government agencies and NGOs provide up to date information for the public on water quality issues that could potentially impact public health, e.g. Heal the Bay Beach Report Cards available online, providing weekly and annual water quality grades based on bacterial pollution at beaches along the coast and county department of public health beach water quality advisories (Beach Report Card 2018, LA County Public Health 2025). See Section 3.B.iv for more information on the existing water quality conditions in the SCB and how aquaculture operations may impact water quality. Projects sited in an AOA would likely have BMPs or other permitting requirements that would be designed to manage water quality stressors, see Appendix 1 for more information on potential mitigation. It is expected that most potential adverse water quality impacts would be mediated and monitored through BMPs in permits.

If the proposed action and siting aquaculture in AOAs influences a growth of seafood supply in the region, there may be an increased demand on seafood safety compliance and quality control systems. The new amount of product from large-scale, offshore operations would likely be much greater than the current small operations in the region. Initially, this could cause bottlenecks in transport, testing, or other stages of regulatory systems for seafood safety. Bottlenecks in regulatory processing may impact product viability, and business costs. Healthy products are required by U.S. biosecurity regulations. In addition, healthy products are more competitive in global markets (Brugère et al. 2010). Strong biosecurity programs can indirectly help communities by increasing incomes, and improve resiliency by enabling them to effectively respond to the impacts of production risks (Brugère et al. 2010). Over time, increased demand for biosecurity logistics in the U.S., as well as potential increased demand for products produced under U.S. biosecurity controls could stimulate increased market supply and private investments to support efficient production.

Public Health Topics Related to Seafood

Seafood comprises nearly 20% of animal protein consumed around the world, providing vital nutrition across developing countries and growing middle-class communities (Gephart and Pace 2015). Using recommendations from doctors and nutritionists, the USDA and FDA 2020-2025 dietary guidelines encourage Americans to eat more seafood, and include seafood as one of the core elements of a healthy dietary pattern to maintain good health (FDA 2020). If the identification of one or more AOAs and siting aquaculture in AOAs leads to a competitive domestic aquaculture industry, it may provide Americans' better access to affordable and nutritional protein options. This benefit would be realized as a combined result of increased seafood production, targeted sales and marketing, and increased social license of aquaculture products. Beyond providing food, involvement in aquaculture has shown globally to strengthen people's capacity to exercise their right to food through employment, community development, generating income and accumulating other assets (Brugère et al. 2010).

Marine debris are related to risks associated with leached chemicals or microplastics entering the marine food web. Microplastics in seafood have the potential to impact food security and human health (Smith et al. 2018, Andreas et al. 2021, Bennett et al. 2022, Unuofin and Igwaran 2023). Studies indicate that there is little difference, or mixed results depending on the country of origin, in the amount of microplastics found among different types of animal protein, including comparing cultured and wild sources; however, there is a difference indicated by the amount of processing in the food product (Andreas et al. 2021, Ramasamy and Subramanian 2021, Alberghini et al. 2023, Milne et al. 2024). Seafood products may be less processed than other plant and animal protein choices (Milne et al. 2024). If the proposed action and siting aquaculture in AOAs increases minimally-processed, seafood-sourced protein for human consumption, it could help to address the risk of microplastics in animal-based protein choices.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

The following drivers of biodiversity may continue with or without the identification of an AOA or the potential growth of aquaculture in the U.S. Changes in biodiversity globally are related to public health and economic trends, including changes in demographics, in consumer demands, and in international trade dynamics (Brugère et al. 2010). Ecosystems around the world are becoming increasingly fragmented, and species used for food and medicine are at an increasing risk of extinction (Brugère et al. 2010). In addition to the decline in wild species populations, there has also been a decline in genetic diversity, both in natural ecosystems and in systems of crop, livestock, and aquaculture production (Brugère et al. 2010). Increased reliance on cultivated species, in combination with loss of diversity in natural and cultivated populations, would be a concern for the sustainability of any species used to sustain human livelihoods (Brugère et al. 2010). Marine aquaculture could counteract other global practices of agriculture and land-based aquaculture that contribute to unsustainable practices in water consumption, use of pesticides and fertilizers, land development, and conversion of natural habitats (finfish aquaculture would still rely on either wild harvest or terrestrial sources of feed produced through agriculture) (Brugère et al. 2010).

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

All N2 AOA options in Alternative 2 (the eastern side) overlap with the Military Training Route (MTR) and special use airspace (SUA). Due to the nature of military activities to vary over space and time, additional formal DOD clearinghouse coordination would likely be necessary at the time of permitting decisions in regard to aquaculture compatibility. This may create additional time and cost to permit application processes in order to sufficiently coordinate with the DOD and FAA. It could also create additional public safety risks relative to other areas due to military training activities that could occur. The

MTR and SUA also impose limitations on civilian aircraft operations, which may impose additional considerations for operations and maintenance.

Predominant wind and ocean currents in the Santa Barbara Channel may help to alleviate pressures related to land-based marine debris and pollutants; but aquaculture projects would need to consider site location relative to other aquaculture facilities and offshore infrastructure to properly assess risk of marine debris and effluents from other ocean-based sources. Significant and complex eddies in the Santa Barbara Channel can entrain and trap waters carrying contaminants, such as oil from natural seeps or anthropogenic sources (Rhodes et al. 2023a). Evidence from Channel Islands beach surveys show heavier debris, mostly associated with fisheries gear, gathers on offshore beaches more than on the mainland (Miller et al. 2018, Steele and Miller 2022). Localized changes to hydrology due to gear placement may also act to accumulate materials close to facilities, and close to wildlife aggregations.

a) Shellfish and Macroalgae

Macroalgae

An example of how USACE Section 10 public interest factors were analyzed for a kelp facility in the Santa Barbara Channel are summarized in Table 4 on pp. 17 through 21 of USACE (2021). In addition to surface buoys or anchored lines that would be present for all types of aquaculture operations, growing vegetation or shellfish on longlines at facilities could entangle vessels transiting through the area which could cause vessel damage and safety incidents. Required structural performance monitoring was incorporated into the EA for offshore kelp aquaculture in the Santa Barbara Channel. It is likely that any offshore aquaculture facility sited in an AOA would be subject to the same or similar requirements. These conditions are described in Section 12.2 of USACE (2021).

The food market is thought to be one of the most profitable markets for macroalgae that may be grown in offshore aquaculture. If the identification of one or more AOAs and siting aquaculture in AOAs led to higher availability of seaweed food products on the market, there may be a new opportunity for consumer access and affordability due to increased availability, or from new products and marketing. Seaweeds and macroalgae are used in many food markets as a nutritious additive. Seaweeds are rich in macronutrients including calcium, magnesium, potassium, as well as micronutrients including iodine, iron, zine and others (FAO 2018a, Kamal et al. 2023). Added nutritional value of different seaweed products are provided in Table 5 on p. 7 of Sultana et al. (2023). Benefits come with certain biohazard risks. Seaweed and macroalgae serve as a substrate for other biological organisms in the marine environment, so there are risks of housing biofouling organisms and transporting undesired organisms, even with healthy-looking crops (Rhodes et al. 2023b). Salmonella, heavy metals, bacteria and viruses may be associated with harvested seaweeds (Kamal et al. 2023, Janasie 2023). A list of potential chemical exposures from seaweed and macroalgae products, required under the California Safe Drinking Water and Toxic Enforcement Act (Prop. 65) is provided on Maine Coast Sea Vegetables' website (SeaVeg n.d.).

Seafood safety topics surrounding seaweed aquaculture in the U.S. are still developing at state and Federal levels. Federally, seaweed is recognized as a raw agricultural commodity, with no Federal oversight during growth or harvest (NSGLC 2023). Typically after harvest, cleaning and fallowing or cleaning and disinfection (e.g., sun-drying) is used to break pathogen transmission between crop cycles (Rhodes et al. 2023b). Once processed, the Food Safety and Modernization Act's Preventive Controls for Human Foods (PCHF), which includes current Good Manufacturing Practices, and the FDA's Seafood Hazard Critical Control points (HACCP) regulations are used to regulate seaweed food safety. The PCHF and Seafood HACCP regulations focus on preventive food safety programs that are designed to identify significant hazards and implement controls to prevent those hazards from occurring. Existing regulatory mechanisms, programs, and protocols applicable to seaweed/macroalgae aquaculture that would minimize risks of seafood safety impacts are further discussed in Appendix 1 (Potential Mitigation for Offshore Aquaculture Facilities).

Consistency in quality products relates to how well a company understands what is necessary to produce a safe product. The system places the logistical burden to ensure safety on state and federal government, which in turn affects public confidence in the safety and wholesomeness of these products (60 FR 65096). In addition, preventative controls differ depending on the type of seaweed product produced, the specific actions that go into processing the product, and if the business meets the NAICS US industry size standards threshold to be considered a small business (Janasie 2023, NSGLC 2023). It is likely that projects sited in an AOA would be large businesses, due to the start-up costs for an offshore project. In this case, the proposed action and siting aquaculture in AOAs could lead to streamlining for large businesses to overtake seaweed food markets because they may be favored in a more straightforward way with current safety measures, though this could be mitigated if the seaweed grown in an AOA is used not used for food purposes. This could perpetuate the disparity in large businesses being able to dominate the potential economic opportunities from an AOA (see similar discussion in Section D.iv (Working Waterfronts)).

Shellfish

Cultured shellfish are held to the same FDA food safety standards and regulatory requirements as wild-capture seafood, to ensure safe foods are offered to consumers and to protect public health (FDA 2023b). Products that enter interstate commerce must meet the requirements of NSSP for shellfish. The FDA has a variety of tools to ensure compliance with seafood safety requirements, including inspections of processing facilities, and examination or sampling of products.

The risk from pollutants that may leach from plastics or other disposed materials in the marine environment could accumulate in the tissues of cultivated shellfish. Water quality issues for invertebrate pathogens and public health pathogens are related (FDA 2020, Rhodes et al. 2023b). However, these risks are similar in farmed and wild seafood, with most samples in the U.S. testing below FDA-approved levels (Smith et al. 2018, Nelson et al. 2019). A more prominent risk in the SCB for shellfish cultivation is the risk of oil spills or HABs. Bivalve mollusks cannot swim away from a pollutant, and do not metabolize potential carcinogens as rapidly as finfish and some other shellfish (Klasing and Brodberg 2015). The risk of biotoxin uptake in shellfish may be higher between May 1 and October 31 when phytoplankton uptake is higher in shellfish (CDFW 2010). Existing regulatory mechanisms, programs, and protocols applicable to shellfish aquaculture that would minimize risks of seafood safety impacts are further discussed in Appendix 1 (Potential Mitigation for Offshore Aquaculture Facilities).

b) All Types of Commercial Aquaculture

Structural integrity for finfish systems carry all the same risks to public health and safety as macroalgae and shellfish gear, related to risk of collision, entanglement, and marine debris. Nets used in cage aquaculture are most commonly made with nylon. Rigid polyethylene terephthalate (PET), copper, and stainless steel mesh are also used to maintain cage structure better in heavy currents and other harsh offshore conditions (Bath et al. 2023). There are some additional considerations for finfish systems that would be needed in engineering evaluations, compared to shellfish and macroalgae gear systems. For example, in offshore finfish operations, it is likely that automated feed systems would be utilized. Large feed system mooring systems may be designed and evaluated separately from the containment system; and additional dynamic loading analysis may need to be modified to incorporate specific motion response characteristics in both the typical and extreme loading conditions, as well as with full versus empty configurations (Fredriksson and Beck-Stimpert 2019). Engineering evaluations would also need to address the risk of compromised gear allowing cultured animals to escape (Fredriksson and Beck-Stimpert 2019). Another human safety concern that may be more pronounced associated with finfish aquaculture is the risk of shark or marine mammal interactions. Wildlife aggregating effects are a confirmed impact of marine finfish aquaculture facilities. Potential Shark and marine mammal entanglements pose danger not only to marine life, but to human operators as well (Bath et al. 2023). Pinniped attacks on cage divers have also been reported in finfish aquaculture (Price and Morris 2013).

Recreational fishers and divers that may be drawn to the area may also be at higher risk of shark interactions, in addition to marine mammals, around these new aggregations.

Cultured fish and shellfish are held to the same FDA food safety standards and regulatory requirements as wild-capture seafood, to ensure safe foods are offered to consumers and to protect public health (FDA 2023b). Fish and fishery products that enter interstate commerce must meet the requirements of the Seafood Hazard Analysis Critical Control Point (HACCP) regulations or the NSSP for shellfish. The FDA has a variety of tools to ensure compliance with seafood safety requirements, including inspections of processing facilities, and examination or sampling of products.

Fish provide unique nutritional benefits, but also serve as a potential exposure pathway for several chemicals of concern. The risk from pollutants found in the SCB could accumulate in the tissues of cultivated finfish, as has been found evident in commercially and recreationally-targeted species in the SCB (Schiff et al. 2000, LARWQCB 2011, Klasing and Brodberg 2015, Spyrka 2017, McLaughlin et al. 2021). Potential human health concerns related to finfish aquaculture production include the potential increase in use of formulated food, and the use of antibiotics or other husbandry materials. If these aquaculture practices potentially lead to elevated levels of antibiotic residuals, antibiotic-resistant bacteria, persistent organic pollutants, metals, parasites, and viruses in cultured finfish, then people working in and around aquaculture facilities and consumers could be at potential risk of exposure to these contaminants (Sapkota, et al. 2008). However, these risks are similar in farmed and wild seafood, with most samples in the U.S. being below FDA approved levels (Nelson et al. 2019). Cultured finfish could additionally ingest plastics occurring in the marine environment. Microplastics pose health risks to both wildlife and humans (Smith et al. 2018, Andreas et al. 2021, Unuofin and Igwaran 2023). Based on the literature reviewed in preparation of this PEIS, more research is needed to indicate if there are differences in the potential accumulation of plastics in the consumed tissues of cultivated finfish versus shellfish, or between cultivated and wild-capture finfish. Existing regulatory mechanisms, programs, and protocols applicable to finfish or IMTA aquaculture that would minimize risks of seafood safety impacts are further discussed in Appendix 1 (Potential Mitigation for Offshore Aquaculture Facilities).

Information on commercial IMTA is limited; but stakeholders also have food safety concerns associated with the potential technologies that would grow multiple species or trophic levels together. It is unclear what cumulative impact may arise from combining different systems in an offshore facility. An example in IMTA is if shellfish were used to utilize fish waste or mitigate nutrient loading, any exposure pathway from fish to humans may also be created in the shellfish. Ratcliff et al. (2016) found that seaweeds cultivated in IMTA had raised heavy metal concentrations compared to monoculture seaweed production; however, concentrations of metals were within the range of those from macroalgae collected from undisturbed wild populations. Concentrated metals were found not to exceed regulatory limits, with the exception of arsenic (regulatory limits in the UK, see Table 4 on p. 241 of Ratcliff et al. (2016) for quantified results that may be compared to FDA and USDA limits in the U.S.). According to literature and stakeholder interviews reviewed in Alexander et al. (2016), consumer concerns associated with IMTA is a lack of proof of concept, regulations, and inadequacies in planning and management. Public perceptions are important to factor into financial risk and product viability because they can influence policy and consumer choices (Alexander et al. 2016). IMTA may have higher start-up costs due to these unknowns.

Despite the risks, fish are an excellent source of protein, beneficial fats, and other micronutrients that are essential to human health. Still, there are trade-offs to be aware of in analyzing these benefits. Aquaculture products may have a nutrition profile differing from wild counterparts, particularly in relation to the content of the beneficial long-chained omega-3 fatty acids (Brugère et al. 2010). According to studies reviewed in Hicks et al. (2019), smaller fish species have higher concentrations of important micronutrients (e.g. zinc, calcium, iron). An important ecological trade-off to be aware of is that if finfish aquaculture in the region increased fishing pressure on smaller species and forage species for feed

purposes, it could leave less nutrient-rich in the ecosystem available to marine life and recreational or subsistence fishers.

Concerns regarding food safety in fish products globally have placed focus on the value of expanding a domestic supply, as well as economic and environmental considerations related to "food miles" as seafood products are transported over great distances for packaging and final marketing (CDFW 2010). If the identification of an AOA increased domestic fish seafood supply, under the stringent regulatory mechanisms for U.S. seafood sourcing and quality testing, it would potentially help alleviate some of these concerns. In addition, using global examples from salmon production, Krause et al. (2020) found that finfish aquaculture companies invest in community initiatives which promote positive health outcomes, directly by increasing the availability of seafood as well as indirectly by increasing attention, viability, and capital into communities. Literature review and stakeholder interviews in Alexander et al. (2016) also showed that socio-economic benefits from aquaculture are recognized as positive outcomes related to consumers and animal welfare.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

According to the spatial analysis and military coordination in the development of the Atlas, there are no currently-known MTRs in Alternative 3. All documented formerly-used defense sites occur south of the alternative area. The overlap of the San Pedro Channel Operating Area (see Figure 3.1 on p. 53 of the Atlas is not anticipated to be a major constraint for aquaculture development, based on review by the DOD provided for the Atlas, as Appendix D in Morris et al. (2021). Due to the nature of military activities to vary over space and time, additional formal DOD clearinghouse coordination would likely be necessary at the time of permitting decisions in regard to aquaculture compatibility.

Rapid population growth and industrialization in the greater Los Angeles area have historically strained the marine environment of Santa Monica Bay. Many of the pollutants that wash into the Bay from land-based run-off are known to pose health hazards for people and for fish and other wildlife (Schiff et al. 2000, USGS 2003, LARWQCB 2011). There has been a lot of research and conservation work done in the area to monitor and determine the distribution of contaminants. For example, advisories for recreational fishers are posted when advisory tissue concentrations of DDTs and PCBs exceed threshold limits set by the State, restricting consumption (Schiff et al. 2000, McLaughlin et al. 2021). Regarding the potential for seafood contamination by DDT, Almada (2024) highlights the importance of fish ecological traits—particularly habitat and diet—in influencing the relationship between local sediment contamination and bioaccumulation levels in fish. McGill et al. (2024) expands on this by demonstrating that DDT bioaccumulation in fish is context-dependent, with proximity to and interaction with contaminated sediments increasing the likelihood of accumulation. Most species being considered for offshore aquaculture would have no interaction with sediments, as cultivation occurs in the upper water column. Additionally, the proposed AOAs are located far from known DDT sources. Therefore, it is highly unlikely that aquaculture products would contain measurable levels of DDT related to historic ocean disposal.

Cultivated species grown within Alternative 3 may be impacted by these baseline water quality concerns. It is not likely that aquaculture projects would have higher risk of accumulating toxins or microplastics than wild-harvested species. BMPs and contingency management would be important to implement in Alternative 3 so that any potential water quality impacts or risk of spills from an aquaculture project would not create cumulative impacts with baseline stressors.

Predominant currents towards the southeast and swell from the west in the offshore area of Santa Monica Bay may help to alleviate pressures related to marine debris and pollutants from coastal resources (Morris et al. 2021). However, NPDES data show that movement of discharge plumes in Santa Monica Bay during storms and high flow events is highly variable (LARWQCB 2011). Complex eddies in the Santa

Monica Basin can entrain and trap waters carrying contaminants, such as oil from natural seeps or anthropogenic sources (Rhodes et al. 2023a). Santa Monica Canyon is the closest bathymetric feature that may accumulate debris at the seafloor, located south, within 2 nm from both AOA options within Alternative 3. This canyon may help to mitigate against higher concentrations of existing contaminants that are concentrated near the Palos Verdes Shelf, a designated Superfund site by the EPA. Palos-Verdes shelf is located further south and down-current of Alternative 3 and Santa Monica Canyon.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section. Historic environmental concerns related to water quality in Santa Monica Bay may exacerbate public concern, planning and management logistics, and operation costs related to potential public health and safety concerns in the area.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

Alternative 4: Combined Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. AOAs in both Santa Barbara Channel and Santa Monica Bay may distribute risks to more communities. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from shellfish and macroalgae aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

E. Cultural and Historic Environment and Potential Impacts

i. Tribal Resources and Cultural Practices

National Historic Preservation Act (NHPA) Section 106 (1966) - Section 106 of the NHPA requires review of any project funded, licensed, permitted, or assisted by the federal government for impact on significant historic properties, including consultation with Tribes. Federal agencies must allow the State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (ACHP), a federal agency, to comment on a project. NHPA includes provisions for Tribes to assume the responsibilities of the SHPO on Tribal lands and establishes the position of a Tribal Historic Preservation Officer (THPO). Tribal lands are defined in the NHPA and the Section 106 regulations (36 CFR Part 800) as, 1) all lands within the exterior boundaries of any Indian reservation; and, 2) all dependent Indian communities. NMFS has not initiated consultation with the California SHPO or THPOs for the PEIS as

the action is a planning exercise without project-specific details and does not permit aquaculture activity to take place in any identified AOAs. Specific project proposals would result in consultation by authorizing federal agencies as relevant prior to obtaining permits for any aquaculture project sited in an AOA.

Cultural resources have been defined as prehistoric and ethnohistoric archaeological sites, historic archaeological sites, historic buildings, and elements or areas of the natural landscape which have traditional cultural significance (CDFW 2014). Tribal cultural resources in California have been defined as sites, features, places, cultural landscapes, sacred places, and objects with cultural value to a California Native American tribe that are either included or determined to be eligible for inclusion in the California Register of Historical Resources or included in a local register of historical resources, or a resource determined and supported by substantial evidence to be significant (Los Angeles City Planning 2017). Historical and archaeological resources may also be tribal cultural resources (Los Angeles City Planning, 2017). Tribal resources and cultural practices are present in the proposed AOAs and are considered below.

Affected Environment

The U.S. government operates under a unique relationship with Tribal governments based on provisions of the U.S. Constitution, Congressional legislation, treaties, Executive Orders, Secretarial Orders, and judicial decisions that recognize reserved rights of Native Americans to protect their property and their way of life. The relationship between Federally-recognized Indian Tribes and the federal government is one of sovereign to sovereign and has been described at length by the federal judiciary and referred to in federal law promoting Tribal self-determination and self-governance (NOAA 2023a). Indian Tribes on the West Coast have long-standing and strong spiritual and cultural ties to marine species and habitats based on thousands of years of cultural use, subsistence, and commerce (NOAA 2023a).

There have been multiple Executive Orders (E.O.s) issued that address engagement and coordination with Indian Tribes and Nations. Key EOs are briefly summarized below.

E.O. 13175 Consultation and Coordination with Indian Tribal Governments (2000) was issued by U.S. President Bill Clinton on November 6, 2000. This executive order requires federal departments and agencies to consult with Indian Tribal governments when considering policies that would impact Tribal communities (65 FR 67249).

E.O. 13007 Indian Sacred Sites (1996) directs federal land managing agencies to accommodate access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners and to avoid adversely affecting the physical integrity of such sacred sites (61 FR 26771, BOEM n.d.).

E.O. 13287 Preserve America (2003) directs federal agencies to advance the protection, enhancement, and contemporary use of federal historic properties and to promote partnerships for the preservation and use of historic properties, particularly through heritage tourism (68 FR 65238).

In addition to EOs, there have been other orders and memoranda addressing Tribal sovereignty and government-to-government engagement. The Presidential Memorandum of January 26, 2021 (Tribal Consultation and Strengthening Nation-to-Nation Relationships), and the Presidential Memorandum of November 30, 2022 (Uniform Standards for Tribal Consultation), reiterated the U.S. commitment to, and established uniform standards for, Tribal consultation. Department of Commerce orders and policies include the following:

- Secretarial Order 3206 (June 5, 1997) American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act;
- Department of Commerce American Indian and Alaska Native Consultation and Coordination Policy (March 30, 1995) followed by Tribal Consultation and Coordination Policy of the U.S. Department of Commerce (August 2013);

- Department of Commerce Department Administrative Order 218-8: Consultation and Coordination with Indian Tribal Governments (April 26, 2012); and
- NOAA Procedures for Government-to-Government Consultation with Federally-Recognized Indian Tribal Governments (June 2023).

The Native American Graves Protection and Repatriation Act (NAGPRA, 25 U.S.C. ch. 32 § 3001 et seq.) requires federal agencies and federally assisted museums to return "Native American cultural items" to the federally recognized Indian Tribes or Native Hawaiian groups with which they are associated. Regulations by the National Park Service are located at 43 CFR 10. Chapter 3, Section E(iii) addresses the rights of lineal descendants, Indian Tribes, and Native Hawaiian organizations to certain Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony found in federal agencies and institutions that receive federal funds and addressed trafficking of these materials by private individuals.

The American Indian Religious Freedom Act of 1978 (42 U.S.C. § 1996) protects the rights of Native Americans to exercise their traditional religions by ensuring access to sites, use and possession of sacred objects, and the freedom to worship through ceremonies and traditional rites. The Act says that the U.S. Government will respect and protect the rights of Indian Tribes to the free exercise of their traditional religions; the courts have interpreted this as requiring agencies to consider the effects of their actions on traditional religious practices.

The MSA (discussed in more detail previously in Section C.ii (Wild Fish Stocks)) requires all Fishery Management Plans to contain a description of the fishery, including any Native American treaty fishing rights in the fishery. Associated with marine resources, a Treaty Tribe exercises its management authorities within specific areas for subsistence and cultural fishing locations adjudicated within the federal court system or confirmed by federal administrative procedures (Pacific Fishery Management Council [PFMC] 2013). While fisheries are recognized to be, and have been, important to California Tribes since time-immemorial for cultural purposes, subsistence, and commerce-related activities, there are currently no Federally-recognized Treaty Tribes in Southern California (PFMC 2013 2016). Certain coastal California Tribes (Yurok and Hoopa Valley Tribes) have treaty fishing rights to salmonids that range from western freshwater streams to the high seas of the Pacific Ocean (PFMC 2013). The right to fish in “usual and accustomed” areas has been interpreted by the courts as not restricted to any species, nor dependent on whether the species was historically exploited by the tribe (U.S. Commission on Ocean Policy 2004b). The interest of California tribes in fishery management and shared resource allocation has also been recognized by Congress by requiring the appointment of a Tribal representative to PFMC (42 U.S.C. § 4331(a)).

In addition to Congressional Acts, at the state of California, AB52, enacted in 2014, amends sections of California Environmental Quality Act (CEQA; 1970) related to Native Americans and established a new category of cultural resources, Tribal cultural resources, and states that a project that may cause a substantial adverse change in the significance of a Tribal cultural resource may have a significant effect on the environment.

Santa Barbara, Ventura, and Los Angeles counties are the nearest onshore areas to the proposed AOAs. These counties are the ancestral and present-day homes to the coastal Chumash and Gabrieleno-Tongva Tribes (Gabrielino-Tongva Indian Tribe 2024a; Santa Ynez Band of Chumash Indians n.d.a). The primary ports that may be associated with aquaculture operations in the proposed AOAs are Santa Barbara Harbor, Ventura Harbor, and Port Hueneme (Morris et al. 2021).

Tribal communities have a close relationship with the natural world and rely on stable fishing stocks to provide for their communities. The first inhabitants of the Southern California Bight (SCB), the diverse coastal Tribes of the Chumash people, shaped the general ecology of the region (McGinnis 2006). The Chumash people lived in villages along the south-central California coast from the present-day sites of Malibu Point to Morro Bay and extended to the northern Channel Islands. The Chumash had a population

of about 18,000 people among 150 independent villages by the time Spanish missionaries arrived. It is believed this high population level was brought about by intensified fishing, possibly a result of the plank canoe, or tomol, about 2,000 years ago. Barbed harpoons and shell hooks also allowed the Chumash to harvest an expansive array of fish species. (Norman et al. 2007). The Gabrieleno-Tongva people were and are also coastal people and lived from Palos Verdes to San Bernardino, from Saddleback Mountain to the San Fernando Valley (Gabrieleno-Tongva Indian Tribe 2024a).

The Chumash consider the northern Channel Islands a special place. They still paddle these waters in tomols or special wooden canoes. The first tomol to be owned by the Chumash people since the 1880s is 'Elye'wun, which was built by the Chumash community in 1996–1997 under the leadership of the Chumash Maritime Association. The building of 'Elye'wun ("swordfish") and the crossing to Santa Cruz Island was undertaken to reconnect and restore the Chumash's relationship to the sea and northern Channel Islands. (McGinnis 2006).

The marine component of the Chumash diet traditionally consisted of over 150 types of marine fishes and a variety of shellfish including crabs, lobsters, mussels, abalone, clams, oysters, chitons, and other gastropods. Abalone are also a traditional staple of the Chumash diet. Shellfish were essential to the Chumash economy and material culture. The Chumash produced the majority of shell bead money used by indigenous peoples throughout southern California. (McGinnis 2006). Like the Chumash, the Gabrieleno-Tongva people were and are a seafaring tribe, fishing for sheepshead, shark, barracuda, halibut and other fish from small plank canoes, or ti'ats; they also hunted seals and other mammals and harvested abalone, mussels, and clams (Gabrielino-Tongva Indian Tribe 2024b). The Gabrielino-Tongva also relied on the ocean for commerce, trading abalone shells (Gabrielino-Tongva Indian Tribe 2024b).

For thousands of years before Spanish, Tsarist Russian, and European settlers occupied the West Coast, Native Americans harvested oysters (CDFW 2010). Also, use of *Mytilus* mussels for food in California extends back over 10,000 years. These are the most common shellfish found in island and coastal middens (CDFW 2010). In the Pacific Northwest, Tribes used "clam gardens" to cultivate clams (Lepofsky and Caldwell 2013). In addition, red sea urchins (*Mesocentrotus franciscanus*) were and are important for Tribal subsistence fishing (USFWS 2022). The Santa Barbara Channel region has a rich history in fishing dating back to the Chumash people as evidenced by the occurrence of large middens (Erlandson et al. 2005).

Overall, the Tribal environment associated with the proposed AOAs includes a rich history and culture of ocean use, harvest, and traditional practices extending to the present day. It is difficult to describe the Tribal environment as a separate affected environment from the physical, biological, and socioeconomic environments described in Chapter 3, Sections B, C, and D, respectively. The Chumash have collaborated with the Channel Island National Marine Sanctuary, including authoring a Chumash Ecosystem Services Assessment (Cordero et al. 2016). Cordero et al. (2016) describes traditional Chumash ecological views, including an interdependency between marine and terrestrial systems, without differentiation between consumptive and non-consumptive services. The Chumash view their relationship to the natural world as reciprocal and regenerative, making an economic assessment of the natural world incompatible with a world view that values the intangible and sacred (Cordero et al. 2016). The Chumash view community wellness, sense of place, and psychological, spiritual, and physical health as ecosystem services. Cordero et al. (2016) describe the Chumash tradition as one in which people belong to the land and waters and the land and waters belong to the people in a manner that is not just ownership but is a sense of responsibility to protect, care for, love the land and waters and to make decisions and choose actions reflective of those responsibilities.

Past and ongoing activities contributing to the baseline condition of cultural and historic EJ concerns associated with Tribal resources include the history of harm to Native Americans in California. Wishtoyo Chumash Foundation (2022) states that the Chumash and Gabrielino-Tongva peoples were the first human inhabitants of the Channel Islands and Santa Monica Mountains areas and that numerous

archaeological sites have been uncovered some of which date to 15,000 years. Tribes continue to practice traditional culture and pass this heritage to youth to preserve it for future generations (Wishtoyo Chumash Foundation 2022). The Gabrielino-Tongva history is described by the Tribe (Gabrielino-Tongva Indian Tribe 2024c) and includes lost treaty rights, a devastating "assimilation policy" by the U.S., and eventual recognition by the State of California in 1994, though the federal government has not recognized this Tribe (89 FR 944). The Chumash are federally recognized as the Santa Ynez Band of Chumash Mission Indians of the Santa Ynez Reservation, California (89 FR 944). As with the Gabrielino-Tongva, the Chumash experienced colonization, and their numbers were decimated due largely to European diseases (Santa Ynez Band of Chumash Indians n.d.a). The Santa Ynez Reservation was established on December 27, 1901 (Santa Ynez Band of Chumash Indians n.d.b). The Chumash continue to pass their traditional practices on to their children to preserve their heritage and way of life (Santa Ynez Band of Chumash Indians n.d.c). In Chumash country, there has been an increase in collective healing as the community has strengthened its maritime culture with modern and ancestral tomol traditions, reestablished relationships with traditional medicines and foodways, acquired "seats at the table" for managing homelands and waters, and fought for protections against potential harms to ecosystems and traditional lifeways (Cordero et al. 2016).

Stressors

The stressors associated with physical, biological, and socioeconomic environments are described in Chapter 3, Sections B, C, and D, respectively. These stressors to the environment become stressors to Tribes and Tribal practices, values, and subsistence when they adversely affect aspects of the ecosystem and its balance and interconnectedness. Access to traditional areas is also important to Tribes, and aquaculture sited within AOAs may create areas that are potentially not accessible for traditional fishing or other practices.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors. The potential impacts associated with the administrative, physical, biological, and socioeconomic environments are described in Chapter 3, Sections A-D. Impacts on the natural and human environment are all interconnected to potential Tribal resources and cultural practices.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Aquaculture can be proposed and permitted regardless of the presence of an AOA. The identification of one or more AOAs in the Santa Barbara Channel could encourage aquaculture developers to focus on that area for proposed projects and result in a higher concentration of aquaculture in the AOA(s) than would occur otherwise. The use of AOAs to create a predictable area for aquaculture development may have a beneficial impact on Tribes in creating predictability and focusing aquaculture in an area that has been

evaluated and assessed to be the most suitable in Southern California (Morris et al. 2021) in the context of minimizing use conflict and impacts to wildlife and habitats that are culturally important to Tribes.

The potential adverse impacts of aquaculture itself, described in Chapter 3, Sections B, C, and D of this PEIS, could have adverse impacts on Tribes as further described below. Exclusion from any areas within the AOA that may result from commercial activities and navigational hazard may also affect Tribes that use the area.

Cordero et al. (2016) describes the stress of feelings of failure to meet cultural responsibilities for traditional ecosystems and awareness that ecosystem health is declining due to exploitation by colonial culture. The Chumash consider the Channel Islands and surrounding waters cherished family and feel a responsibility to maintain their well-being, so adverse impacts to this system can cause acute and chronic psychological distress (Cordero et al. 2016). Tribes can experience grief and stress from loss of access to management and inability to fulfill what they see as an obligation to other people and their religious convictions (Cordero et al. 2016). Cordero et al. (2016) point out that what many currently see as an idealized, untouched, wild, and pristine California landscape prior to European colonization was actually a result of thousands of years of reciprocal relationship, tending, and cultivation by the Native peoples of these areas. Thus, adverse impacts to the ecology or biology of the area may affect Tribes in psychological and spiritual ways. Tribal members may potentially become involved in aquaculture activities in the region and may thereby apply marine-ecological knowledge to production of food products for both commercial sale and non-commercial uses, with the latter including production of food for non-market purposes including direct consumption, sharing, ceremonial uses, barter, etc.

a) Shellfish and Macroalgae

The importance and practice of harvesting seaweeds in Indigenous cultures of North America has been passed down through generations of families and Tribal communities. Location, timing, and traditional practices contribute to the importance of the resource. Timing and the amount of harvest to remain a sustainable practice is an ongoing struggle between California tribes and colonized areas (Bigelow Laboratory for Ocean Sciences 2024). For example, historic and ongoing restrictions in California coastal access have shown to impact Tribes because both Tribal and non-tribal harvesters share some areas that may be traditional areas, but do not necessarily have access to the same traditional ecological knowledge of how or desire to maintain seaweed bed/garden productivity for future generations (Bigelow Laboratory for Ocean Sciences 2024). If seaweed aquaculture were established in one or more of the AOAs under Alternative 2, it could reduce the pressure of commercial wild harvesting on the local kelp beds and therefore potentially reduce pressure on tribes' access to wild kelp. As described above, there is a history of subsistence living associated with California tribes with shellfish species along the coast and in the SCB. Therefore, potential impacts associated with native populations of seaweed and shellfish, marine habitat, ecological functions, as well as other resources of the physical, biological, and socioeconomic environments that are described in Chapter 3, Sections B, C, and D, respectively, all may play a role in analyzing potential impacts to Tribal cultural resources.

b) All Types of Commercial Aquaculture

The Chumash people have been heavily dependent on a healthy marine environment (McGinnis 2006). Tribal communities have a close relationship with the natural world and rely on stable fishing stocks to provide for their communities. The potential impacts associated with wild fish stocks, marine habitat, ecological functions, as well as other resources of the physical, biological, and socioeconomic environments that are described in Chapter 3, Sections B, C, and D, respectively, all may play a role in analyzing potential impacts to Tribal cultural resources. Impacts on the natural and human environment are interconnected to cultural systems; and all aspects of aquaculture (no matter what type) would need to be considered carefully for potential impacts to Tribal cultural and historic resources.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

From a macro Tribal impact perspective there is likely little difference between Alternatives 2 and 3. The entire region was and is inhabited by Tribal communities who used and continue to use the waters for fishing, spiritual, and recreational purposes. The potential beneficial and adverse impacts of identifying one or more AOAs in Santa Monica Bay are similar to those for identifying one or more AOAs in Santa Barbara Channel.

a) Shellfish and Macroalgae

The best available information to describe potential impacts from macroalgae and shellfish reflected under Alternative 2a is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

b) All Types of Commercial Aquaculture

The best available information to describe potential impacts from all types of aquaculture reflected under Alternative 2b is the same as reflected under Alternative 3. Impacts between the two geographic spaces may differ, based on variations in geography, resources, and human activity, among others, as described above in this section.

Alternative 4: Combined Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

AOAs in both the Santa Barbara Channel and Santa Monica Bay may distribute impacts to more communities. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified. Identification of a larger geographic area may encourage more aquaculture to be proposed and thus lead to greater impacts, as described for Alternatives 2 and 3, to Tribal resources and cultural practices. These impacts are expected to be minimized through further engagement with Tribes as projects are proposed.

a) Shellfish and Macroalgae

The impacts reflected under this sub-alternative may be the same as Alternatives 2a and 3a, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b is the same as reflected under Alternative 4a.

b) All Types of Commercial Aquaculture

The impacts reflected under this sub-alternative may be the same as Alternatives 2b and 3b, except they could take place across the Santa Barbara Channel and Santa Monica Bay area. The best available information to describe potential impacts from all types of commercial aquaculture reflected under Alternatives 2b and 3b are the same as reflected under Alternative 4b.

ii. Non-Tribal Cultural and Traditional Practices

Oceanic resources have provided cultural, economic, and recreational opportunities for human civilizations along the California coastline for generations. The ocean provides a stable source of economic support and diverse food security. Tribal resources and cultural practices are described in Chapter 3, Section E.i. Here we consider non-tribal cultural and traditional practices. Culture is defined and described under the NHPA at 54 U.S.C. § 300101. More broadly, it includes inherent values, ways of life and social expression that influence human systems in family, education, media, politics, work, public programs, and the built environment (Hawkes 2001).

Public interests in the marine environment have traditionally included navigation, fishing, and commerce. As the body of social science develops, the public has influenced policy to protect recreation, environmental protection, research, and preservation of scenic beauty and cultural heritage (U.S. Commission on Ocean Policy 2004b). Even when there may be private ownership or other property interests in public trust lands or waters, the government has a duty to ensure that the public's interest in those areas is protected.

Affected Environment

There are E.O.s and other legal frameworks that address engagement to preserve historic and cultural resources. Key administrative documentation is briefly summarized below.

E.O. 13287 Preserve America (2003) directs federal agencies to recognize and manage historic sites and objects in regard to contributing to the vitality and economic well-being of the nation's communities, including to promote heritage tourism (68 FR 65238).

NHPA Section 106 (1966) is described in Chapter 3, Section E.i. and extends beyond tribal consultation to consultation associated with non-tribal historic and cultural resources. NHPA sets forth government policy and procedures regarding "historic properties" defined as districts, sites, buildings, structures, and objects included in or eligible for the National Register of Historic Places. Section 106 of NHPA requires that federal agencies consider the effects of their actions on such properties, following regulations issued by the ACHP (36 CFR 800). The National Register of Historic Places is a list maintained by the Department of the Interior, defined in 16 U.S.C § 470(a)(1)(A).

The National Marine Sanctuaries Act (1972) and **E.O. 13158 Marine Protected Areas (2000)** also protect cultural and historic resources. E.O. 13158 is described in Chapter 3, Section B.ii. National Marine Sanctuaries and Marine Protected Areas can be designated for the purpose of protecting areas of cultural and archeological significance.

Non-Tribal Resources and Cultural Practices

Coastal communities in and visitors to the SCB have cultural ties to the local resources, including activities and businesses built on coastal aesthetics and natural resources. Commercial and recreational fisheries, tourism, and other recreation are described in Chapter 3, Sections D.i, D.ii, and D.v. These practices are not just economic in nature but also carry cultural value. Historic and traditional places and viewsheds are also important to both Tribal and non-tribal cultural practices in the SCB. Access to and health of the SCB provides jobs, food, economic opportunities, recreation, and spiritual and aesthetic value to people.

Overexploitation of resources is an unfortunate part of the history of the California Current Ecosystem and has influenced the management of marine resources (McGinnis 2006, PFMC 2013). Fisheries overexploitation is detailed in Section 3.4.1 on pp. 51 through 56 of the PFMC's (2013) Pacific Coast Fishery Management Plan for the U.S. Portion of the California Current Large Marine Ecosystem, incorporated herein by reference. Site-specific NEPA analysis of impacts from offshore aquaculture activities on fishery resources may consider the effects of the proposed action on the sustained availability of fishery resources to fishing communities near any identified AOA, and on the sustained participation of those fishing communities in fisheries. Under the MSA, a "fishing community" is a community that is "substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and U.S. fish processors that are based in such community" (16 U.S.C. §1802). Social scientists have used that definition to develop profiles of West Coast fishing communities (Norman et al. 2007) and to define and quantify community involvement in commercial fisheries and their vulnerability to changes in fishery conservation and management measures (Sepez et al. 2007, Clay and Olson 2008, and Alsharif and Miller 2012). Norman et al. (2007) provides detailed social and demographic analyses of over 100 West Coast communities. While NMFS has extensive experience analyzing impacts to communities under MSA,

other laws and policies mandating attention to impacts on human communities may apply at the state and/or local level, applicable to individual projects but not in this programmatic NEPA analysis. The Regulatory Flexibility Act (RFA) of 1980 requires agencies to assess impacts of proposed policies on regulated small entities, such as small businesses, organizations, and governmental jurisdictions as defined in the RFA and the Small Business Act (described in Section D.iv (Ports and Working Waterfronts). Fisheries resources are culturally important to SCB communities and impacts to these resources have both commercial and cultural ramifications. In addition to fisheries and fishing, ocean-related heritage, traditions, social identity, political values, and community well-being are important considerations in assessing impacts to non-tribal cultural and traditional resources.

Southern California was home to large fishing fleets of seine operators and to numerous tuna processing canneries (Felando and Medina 2012). By the early 1980s, most of the canneries had gone out of business or relocated to U.S. territories or other countries due to lower processing costs, fisheries management challenges, and the shifting of fishing operations to the western Pacific to avoid conflicts with dolphins and porpoises (Sea Grant 2024d). Despite the decline in the tuna fishery, the fishing communities of the region persist due to the continued productivity of the ocean ecosystem, proximity to large urban communities, and an extensive and large port infrastructure that provides ready access and connection to both domestic and global markets (Sea Grant 2024d).

Aquaculture is also a tradition of the SCB. A substantial commercial oyster fishery began in the 1850s, when settlers from the east coast attracted to California by the prospect of gold and new opportunities created larger markets for oysters (CDFG 2001b). Public hatchery production of salmonids in California also has a long history.

Stressors

The stressors associated with physical, biological, and socioeconomic environments are described in Chapter 3, Sections B, C, and D, respectively. These stressors to the environment become stressors to non-tribal cultural practices. Infrastructure itself is a potential stressor, possibly causing limits to access to small areas of ocean and having the potential to affect views and increase traffic. Potential for aquaculture to conflict with fisheries activities can be both a cultural and commercial stressor.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors. The potential impacts associated with the administrative, physical, biological, and socioeconomic environments are described in Chapter 3, Sections A-D. Impacts on the natural and human environment are all interconnected to potential non-Tribal cultural and historic concerns.

Aquaculture can be proposed and permitted regardless of the presence of an AOA. The identification of one or more AOAs in the Santa Barbara Channel could encourage aquaculture developers to focus on that area for proposed projects and result in a higher concentration of aquaculture in the AOA(s) than would occur otherwise. The use of AOAs to create a predictable area for aquaculture development may have a beneficial impact on communities in creating predictability and focusing aquaculture in an area that has been evaluated and assessed to be the most suitable in Southern California (Morris et al. 2021) in the context of minimizing use conflict and impacts to wildlife and habitats that are culturally important to

non-tribal groups. The potential adverse impacts of aquaculture itself, described in Chapter 3, Sections B, C, and D of this PEIS, could have adverse impacts on communities.

Exclusion from the AOA that may result from commercial activities and navigational hazard may also affect communities that use the area. Fishing communities may be vulnerable socially and economically to potential effects to commercial fisheries and recreational fishing opportunities. The profile of communities engaged in the seafood sector includes a wide variety of involvement. From the perspective of a coastal community dependent on or engaged in seafood production, whether a particular fishery or aquaculture production is under state or federal jurisdiction is of less importance to the health and resilience of the community than the strength and sustainability of the industry itself. Community profiles for fishing communities are used in environmental impact statements and management decisions, and are described in Section D.iv (Ports and Working Waterfronts).

Identification of potentially affected historic properties would occur at the project authorization stage, but no currently designated historic properties are within the proposed AOAs. The distance from shore and low profile of aquaculture operations makes visual/aesthetic impacts unlikely.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

a) Shellfish and Macroalgae

The impacts may vary depending on the types of aquaculture undertaken (e.g., macroalgae, shellfish, finfish) and would need to be further assessed at the project proposal stage. Potential impacts associated with native populations of seaweed and shellfish, marine habitat, ecological functions, as well as other resources of the physical, biological, and socioeconomic environments that are described in Chapter 3, Sections A- D all may play a role in analyzing potential impacts to non-tribal cultural and traditional practices.

b) All Types of Commercial Aquaculture

The impacts vary depending on the types of aquaculture undertaken (e.g., macroalgae, shellfish, finfish) and would need to be further assessed at the project proposal stage. Potential impacts that are described in Chapter 3, Sections A-D all may play a role in analyzing potential impacts to non-tribal cultural and traditional practices.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

From a macro community impact perspective there is likely little difference between Alternatives 2 and 3, though different communities and individuals may be affected. The potential beneficial and adverse impacts of identifying one or more AOAs in Santa Monica Bay are similar to those for identifying one or more AOAs in Santa Barbara Channel.

a) Shellfish and Macroalgae

The impacts may vary depending on the types of aquaculture undertaken (e.g., macroalgae, shellfish, finfish) and would need to be further assessed at the project proposal stage. Potential impacts associated with native populations of seaweed and shellfish, marine habitat, ecological functions, as well as other resources of the physical, biological, and socioeconomic environments that are described in Chapter 3, Sections A-D all may play a role in analyzing potential impacts to non-tribal cultural and traditional practices.

b) All Types of Commercial Aquaculture

The impacts may vary depending on the types of aquaculture undertaken (e.g., macroalgae, shellfish, finfish) and would need to be further assessed at the project proposal stage. Potential impacts that are described in Chapter 3, Sections A-D all may play a role in analyzing potential impacts to non-tribal cultural and traditional practices.

Alternative 4: Combined Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

AOAs in both the Santa Barbara Channel and Santa Monica Bay may distribute impacts to more communities. Effects could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified. Identification of a larger geographic area may encourage more aquaculture to be proposed and thus lead to greater impacts, as described for Alternatives 2 and 3, to non-tribal resources and cultural practices. These impacts are expected to be minimized through further engagement with communities and the required public processes as projects are proposed.

a) Shellfish and Macroalgae

The impacts may vary depending on the types of aquaculture undertaken (e.g., macroalgae, shellfish, finfish) and would need to be further assessed at the project proposal stage. Potential impacts associated with native populations of seaweed and shellfish, marine habitat, ecological functions, as well as other resources of the physical, biological, and socioeconomic environments that are described in Chapter 3, Sections A-D all may play a role in analyzing potential impacts to non-tribal cultural and traditional practices.

b) All Types of Commercial Aquaculture

The impacts to may vary depending on the types of aquaculture undertaken (e.g., macroalgae, shellfish, finfish) and would need to be further assessed at the project proposal stage. Potential impacts that are described in Chapter 3, Sections A- D all may play a role in analyzing potential impacts to non-tribal cultural and traditional practices.

iii. Archaeological Resources

The Archaeological Resources Protection Act (1979) defines ‘‘archaeological resource’’ as any material remains of past human life or activities which are of archaeological interest. Tribal and non-tribal cultural resources can be categorized as archaeological resources.

Affected Environment

Administrative

The Archaeological Resources Protection Act (ARPA; 1979) was enacted “to secure, for the present and future benefit of the American people, the protection of archaeological resources and sites which are on public lands and Indian lands…” (16 U.S.C. §470aa (b)). With regard to the marine environment, ARPA applies only in federal marine protected areas or other submerged lands to which the U.S. Government retained title and did not transfer to states under the Submerged Lands Act or other otherwise owns or controls through agreements with states (NOAA n.d.a). ARPA was enacted to deter looting of archaeological sites located on federal lands (NOAA n.d.a).

The Abandoned Shipwreck Act (ASA; 1987) establishes the federal protection of certain shipwrecks that are historic and eligible for inclusion in the National Register of Historic Places (43 U.S.C. §§ 2101, 2102). Any discovered shipwreck that may be eligible for title under the ASA must go under public notice and must be reviewed by the National Park Service (43 U.S.C. §§ 2105(b)). Shipwrecks that meet the ASA criteria are then transferred to the responsibility of the State (43 U.S.C. §§ 2105(c)). The law of

salvage and the law of finds apply to abandoned shipwrecks that do not meet the criteria of the ASA and do not otherwise have some sort of legal protection (U.S. Commission on Ocean Policy 2004b).

The National Marine Sanctuaries Act (1972) includes protection of areas of cultural and archaeological significance as sanctuary resources.

NAGPRA recognizes that human remains of any ancestry "must at all times be treated with dignity and respect." Human remains and other cultural items removed from federal or Tribal lands belong, in the first instance, to lineal descendants, Indian Tribes, and Native Hawaiian organizations.

NHPA Section 106 requires potential project areas to file protocols for inadvertent archaeological discoveries. The California SHPO evaluates if the project may cause significant impact to known historic resources. The Department of Interior has authority under NHPA to ensure that permitted actions do not adversely affect significant historic properties and has also created guidance for the discovery of, and avoidance of adverse impacts to, any archeological resource discovered in offshore waters within the U.S. Exclusive Economic Zone (30 C.F.R. §§ 250.194, 250.203(b)(15), 250.203(o), 250.204(b)(8)(v)(A), 250.204(s), and 250.1007).

Archaeological Resources

There are two basic types of archaeological sites off the California coast: Native American archaeological sites and historic-era shipwrecks, cargo spills, or landing sites (Foster 2024). Archaeological resources in Federal waters could include shipwrecks, sunken aircraft or other machinery, lighthouses, and prehistoric archaeological sites that have become inundated due to the global sea level since the height of the last ice age (ca. 19,000 years ago; National Oceanography Centre 2010). Typical characteristics of archaeological resources in the SCB region are described on p. 13 of the Introduction of Morris et al. (2021) and are incorporated here by reference.

The two Tribes most likely to have historic habitations and artifacts offshore where the AOAs are proposed are the Chumash and Gabrieleno-Tongva Tribes, who are described in Chapter 3, Section E.i. Artifacts found in the marine environment have helped archaeologist's piece together Chumash trade networks, fishing practices, and submerged village sites (McGinnis 2006). Thousands of years ago the sea level was at least 150 feet lower than it is today and the northern Channel Islands were joined as one island, and some submerged artifacts may have been deliberately deposited in the water during religious ceremonies, washed to the sea from shore, or been deposited in the water through cliff erosion (McGinnis 2006).

There are identified wrecks in Santa Monica Bay and the Santa Barbara Channel (NOAA n.d.b). There are no known wrecks in any of the Alternatives (Morris et al. 2021). As noted above, sunken vessels and aircraft discoveries are governed by federal laws that determine how they are preserved and accessed.

Stressors

Stressors to archaeological resources include activities like geotechnical surveys, infrastructure installation, and anchoring. Public knowledge of and access to archaeological resources can also be a stressor.

Potential Impacts

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have

sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Potential impacts to archaeological resources include disturbance or damage from bottom disturbing activities. Public knowledge and access can result in divers or other people damaging or looting wrecks, habitations, or other important sites. The potential impacts associated with physical, biological, and socioeconomic environments are described in Chapter 3, Sections B, C, and D, respectively. Without knowing the specific location, potential seafloor disturbance actions, and any baseline environmental surveys, the impacts to potential archeological resources are unknown.

Aquaculture can be proposed and permitted regardless of the presence of an AOA. Coordination with the California SHPO and DOI would be necessary for any aquaculture project, in accordance to NHPA (described above in this section). Identification of one or more AOAs could be beneficial for NHPA coordination because it would encourage more geographic certainty around permitting and encourage developers and academic organizations to focus data collection on the AOA(s), including geophysical surveys that could provide information on archaeological resources present in the area prior to significant resource commitment to development of aquaculture or issuance of any sort of leases or easements, improving consultations and engagement. This site assessment activity could allow proposed projects to avoid impacts to archaeological resources, regardless of the type of aquaculture undertaken.

Alternative 1: No Action

Under the no action no AOAs would be identified, and there would be no changes or impacts to baseline conditions.

Alternative 2: Santa Barbara Channel

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

a) Shellfish and Macroalgae

The impacts may vary depending on the types of aquaculture undertaken (e.g., macroalgae, shellfish, finfish) and would need to be further assessed at the project proposal stage.

b) All Types of Commercial Aquaculture

The impacts may vary depending on the types of aquaculture undertaken (e.g., macroalgae, shellfish, finfish) and would need to be further assessed at the project proposal stage.

Alternative 3: Santa Monica Bay

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

There is likely little difference between Alternatives 2 and 3, though different archaeological resources would potentially be present. The Chumash Heritage National Marine Sanctuary is adjacent to the Channel Islands National Marine Sanctuary and closer to the Santa Barbara Channel than the Santa Monica Bay, potentially indicating the likelihood of Chumash archaeological resources to be present is higher in Santa Barbara Channel than Santa Monica Bay, but presence of archaeological artifacts or sites must be assessed through surveys to identify specific wrecks, artifacts, and habitations.

a) Shellfish and Macroalgae

The impacts may vary depending on the types of aquaculture undertaken (e.g., macroalgae, shellfish, finfish) and would need to be further assessed at the project proposal stage.

b) All Types of Commercial Aquaculture

The impacts may vary depending on the types of aquaculture undertaken (e.g., macroalgae, shellfish, finfish) and would need to be further assessed at the project proposal stage.

Alternative 4: Combined Geographic Areas

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here.

Identification of a larger geographic area that included both Santa Barbara Channel and Santa Monica Bay may encourage more aquaculture to be proposed and thus lead to greater potential for impacts, as described for Alternatives 2 and 3, to archaeological resources. Risk could be compounded due to larger total acreage and potential total facilities that may be sited if more total AOAs are identified.

a) Shellfish and Macroalgae

The impacts may vary depending on the types of aquaculture undertaken (e.g., macroalgae, shellfish, finfish) and would need to be further assessed at the project proposal stage.

b) All Types of Commercial Aquaculture

The impacts may vary depending on the types of aquaculture undertaken (e.g., macroalgae, shellfish, finfish) and would need to be further assessed at the project proposal stage.

Chapter 4: Cumulative Impacts

A. Past, Present, and Foreseeable Actions

i. Environmental Variation

Evidence of environmental variation and its impacts have been detected for at least the past 50 years globally and are expected to continue for decades into the future (Intergovernmental Panel on Climate Change [IPCC] 2023). Multi-decadal projections of future environmental variation are available (IPCC 2023). At some time and geographic scales, the "signal" of environmental variation in available projections cannot be distinguished from the "noise" of natural climate variability over short time periods. In a review of available literature, NMFS West Coast Region Protected Resources Division concluded that, for at least 10 years into the future, and up to 50 years at the regional scale, predicted climate is dominated by annual and decadal natural variability and the signal of environmental variation is difficult to distinguish or project. When choosing a period for climate-scenario or population-response projections, it is important not to confuse the uncertainty in rate or magnitude of change with uncertainty in directionality. Although the precision of estimates of global temperature increase is low, for example, an increase in mean global temperature is virtually certain (IPCC 2023). When the direction of change is clear, projections of species status under environmental variation should not be discounted solely because the magnitude of projected change at a particular time is highly variable. As such, effects of the proposed action are described in the context of environmental conditions expected under current climate variability and could be applicable over a 10-year to 50-year scale.

NOAA and the World Meteorological Organization define "climate normal" as uniform 30-year periods consisting of annual/seasonal, monthly, daily, and hourly averages and statistics of temperature, precipitation, and other climatological variables from almost 15,000 U.S. weather stations (National Centers for Environmental Information n.d.). These periods are used as reference points to detect deviations from long-term averages, which enables trends in departures from the baseline conditions to be tracked. Departures from baseline conditions are being observed with increasing frequency and greater magnitude. Recent extreme events are characteristic of the variability of relevant environmental conditions and are important for representing developing conditions of environmental variation. An example is the frequency and severity of large marine heatwaves in the Northeast Pacific Ocean increasing over the last four decades, and the tendency for them to persist offshore during summer and autumn. The 2023 event of this nature was the fourth largest by area and fifth longest in duration since satellite observations began in 1982 (Leising et al. 2024). The ecosystem effects of marine heatwaves propagate through the food web and can result in impacts to fisheries (Robertson and Bjorkstedt 2020) and aquaculture (Reid et al. 2019). Environmental variation is occurring over a long period, and although projections become more uncertain farther into the future, the general trend is toward increasing changes as part of the environmental baseline. Aquaculture is one of the fastest growing food production sectors globally and this growth is recognized as crucial to global food security in the context of environmental variation.

Environmental Variation and the Administrative Environment

The current programmatic action does not authorize any aquaculture to occur, and given the scope and scale of activities that may occur and changing technologies, it is not possible to quantify GHG emissions for potential aquaculture projects in the potential AOAs at this time; however, aquaculture projects would be permitted under various statutes, including Clean Air Act (CAA) as applicable, which may necessitate GHG quantification and mitigation for projects as they are proposed and permitted if statutory thresholds are reached.

In the state of California, shoreward of where the AOAs are proposed, the Global Warming Solutions Act, California Environmental Quality Act, and Ocean-Going Vessel Fuel Regulation regulate activities

associated with environmental variation impacts. In addition, California enacted two climate-related disclosure laws in 2023: (1) the Climate Corporate Data Accountability Act (SB-253), which requires entities with annual revenues over $1 billion to disclose their GHG emissions; and (2) the Greenhouse Gases: Climate-Related Financial Risk law (SB-261), which requires entities with total annual revenues over $500 million to post their climate-related financial risks on their websites with a description of how they plan to reduce or adapt to those risks.

Environmental Variation and the Physical Environment

Departures from typical climate parameters are mostly driven by anthropogenic activities, including emissions of GHGs from burning of fossil fuels and other activities, such as deforestation, that release GHG from their natural reservoirs (IPCC 2023). GHGs include water vapor, carbon dioxide, methane, nitrous oxide, and ozone; these gasses trap heat within the earth's atmosphere, causing global warming. According to the IPCC CMIP6 climate models, it is "very likely" that the Earth's atmosphere will warm to at least 1.5°C above pre-industrial temperatures between 2021 and 2040. IPCC (2023) reports that ocean temperatures increased 0.93°C from 1850-1900 to 2013-2022. Environmental variation is expected to lead to substantial changes in physical characteristics and dynamics within the marine environment, with complex and interacting impacts to marine populations, fisheries, and other ecosystem services (Scavia et al. 2002, Harley et al. 2006, and Doney et al. 2012). IPCC (2023) reports that ocean warming has contributed to an overall decrease in maximum catch potential for some fish stocks, and ocean warming and acidification have adversely affected shellfish aquaculture and fisheries in some oceanic regions.

The ocean absorbs approximately one-third of the CO_2 released into the atmosphere every year from industrial and agricultural activities, changing the chemistry of the ocean by decreasing the pH of seawater. CO_2 absorbed by the ocean gets converted to carbonic acid which lowers the pH of seawater over time, resulting in ocean acidification (Andersson et al. 2015). The combined effects of global warming and ocean acidification drive changes in other physical characteristics, such as sea level, salinity (Cullum et al. 2016), dissolved oxygen (Keeling et al. 2010), wind speed and direction, ocean currents (Howard et al. 2020) precipitation, nutrients (Marinov et al. 2010) and sediment loads. These physical changes, in turn, can result in biological effects such as changes in species distribution and abundance (Pecl et al. 2017); organism development and growth (e.g., shell formation in certain invertebrates) (Waldbusser et al. 2015); disease prevalence (Glidden et al. 2022); and occurrence of harmful algal blooms (HABs; Riebesell et al. 2018).

A key indicator of ocean acidification is aragonite saturation state, a measure of the availability of aragonite (a form of calcium carbonate). Aragonite saturation <1.0 indicates relatively acidified, corrosive conditions that are stressful for many California Current Ecosystem (CCE) species, particularly shell-forming invertebrates. Aragonite saturation states tend to be lowest during spring and summer upwelling, and highest in winter in the CCE (Harvey et al. 2023). Ocean acidification affects many shell-forming species, including oysters, mussels, abalone, crabs, and the microscopic plankton that form the base of the oceanic food web (Kroeker et al. 2010, 2013). In addition, significant changes in the behavior and physiology of fish and invertebrates attributable to rising CO_2 and increased acidity have been documented (OEHHA 2022). Ocean acidification impacts on these species can propagate through marine food webs and potentially affect fisheries (Marshall et al. 2017).

In addition to these large-scale aspects of environmental variation, some immediate and localized aspects of environmental variation are observed in coastal marine ecosystems: intensification of upwelling (Bakun 1990, Schwing and Mendelssohn 1997), changes in phenology (cyclic and seasonal natural phenomena, especially in relation to climate and plant and animal life) (Bograd et al. 2009), and changes in the frequency and intensity of existing interannual and interdecadal climate patterns (Yeh et al. 2009). Substantial changes in weather and precipitation patterns will also affect snowpack, streamflow, river temperatures and other aspects of freshwater habitat, with potential consequences to the future

productivity and sustainability of anadromous resources such as salmon (Mantua and Francis 2004, Crozier et al. 2008). As described by Bakun (1990), environmental variation has led to an intensification of alongshore wind stress, which in turn has led to an intensification of coastal upwelling, as has been documented both around the globe and specifically within the CCE (Schwing and Mendelssohn 1997).

Recent trends in recent years indicate an earlier timing to the start of upwelling in the south, and a later start to upwelling in the north (NMFS 2012), with an earlier start of upwelling likely leading to higher integrated productivity. Changes in the timing of upwelling will also likely have impacts all the way up the food web to the top-level predators and consumers because it is the timing and strength of upwelling that mainly controls primary productivity in the CCE, and thereby overall productivity. Upwelling transports hypoxic, acidified waters from deeper offshore onto the continental shelf, where increased community-level metabolic activity can further exacerbate ocean acidification (Feely et al. 2008). Changes in the timing of upwelling may result in match-mismatch between the availability of predators and their prey, if those timings are somewhat uncoupled (e.g., salmon entering the ocean may have a different timing set by terrestrial forcing, as opposed to the timing of upwelling initiation). Three major aspects of future environmental variation that will have direct effects on the CCE are: ocean temperature, pH of ocean surface waters, and deep-water oxygen. All three factors show long-term trends and decadal-scale variance similar to changes in the Pacific Decadal Oscillation (Mantua et al. 1997) and North Pacific Gyre Oscillation (Di Lorenzo et al. 2008) climate signals. Within the CCE, deep-water oxygen levels showed a steady and relatively rapid decrease from the mid 1980's into the 2000s (Bograd et al. 2008, McClatchie et al. 2010).

There is increasing evidence that sea-level rise, ocean acidification, and ocean warming associated with environmental variation are transforming and degrading California's coastal and marine ecosystems (OEHHA 2022, CDFW 2022). In the last few years, California has experienced an unprecedented marine heat wave, resulting in closures of fisheries and a significant loss of northern kelp forests. California's ocean supports a vast diversity of marine life, as well as fishing communities that depend on fish and shellfish for their livelihoods and that provide a diverse supply of seafood to the state and for export.

The current projections are for a 0.6°C increase in mean sea surface temperature in the Southern California Bight (SCB) over the next two decades. Sea level is estimated to rise by 0.1 m and 0.2 m for the SCB; ocean surface pH is expected to decrease by 0.1 units. While coastal precipitation is predicted to range from a 2% decrease to a 0.8% increase in precipitation in the SCB. Currently available information indicates environmental effects like these are likely to impact the proposed AOAs. Weather events, such as extreme heat, heavy precipitation, drought, and tropical cyclones are also predicted to become more frequent and intense. Dissolved oxygen and salinity are predicted to decrease in many areas/depths within proposed AOAs (Rhodes et al. 2023a).

Environmental Variation and the Biological Environment

Environmental variation is likely to affect species' distributions, abundances, interactions with other species, and community structures. Suitable habitat location, quality, timing, and use may also change with environmental variation. The SCB undergoes periods of mass warming during El Niño events and Pacific Decadal Oscillation phase (see Chapter 3, Section B (Physical Environment)). Ecosystem productivity and species occurrence is affected greatly during these warming trends, which impacts fisheries, tourism, and other socioeconomic resources in the region and at the state level. El Niño and the Pacific Decadal Oscillation already pose serious conservation concerns in the region and may interact with the potential impacts from rising sea surface temperature (SST) due to environmental variation. Approximately 85% of the marine species in the SCB are at the extreme northern or southern end of their range (Schiff et al. 2000). The ecotone created by the coastline delineates the northern and southern range for many of the seabirds observed in offshore waters as well (USFWS 2005).

Point Conception has been shown to be a major biogeographic boundary for benthic invertebrates and marine fishes (NCCOS 2005). The SCB is less of a barrier for highly mobile, larger predators, but

approximately 10 percent of the 132 bird species analyzed in NCCOS (2005) had a range crossover in the SCB. While larger cetaceans and pinnipeds do not seem significantly affected by the range endpoint of Point Conception, many of the smaller dolphin species show a range significantly defined by Point Conception and occur primarily north or south of the boundary (NCCOS 2005).

Biological resources described in Chapter 3, Section C. (Biological Environment) of this PEIS are being affected by environmental variation as part of the baseline of the biological environment. Some species may be shifting or will shift their ranges; there may be reductions in suitable habitat, temperature and other physical changes to the environment may be affecting prey or predators in ways that will impact populations and their distributions, and habitats may be changing in ways that also affect populations. There is research on some specific taxa and locations that can be applied to future analysis of specific project proposals when permits are sought (e.g., Patrício et al. 2021, Evans and Bjorge 2013, and Sydeman et al. 2015).

Protected Species

All sea turtles, black abalone, and several species of fish are protected under the Endangered Species Act (ESA). Marine mammals are protected under the Marine Mammal Protection Act (MMPA), and some are also protected under ESA. Migratory birds (which is the majority of birds) are protected under the Migratory Bird Treaty Act, and some are also protected under ESA. Environmental variation constitutes an environmental baseline for all species and habitats, and changes in temperature, salinity, pH, and other ocean conditions may affect the use patterns and distribution of species, in some cases driven by changes in prey distributions and use patterns. The availability of suitable alternative habitats and available prey and conditions for feeding, breeding, and other important life history activities will determine the resilience of species to environmental variation. Specific discussion of potential effects of environmental variation on baseline conditions for protected species is described in Appendix 4.

Environmental Variation and the Socioeconomic Environment

Decreased food security is an issue that may be exacerbated or brought on by environmental variation impacts to food resources. As a proxy to consider potential effects of change, during the height of the COVID-19 pandemic, the U.S. experienced food shocks and supply chain issues across a multitude of food systems (Galanakis 2020; Laborde et al. 2020; and Love et al. 2021b). Increased food resilience, defined as the "capacity over time of a food system and its units at multiple levels, to provide sufficient, appropriate and accessible food to all, in the face of various and even unforeseen disturbances," can buffer against shocks (Love et al. 2021b). A diverse and vibrant aquaculture industry can add resilience to U.S. food systems via select species propagation and responsive production control (Troell et al. 2014).

Despite the changes predicted to occur in the SCB, temperatures are still expected to remain more stable than on land. Along with temperature, drought is, and will continue to be, a major factor of environmental variation in California. Therefore, marine aquaculture may offer a comparatively stable option for food production on the West Coast (Froehlich et al. 2018). Finfish may be more resilient to environmental variation than shellfish because of issues with ocean acidification (Froehlich et al. 2018). The potential changes to marine aquaculture production as a result of environmental variation will likely be considered as California determines what types of aquaculture it will include to support a more climate-resilient food portfolio for the state (Nelson et al. 2019).

Environmental Variation and the Cultural and Historic Environment

Chapter 3, Section E (Cultural and Historic Environment) describes the cultural and historic baselines in the SCB region where AOAs are proposed. With respect to environmental variation, a recent state assessment (Sievanen et al. 2018) reported that environmental variation impacts like exposure to algal toxins and poor water quality may disproportionately affect tribes and tribal communities and subsistence harvesters of seafood, particularly as California tribes eat more seafood per capita than other groups. This

report also notes that tribal economies, cultures, and traditions include marine species that may be affected by environmental variation, requiring cultural and economic adaptation.

ii. Other Ocean Uses and Current Events in the Southern California Bight

The baseline of activities to be considered as potentially contributing to cumulative impacts in aggregation with AOAs is described below. The following list is a summary of topics, many of which are addressed in previous sections of this PEIS, which contribute to the baseline conditions and trends in the SCB and should be considered for potential cumulative impacts associated with aquaculture, should an AOA be identified.

- HAB and domoic acid incidents;
- Marine mammal vessel interactions, vessel restrictions;
- Commercial and recreational fishing;
- Ocean research and ecosystem monitoring;
- Tourism and recreation;
- Commercial shipping;
- Military readiness activities;
- OCS leases;
- Marine debris and water quality;
- Marine aquaculture in the SCB; and
- Marine conservation efforts.

The following current events and trends in the SCB are considered beyond the temporal and spatial scope of this PEIS. These topics include those that may be considered in a site-specific NEPA analysis at the proposed project level for indirect and cumulative impacts when more information about project designs and coastal interactions are known or if other potential large-scale actions become foreseeable and create potential for cumulative impacts at that time.

- Resource extraction (e.g., deep-sea mining, dredging);
- Historic and present-day dumping zones (e.g. DDT, spoils, run-off); and
- Historic and present-day spill cleanup efforts (e.g., sewage, oil).

Due to other industries in the area, there is a potential for oil spills, chemical spills, and other pollutants to occur in the broader Santa Barbara Channel and Santa Monica Bay. Notable events, such as oil spills, that have occurred in the last 60 years are summarized on p. 196 of Morris et al. (2021), incorporated by reference. Submarine utilities such as cables and pipelines were incorporated into Morris et al. (2021) modeling as incompatible with aquaculture operations. The AOA alternatives considered in this PEIS do not currently have any submarine utilities within the areas of analysis. However, it is not possible to predict where new installations may occur in the future. Site-specific NEPA analyses would need to consult with local permitting authorities for the potential overlap of specific sites with any new projects for this type of interaction. There are no cumulative impacts for submarine utilities expected at this time.

HAB and Domoic Acid Incidents

Harmful algal blooms, or HABs, occur when a variety of environmental factors cause algae colonies to grow rapidly within a short period of time, which not only consume large amounts of dissolved oxygen as they decay, but also produce high levels of toxins that adversely impact both the ecosystem and human health (NOAA 2016). These toxins bioaccumulate within the food web, which is why they are especially important to consider in aquaculture, as algae is often consumed by shellfish, either directly or indirectly, which is then consumed by humans. One such toxin is domoic acid, a powerful neurotoxin that, in high doses, results in amnesic shellfish poisoning, which causes severe symptoms such as memory loss, heart problems, seizures, and even death. HABs have been known to occur annually along the coast of California, which is why commercially consumed shellfish and finfish are monitored for their levels of toxins; however, recreationally harvested shellfish are not, which poses a great risk to human health

(NOAA 2023b). According to NCCOS (2019), NOAA is currently studying the co-occurrence of multiple toxins produced by HABs in Southern California to examine the potential health impacts on the local community. With global environmental variation, incidents of HAB may become more common in shallow, nearshore areas, where the impacts of decreased dissolved oxygen and ocean acidification are more pronounced. The Southern California Coastal Water Research Project monitoring provides general trends in resource health in the region. Significant findings from the published results of 2018 surveys include the following (Smith et al. 2021):

- Domoic acid was widespread in continental shelf sediments of the SCB;
- Domoic acid was detected in 54% of the total shelf habitat area sampled and was most prevalent in the middle shelf strata (67% of mid-shelf area);
- Domoic acid was consistently detected in the sediments during 3 years of field surveys; and
- Domoic acid was consistently detected in benthic infauna tissues on annual and monthly timescales.

Marine Mammal Vessel Interactions

Vessels can attract or repel marine mammals. The main concern around marine mammal/vessel interactions in the SCB is vessel-whale collision. In 2015, NOAA implemented a voluntary vessel speed reduction May 1 through December 15 in the Greater Farallones, Cordell Banks, and Channel Islands National Marine Sanctuaries, and these zones were extended to include the Monterey Bay National Marine Sanctuary and Santa Barbara Channel Traffic Separation Scheme and Area To Be Avoided in 2023 (NOAA n.d.c). Redfern et al. (2020) found that static spatial management measures like changing shipping lanes and seasonal speed reductions can be effective in mitigating risk from ship traffic variability off California. Rockwood et al. (2021) estimated 8.9 blue whales, 4.6 humpback whales, and 9.7 fin whales were killed in ship collisions each year from Point Conception to San Diego, California based on whale densities and seven years of Automated Information System (vessel location) data. They estimated that if 95% cooperation occurred in the vessel speed reduction lanes, whale deaths there would decrease by 22–26%.

Commercial and Recreational Fishing

Commercial and recreational fishing activity in the SCB is described in Chapter 3, Sections D.i. and D.ii. Fisheries can affect the environment through impacts such as adverse effects to fish stocks, protected species, and habitats, and generally have beneficial socioeconomic effects. Entanglement in fishing gear effects wildlife, and aquaculture infrastructure could potentially contribute additional risk for entanglement (see Chapter 3, Section C (Biological Environment) for entanglement impacts discussion). Fisheries vessels produce emissions and refuse. Commercial, and to the extent practicable recreational, fishing activities have been considered in deconflicting proposed locations for AOAs (Morris et al. 2021). Fisheries may not be able to operate in some areas where aquaculture infrastructure creates navigational hazard for towed gear, and target fish may be repelled from or attracted to aquaculture infrastructure, creating a potential adverse or beneficial interaction for fisheries. The baseline conditions of fisheries for consideration of cumulative impact for the area associated with each alternative are described in Chapter 3, Section D. (Socioeconomic Environment).

Ocean Research and Ecosystem Monitoring

There are a variety of research and monitoring efforts in the region where potential AOAs have been proposed. The Southern California Coastal Water Research Project (SCCWRP 2024) monitoring provides general trends in resource health in the region, conducting regular surveys of sediment, water quality, benthos, and fish. Research grants associated with the State's native fish stock enhancement programs support collaborative projects across a wealth of topics including fish health, physiology, systems design, post-release acoustic tracking, and genetics (e.g., CDFG 2010). NMFS conducts ongoing fishery and protected species research off the California coast, and U.S. Geological Survey and U.S. Fish and

Wildlife Service conduct bird studies in the region as well. These ongoing agency projects were considered to the extent practicable in deconflicting proposed locations for AOAs (Morris et al. 2021). The California Cooperative Oceanic Fisheries Investigations project has been ongoing in the CCE since 1949, collecting a variety of physical and biological data (the latest report is Thompson et al. 2022).

Current ocean research and ecosystem monitoring activities may be excluded from aquaculture operations for safety, regulatory, or commercial reasons. This may disrupt long-term data collection and trend analyses. Ocean research and ecosystem monitoring can have adverse impacts on wildlife and habitats, including damaging habitats (e.g., trawl surveys) and creating sound, debris, turbidity, and emissions. At the same time, aquaculture operations may also provide platforms of opportunity to conduct additional research or test and use new technologies for research.

Tourism and Recreation

Within the California Bight, there is a high amount of tourism and recreational activity, most of which occurs nearshore, and includes activities such as sailing, marine mammal watching, scuba diving, and fishing. These activities have been found to be relatively evenly distributed, with no distinct routes, however many recreational users were found to favor areas with high biodiversity (Morris et al. 2021). Tourism and recreational activities in the SCB are described in Chapter 3, Section D.v. These activities can affect the environment through impacts such as adverse effects to fish, protected species, and habitats, and generally have beneficial socioeconomic effects. Vessels for tourism and recreation produce emissions and refuse. Tourism and recreational activities have been considered in deconflicting proposed locations for AOAs to the extent practicable (Morris et al. 2021). Tourism and recreation activities may not be able to occur in some areas where aquaculture infrastructure creates safety hazards, and whales or other targets of tourist activities may be repelled from or attracted to aquaculture infrastructure, creating a potential adverse or beneficial interaction for tourism. The baseline conditions of tourism and recreation for consideration of cumulative impact for the area associated with each alternative are described in Chapter 3, Section D.v.

Commercial Shipping

Morris et al. (2021) reports that shipping is considered essential to many industries and should be avoided by aquaculture. While commercial shipping vessels within Santa Monica Bay are rare, the adjacent shipping lanes have a high concentration of tanker traffic, specifically vessels used to offload oil at the Chevron El Segundo terminal (Morris et al. 2021). The proposed potential AOAs are not within shipping channels. Shipping can displace fishing and recreational activities and affect wildlife with potential vessel collision, sound, emissions, and water quality impacts. Shipping routes and types of major vessel patterns near the proposed potential AOAs are described in Morris et al. (2021) and Chapter 3, Section D.vi. (Transportation and Navigation).

Military Readiness Activities

The U.S. Navy's Hawaii-California Training and Testing (HCTT) Study Area consists of the Hawaii Operating Area and the California Operating Area, in addition to a corridor that connects the two. The California Operating Area spans the length of Southern California, including the proposed AOAs located along Santa Barbara and Santa Monica. The HCTT Study Area is used to conduct at-sea military readiness activities, which include active sonar, explosive use, and other sources of underwater sound (U.S. Navy 2024). Military training and testing can displace fishing and recreational activities and affect wildlife with potential vessel collision, sound, emissions, and water quality impacts.

OCS Offshore Wind Leases and Renewable Energy

Offshore wind leases are described in Chapter 3, Section D.vii (Offshore Energy and Public Services). Five wind leases have been sold off the coast of Central and Northern California, and on April 24, 2024, the Department of Interior announced a new five-year offshore wind lease schedule that includes another

lease sale off the coast of California scheduled for 2028 (BOEM 2024). Potential locations for 2028 lease blocks have not yet been identified by BOEM. A January 20, 2025 Presidential Memorandum has withdrawn the Outer Continental Shelf from new commercial leasing for offshore wind energy projects. Offshore wind farms have the potential to affect the physical and biological environment, as well as the potential to affect fisheries and other commercial activities and cultural resources. BOEM is preparing a PEIS for the five leases currently under development (BOEM n.d.). Offshore wind projects undertake site assessment activities that include deployment of meteorological ocean buoys and other scientific devices and conduct geophysical, geotechnical, and biological surveys. Off California, offshore wind would be floating wind, which would include bottom anchored moorings and inter-array cables among potentially hundreds of turbines. Windfarms are subject to permitting and must be in compliance with federal law, including the implementation of a variety of mitigation measures to avoid, minimize, and offset impacts. The Port of Long Beach is evaluating the opportunity to develop an approximately 400-acre terminal known as Pier Wind. This port terminal, located in the outer harbor of the Port of Long Beach, will have the flexibility to serve any of the offshore wind industry needs (Port of Long Beach 2023). Planning is also underway to identify suitable sea space for offshore wave energy and tidal energy projects in state and Federal waters off California (PFMC 2025).

Marine Debris and Water Quality

Marine debris and water quality issues affect ecosystem health and are a biological resources conservation concern as discussed in Chapter 3, Section C. (Biological Environment). According to EPA (2011), ocean-based litter contributes about 11% to all marine debris along the west coast, and 35% is from unknown or unspecified sources. Based on the California Ocean Litter Prevention Strategy (California Ocean Protection Council and NOAA Marine Debris Program [CalOPC 2018]), about 46% of the debris found on California beaches is from ocean-based sources. This debris is concentrated by ocean currents along the same fronts, eddies, and convergences that characterize the SCB and that concentrate marine life in food web interactions (EPA 2011). Water quality is affected by other activities in the SCB. The SCB Coastal Water Research Project monitoring provides general trends in resource health in the region (SCCWRP 2024). The reports generated by this program provide additional baseline information for future analysis of potential cumulative impacts of marine debris and water quality impairments across ongoing actions in the region and proposed aquaculture projects.

iii. Marine Aquaculture in the Southern California Bight

Statewide, grown or proposed macroalgae species include Ogo (*Gracilaria* spp.), Sea Lettuce (*Ulva* spp.), Dulse (*Palmaria palmata*), Giant Kelp (*Macrocystis pyrifera*), Bladder Wrack (*Fucus* spp.), Nori (*Porphyra lanceolata*), Kombu (*Laminaria farlowii*, *Laminaria setchelii*), and Turkish Towel (*Chondracanthus exasperatus*). Aquaculture farms may sell seaweed that is harvested opportunistically from their shellfish cultivation gear, as regulations allow (CDFW 2020a). The industry is still minimal, with little to no impact on the economy at this point in time (CDFW 2020a). Additional commercial shellfish and seaweed operations located in the SCB but outside the geographic areas associated with the PEIS alternatives include one mussel farm near Long Beach, a variety of shellfish and macroalgae species near Carlsbad, and seaweed and shellfish near San Diego (Aquarium of the Pacific 2015, CDFW 2020a; and Sea Grant 2024a).

Commercial marine aquaculture development for seaweed, shellfish, and finfish in the SCB is being researched for its economic potential while managing and minimizing significant adverse impacts on the environment and existing commercial fisheries (Lester et al. 2018b, Nelson et al. 2019, and CDFW 2022). Ocean-based, commercial aquaculture in California state waters is limited currently to shellfish and seaweed projects (Aquarium of the Pacific 2015, Green Wave 2019, and CDFW 2020a). As of the most recent CDFW report, the Santa Barbara Channel currently has a total of 97 acres (39 ha) leased for commercial aquaculture operations in state waters, with an estimated 25 acres (10 ha) being actively used (CDFW 2020a). Cultivated species include Mediterranean Mussels (*Mytilus galloprovincialis*), Pacific

Oysters (*Crassostrea gigas*), and Red Abalone (*Haliotis rufescens*) (CDFW 2020a, 2022; Sea Grant 2024a). There are no commercial marine aquaculture operations in Santa Monica Bay. Reasonably foreseeable aquaculture projects may include Pacific Ocean Aquafarms, Ocean Rainforest, and Avalon Ocean Farm (PFMC 2025), Ocean Rainforest 2024).

Future aquaculture project-specific NEPA analyses would coordinate with USACE on the most up-to-date locations of other proposed or existing aquaculture to sufficiently analyze potential interactions and cumulative impacts among facilities sited in an AOA and other aquaculture operations in the area.

iv. Marine Conservation Efforts

Marine managed areas are described in Chapter 3, Section B.ii. As described in that Section of this PEIS, there are a variety of state and federal managed areas with differing levels and types of restrictions aimed at conservation and management of resources. The Chumash Heritage National Marine Sanctuary has recently been established, adding to the network of marine protected areas in the SCB region. Fisheries management also includes conservation practices to meet statutory requirements of Magnuson-Stevens Fishery and Conservation Management Act (MSA), ESA, MMPA, and other laws. Impacts of potential aquaculture operations on marine conservation areas is described in Chapter 3, Section B.ii. (Marine Managed Areas). Aquaculture may be used as a tool for management and conservation with respect to fish harvest, or it may cause impacts that require additional conservation efforts to offset. Cumulatively, marine conservation efforts generally provide benefits to resources and have potential to enhance and be enhanced by aquaculture operations. In October 2020, the Governor of California issued Executive Order N-82-207 which established a state goal of conserving 30 percent of California's lands and coastal waters by 2030. It is unclear how implementation of the Executive Order may affect the California Marine Protected Area network, which could potentially be expanded to meet this goal.

B. Potential Cumulative Impacts from Past, Present, and Foreseeable Actions

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact. Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. While the AOA process is designed to identify areas that may be suitable for three to five aquaculture projects, the analysis presented in each section assesses potential impacts that may occur as a result of aquaculture activities ranging from one to multiple facilities (e.g., a range of acreage with aquaculture facilities sited within the AOAs). The analysis is framed in this way because 1) the number and size of any farms that could be sited in the future is uncertain and 2) NOAA Fisheries does not have sufficient information with which to bound the analysis with respect to gear, species, harvest levels, or other relevant factors.

Cumulative effects are effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from actions with individually minor but collectively significant effects taking place over a period of time.

Baseline conditions for environmental variation and other ocean uses are described in Chapter 4, Section A. Based on these baselines of past, present, and reasonably foreseeable actions, the increment of cumulative effect of the action of identifying AOAs is likely to be very minimal and may result in a lower increment of cumulative impacts compared to aquaculture projects that may be implemented without AOAs due to deconfliction of aquaculture in AOAs. To the extent practicable, the approach to developing alternatives accounts for commercial, recreational, conservation, and military activities, aiming to deconflict the proposed AOAs with these uses through application of the Atlas (Morris et al. 2021). At the stage of individual project proposals, finer-scale consideration for local interactions may result in different localized cumulative effects in space or time. There may be both adverse and beneficial effects, including adverse ecosystem effects in combination with other uses and beneficial and adverse effects to food security. For example, if aquaculture occurs in waters that are far from shore or are subject to high energy conditions, seafood from such facilities may become costly relative to other foods which may affect the food security benefits (Fujita et al. 2023). Diversification can also build food resilience in combination with fisheries and help address food shocks.

A cumulative analysis of environmental variation on resources that may be impacted by aquaculture facilities may need to scale down from global and regional trends to the local scale of a project-specific action area. The following considerations may be used to analyze cumulative effects in association with environmental variation:

- Changes in the marine physical and chemical condition that could affect biological resources;
- Changes in ocean access and use (habitat use by marine life; commercial or recreational activities for humans);
- Changes in marine ecosystem dynamics, at a population level;
- Changes in fishing community involvement or dependence upon fishery resources; and
- Synergistic effects expected with aspects of environmental variation.

With respect to cumulative effects with past, present, and foreseeable actions (aside from environmental variation), the stressors described in Chapters 4(B), (C), (D), and (E) are also applicable to the physical, biological, socioeconomic, and cultural/historic environmental impacts. These stressors may act in synergy or in conflict across actions. The increment of impact associated with the cumulative stressors for these resources is described below for each alternative.

i. Administrative Environment

The Regulatory Flexibility Act (RFA; 5 U.S.C. §§ 601-612) is a procedural statute that requires federal agencies to take into account the disproportionate impacts regulations may have on small businesses, and requires agencies consider other alternatives if the impact on small businesses is significant. The RFA does not apply to the AOA NEPA planning process because it is not a regulatory process; however, the impacts of offshore aquaculture interactions with fisheries and fishing communities may change how communities are analyzed in accordance with the RFA (McDevitt 2001).

ii. Environmental Variation

The main cause of environmental variation is increasing anthropogenic GHG emissions. Reducing GHG emissions will require national and global efforts. Therefore, any mechanism to consider the impacts of environmental variation and GHG needs to consider the adequacy and the effectiveness of national and international regulatory mechanisms (NMFS 2023e). It is anticipated that environmental variation will affect resources in the AOAs, as well as affecting aquaculture viability over time. The value of aquaculture may increase if commercial fish stocks and/or fisheries are adversely affected by environmental variation.

Ocean acidification and low pH conditions associated with air pollution and environmental variation are ongoing stressors for marine ecosystems off the coast of California. Climate scientists have concerns about the potential for cumulative and synergistic effects of hypoxia and ocean acidification. Ocean acidification, caused by increased anthropogenic CO_2, reduces pH and dissolved carbonate in seawater and is stressful to many marine species (Feely et al. 2008, Busch and McElhany 2016). Marshall et al. (2017) predicted, given the current conditions, a 0.2-unit drop in pH (55% increase in acidity) in the California Current during the summer upwelling season over a 50 year period (2013-2063), and a 0.9°C increase in the annual mean water temperature in the upper 100 m (328 ft.). This pH drop would directly impact invertebrates (crabs, shrimps, benthic grazers, benthic detritivores, bivalves), and indirectly impact some demersal fish, sharks, and epibenthic invertebrates (e.g. Dungeness crab (*Metacarcinus magister*)). Increasing ocean acidification adds to naturally high levels of carbon dioxide in upwelled waters along the California coast (OEHHA 2022). In addition to seasonal meteorological patterns in California, longer term changes associated with El Niño and the PDO can alter the ability of oceanic waters to serve as either a sink or a source of carbon dioxide. Data from monitoring sites 140 miles off Point Conception, California, show that carbon dioxide has increased and pH levels have decreased over the past decade (OEHHA 2022). All of these anthropogenic and natural stressors are impacting the marine ecosystem along the coast of California.

Aquaculture may have greater impacts in conjunction with environmental variation. Cultured species unable to move from unfavorable environmental conditions may experience higher physiological stress and changes in their microbiomes, potentially increasing susceptibility to infection and disease. Temperature fluxes, such as marine heat waves, are expected to be a major driver to vulnerability to disease because adjustment and adaptations can be metabolically demanding. Changes in temperature and pH will alter ocean chemistry, such as dissolved oxygen, dissolved nutrients, and bioavailable carbonate for calcification. Lower pH can reduce immune responsiveness in shellfish and finfish, and early life stages are especially vulnerable to negative effects. Environmental variation is affecting the distribution of commercial fish species. Fish distributions are likely to change to adapt to new conditions and fishing locations would reflect that change. Changing the species composition and the potential for disease transmission near aquaculture facilities. There may be impacts on native pathogens as well. For example, certain ectoparasites can tolerate a wider range of seawater pH than the hosts, possibly resulting in more severe infestations. Ocean acidification in the SCB is already occurring and is expected to persist. (Rhodes et al. 2023a).

The uncertainty associated with the rate and magnitude of climate-related changes and the response of organisms to those changes increases the risk of potential impacts to protected species. The assessment of overall risk to a species, long-term recovery planning, and evaluations of specific actions help to

adequately incorporate environmental variation into the impact analysis for aquatic species (McClure et al. 2013). Whether environmental variation is likely to amplify the effects of a particular proposed action depends, in part, on the duration of the action's effects, whether the action's effects on listed species and critical habitat vary in response to any environmental conditions that are likely to change over time (e.g., water temperature, prevalence of invasive species, etc.), and whether the action includes measures to reduce its adverse effects (e.g., through an adaptive management plan) in response to changing environmental conditions. At this point in time, every aquaculture project consultation is so unique that environmental variation impacts would be considered on a case-by-case basis. To adequately analyze how environmental variation may exacerbate potential impacts of an action on ESA-listed species, NMFS has developed guidance that would be applied at the project level to ESA consultations (NMFS 2023e). Site-specific NEPA analyses tiered from this PEIS may need to refer back to any local-scale environmental variation impacts referenced in the environmental baseline section and further assess cumulative effects.

iii. Alternative 1: No Action

For the no action alternative, no AOA would be identified and baselines around past, present, and foreseeable actions would stay the same as described in Chapter 4, Section A.

iv. Alternative 2: Santa Barbara Channel

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact.

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. Individual project proposals may provide more detail for assessing cumulative effects across regional aquaculture activities.

Environmental Variation

Environmental variation introduces substantial risk and uncertainty to ongoing growth and development of aquaculture, as changing oceanographic conditions (e.g., temperature, upwelling, and dissolved oxygen) are expected to impact the environment on which aquaculture depends. Aquaculture may contribute to environmental variation through greenhouse gasses (GHGs) produced in pre-installation, installation, and post-installation activities, but may also serve to mitigate effects of environmental variation in the context of providing improved food security where environmental variation has affected other food sources. The increment of impact of siting aquaculture in one to eight AOAs in Santa Barbara Channel is likely to be very minimal in the context of GHGs, environmental variation, and food security. Quantification of estimated emissions and food production value of specific projects in the context of environmental variation may be analyzed in future project-specific permitting NEPA analyses.

HAB and Domoic Acid Incidents

HAB and domoic acid incidents affect fish and shellfish supplies for commercial and recreational fisheries. The proposed AOA(s) in Santa Barbara Channel are more than three miles from shore, making them less susceptible to HAB, possibly allowing for the beneficial impact of making more uncontaminated seafood available if aquaculture is undertaken in the AOA(s). The growth of seaweed aquaculture could provide a potential prevention/remediation for HAB events through its natural ability to absorb excess nutrients from the water. Land-based nutrient export to the Southern California Bight has been shown to result in chemical changes in seawater acidification, O2 loss, and impacts pelagic habitat capacity (Frieder et al. 2024). Cultivating seaweed at a significant scale has the potential to mitigate some of those impacts. Roleda and Hurd (2019) explain that "In addition to the economic value of sea-weeds, seaweed farming can have positive environmental impacts because it makes use of nutrient emissions from fish farms and other anthropogenic nitrogen and phosphorus sources that enter the ocean". This may be on a small, localized scale due to the relative size of a potential seaweed farm within an AOA compared to the entire SBC. In combination with HAB and domoic acid events, the increment of impact

of siting aquaculture in one or more AOAs in Santa Barbara Channel is likely to be very minimal. Localized depletions and HABs may be a concern and could potentially be addressed through planning, monitoring and best management practices that allows for water flow and managed water quality. EPA will review activities as required for National Pollutant Discharge Elimination System permits where discharges are involved in aquaculture activities and require appropriate mitigation and monitoring to meet statutory Clean Water Act (CWA) requirements.

Marine Mammal Vessel Interactions

Relative to the substantial amount of vessel traffic in the Santa Barbara Channel region, the increases in numbers of vessels and time vessels spend on the water is likely to be a very minimal increment of vessel traffic and its associated sound, emissions, and potential for vessel collision with marine mammals and other protected species. Mitigation to avoid vessel collision would be expected to include implementation of NOAA vessel strike avoidance guidance (NMFS 2021f). The voluntary vessel speed reduction program requiring vessels 300 gross tons (gt) and larger to reduce speed to 10 kt maximum in shipping lanes approaching and leaving San Francisco Bay, and 10 kt restrictions May 1 – December 15 in Channel Islands, Greater Farallones, and Cordell Bank National Marine Sanctuaries also reduce general risks to whales. Aquaculture vessels would be much smaller than 300 gt, but cumulatively, this mitigation reduces risks in the region. In 2023, the vessel speed restriction zone was expanded to include Monterey Bay National Marine Sanctuary and the International Maritime Organization modifications to the Santa Barbara Channel Traffic Separation Scheme and Area to be Avoided (NOAA n.d.c), further protecting whales in the region. Thus, impacts of vessel traffic are reduced through regional mitigation measures and the increment of potential to interact with or collide with whales in aquaculture pre-, during- and post-construction is minimal. These restrictions also reduce emissions (NOAA n.d.c).

Commercial and Recreational Fishing

Development of aquaculture in the Santa Barbara Channel region could incrementally increase impacts from commercial and recreational fisheries on habitats, fish stocks, and prey species. Federal fisheries are managed under the MSA to avoid overfishing and minimize impacts to protected species and habitats. Management may be adapted to the presence of aquaculture to avoid cumulative impacts that result in commercial stock depletions. Aquaculture can increase potential for localized disease or escape that result in cumulative adverse impacts to resources affected by fisheries. In combination, fisheries and aquaculture can benefit food security and resilience. Environmental variation analysis suggests fish distributions are likely to change to adapt to new conditions and fishing locations would reflect that change, and it is unclear how aquaculture sites may adapt to maintain fishing access as fish distribution changes. Fisheries may not be able to operate within some types of aquaculture facilities, changing the local dynamic of harvest, but the increment of impact to protected resources, commercial or recreational fish stocks, or habitats is likely to be minimal given the small footprint of the proposed AOAs compared to the range of fish and other resources. Morris et al. (2021) was used to minimize conflict of the proposed AOAs with fisheries, and further mitigation may be applied at the project-level by NMFS and USFWS to ensure the effect of aquaculture and fisheries complies with MSA, ESA, MMPA, and other relevant statutes. Individual project proposals may provide more detail for assessing cumulative effects across regional aquaculture activities.

Ocean Research and Ecosystem Monitoring

Ocean research and ecosystem monitoring are common in the SCB, with decades of academic studies and ongoing research in the region for management of fisheries and protected species and habitats. Ocean research and monitoring include deployment of buoys and other scientific equipment platforms and a wide variety of surveys. Morris et al. (2021) was used to minimize conflict of the proposed AOA(s) with areas of ongoing ocean research, particularly for conservation and management purposes, where trend studies may be important. The increment of impact to resources combined with ocean research and ecosystem monitoring is likely to be minimal given the efforts to minimize conflict and the benefits of

ocean research and ecosystem monitoring. Aquaculture could result in additional minimal adverse impacts to benthic resources where moorings are installed but may also act to aggregate fish through reef effects and create research opportunities through infrastructure and vessel operations as platforms of opportunity, cumulatively enhancing some research opportunities.

Tourism and Recreation

Tourism and recreation activities are common in the SCB. The increment of impact to resources combined with tourism and recreation is likely to be minimal. The proposed AOA is in Federal waters more than 3 nm from shore, reducing the likelihood of synergistic impacts with onshore and nearshore tourism. Combined effects to water quality may be a consideration at the project stage, though requirements of CWA for finfish will result in mitigation at the project level and ongoing monitoring of sediment and water quality in the SCB (SCCWRP 2024) will provide historical and future information to assess potential cumulative impacts related to implementation of aquaculture.

Commercial Shipping

Impacts associated with commercial shipping include emissions, collision risk with protected species, sound, and interruption to fisheries and recreational activities. Although the development of aquaculture would create similar risks, these risks would be in a localized area outside shipping lanes and the increment of additional risk would likely be minimal.

Military Readiness Activities

The military operates in the SCB (U.S. Navy 2018) undertaking a variety of training and testing activities. Morris et al. (2021) was used to minimize conflict of the proposed AOA(s) with military readiness activities. The increment of impact to resources combined with military readiness activity is likely to be minimal. Deconfliction will reduce overlap that could cumulatively stress local resources. Department of Defense will further review any proposed aquaculture operations for mission compatibility.

OCS Offshore Wind Leases

Five offshore wind leases have been sold off the coast of California, and future wind leases are anticipated (BOEM n.d.). The size of offshore wind leases is substantially larger than the proposed AOA (current leases off California range from 63,338 acres to 80,418 acres (25,632 to 32,544 ha); BOEM n.d.). Windfarms would be expected to have substantially more infrastructure than aquaculture, with hundreds of platforms with mooring cables, inter-array cables, substations, and export cables to shore, as well as turbines reaching hundreds of feet into the air. The increment of impact to resources combined with offshore wind projects is likely to be minimal given this substantive difference in footprint and infrastructure. BOEM is preparing a PEIS for the five current leases for their construction and operations authorizations, which will include mitigation to be compliant with applicable statutes.

Marine Debris and Water Quality

As noted in Chapter 4, Section A.ii (Other Ocean Uses and Current Events), the California Ocean Litter Prevention Strategy (CalOPC 2018) reports that about 46% of the debris found on California beaches is from ocean-based sources. The cumulative effects of marine debris across anthropogenic sources can have serious impacts on wildlife and habitats. The increment of impact to resources from marine debris that may be associated with aquaculture operations, should they be authorized, is likely to be minimal. It is expected that mitigation associated with authorizations for aquaculture projects will include marine debris awareness and prevention, as is the case for offshore wind authorizations (e.g., see NMFS 2022c). This will further reduce the increment of impact.

Water quality is impacted by a variety of activities in the region and is monitored via programs like the SCB Regional Monitoring Program (2024). The increment of impact to resources combined with other actions that affect water quality and produce marine debris is likely to be minimal given the scope and

scale of the proposed AOA and the mitigation and monitoring likely to be implemented as a result of permitting and consultations, such as National Pollutant Discharge Elimination System permits and ESA consultations.

Marine Conservation Efforts

The Santa Barbara Channel is adjacent to the Channel Islands National Marine Sanctuary and the Chumash Heritage National Marine Sanctuary. The Santa Barbara Channel also has a network of 19 marine protected areas that include marine reserves, state marine conservation areas, no-take state marine conservation areas, and special closures (Santa Barbara Channel Keeper n.d.). Morris et al. (2021) was used to avoid identifying AOAs in marine conservation areas. In some cases, these areas restrict access or activities, and project specific requirements of future aquaculture operations within AOAs in the region may further restrict access and activities. Monitoring associated with marine conservation efforts may either be adversely affected because of further limits on access or benefited by new platforms of opportunity for collaborative monitoring. The increment of impact to resources as a result of minor access limits or a small number of platforms of opportunity is likely to be minimal compared to the benefits of marine conservation efforts in aggregate.

Marine Aquaculture in the Southern California Bight

In aggregation with other marine aquaculture present or planned in the SCB, development of aquaculture in the potential AOAs could increase the adverse and beneficial effects to resources described in Chapter 3. The increment of impact may be meaningful in the context of aquaculture as a whole given the relative size and scope of potential aquaculture activities in comparison to existing and proposed aquaculture operations described in Chapter 4, Section A.iii (Marine Aquaculture). Cumulatively, this impact to resources is affected by the type of aquaculture and its extent. Individual project proposals will provide more detail for assessing cumulative effects across regional aquaculture activities.

v. Alternative 3: Santa Monica Bay

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact.

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. Individual project proposals may provide more detail for assessing cumulative effects across regional aquaculture activities.

The potential for cumulative impacts and the increment of impact associated with the past, present, and foreseeable actions described for Alternative 2 are not meaningfully different for Alternative 3. The resolution of data and impact potential is generally not sufficient to identify fine-scale difference in potential for increment of cumulative impact between the two potential Alternatives.

Potential Mitigation for Cumulative Impacts

The general discussion of mitigation for Alternative 2 is applicable to Alternative 3 in the context of cumulative impacts.

vi. Alternative 4. Combination of Geographic Areas

Identification of AOAs is a planning effort that does not result in any authorization, permit, or regulatory impact.

Later actions of siting and operating aquaculture facilities may have impacts, which are discussed here. Individual project proposals may provide more detail for assessing cumulative effects across regional aquaculture activities.

A combination of geographic areas has the potential to increase the increment of impact. The larger acreage also contributes to potential for more aquaculture activity, and so more increment of impact in conjunction with past, present, and foreseeable actions. Impacts reflected under Alternative 4 would have similar impacts to those described for Alternatives 2 and 3, with an increased increment of impact on cumulative effects, but the scale of impacts reflected under Alternative 4 is not large enough that a substantive increase in increment of effect would be anticipated. At this stage, identification of AOAs does not authorize any development of aquaculture, so the extent to which aquaculture would occur in the proposed potential AOAs cannot be determined until projects are proposed. Overall, the increment of impact associated with impacts reflected under Alternative 4 is higher than Alternatives 1-3 but would not make up a large component of the cumulative impacts from other activities in the region.

Chapter 5: Compliance with other Laws, Policies, and Regulations

While the proposed action in the EIS is a planning action and does not trigger compliance with the below laws and regulations, any potential future aquaculture projects should consider compliance requirements of applicable federal, state, and local laws, regulations, and executive orders. Table 4 summarizes anticipated (but not necessarily exhaustive) federal environmental compliance requirements for site-specific aquaculture facilities, and includes some state requirements that facilities may wish to consider.

Table 4: Laws, Policies, and Regulations

Name	Agency Jurisdiction	Relevance to Facilities Sited in an AOA
National Environmental Policy Act 42 U.S.C §4321	Federal Agencies	Considers the effects of federal agency actions and alternatives on the human environment.
Endangered Species Act 16 U.S.C. § 1531 et seq. section 7(a)(2)	NMFS, USFWS	Evaluates and ensures that any action is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of the designated critical habitat of listed species.
Marine Mammal Protection Act 16 U.S.C. § 1361 et seq. sections 101, 104	NMFS, USFWS	Evaluates actions for potential impacts on marine mammals and manages the development and implementation of measures to minimize effects.
Migratory Bird Treaty Act 16 U.S.C. § 703 et seq.	USFWS	Evaluates actions for potential impacts on birds and manages the development and implementation of measures to minimize effects.
Rivers and Harbors Act 33 U.S.C. § 403 section 10 33 CFR part 322	USACE	Evaluates proposed structures and work in or affecting navigable waters, including the OCS.
General policies for evaluating permit applications 33 CFR part 320.4(a)	USACE	Public interest factors that must be evaluated in all permit applications.
Clean Water Act 33 U.S.C. § 1251 et seq., sections 318, 402, 403	EPA	Evaluates actions for impacts to waters of the U.S. and aquatic ecosystems, and establishes pollution discharges and water quality standards to avoid adverse impacts.

Name	Agency Jurisdiction	Relevance to Facilities Sited in an AOA
Outer Continental Shelf Lands Act 43 U.S.C. § 1331 et seq.	BOEM	Considers and manages economic, social, and environmental values of renewable and nonrenewable resources located in submerged lands between the seaward extent of state coastal waters and the seaward extent of the EEZ.
Animal Health Protection Act 7 U.S.C. § 8301 et seq.	USDA	Manages potential diseases in animals and the effects of diseases on animals.
The Food, Drug, and Cosmetic Act 21 U.S.C. § 301 et seq.	FDA	Broad authority to protect public health, primarily through oversight of food and Drugs; includes approving animal drugs, including transgenic fish and therapeutants used in aquaculture, and seafood safety.
National Marine Sanctuaries Act 16 U.S.C. § 1431 et seq.	ONMS	Authorizes the Secretary of Commerce to designate and protect areas of the marine environment with special national significance due to their conservation, recreational, ecological, historical, scientific, cultural, archeological, educational or esthetic qualities as national marine sanctuaries.
Clean Air Act 42 U.S.C. § 7401 et seq.	EPA	Comprehensive law that regulates sources of air emissions. It directs the EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and the environment.
Clean Air Act Section 202 et seq.	EPA	The CAA Section requires a comprehensive approach to reducing pollution from mobile sources, such as cars, trucks, locomotives, ships and planes.
Noise Control Act 42 U.S.C. § 4901 et seq.	EPA	Establishes a national policy to promote an environment for all Americans free from noise that jeopardizes their health and welfare.

Name	Agency Jurisdiction	Relevance to Facilities Sited in an AOA
Fish and Wildlife Coordination Act 16 U.S.C. § 661 et seq.	NMFS, USFWS, USACE	Directs the Service to investigate and report on proposed Federal actions that affect any stream or other body of water and to provide recommendations to minimize impacts on fish and wildlife resources.
National Historic Preservation Act 54 U.S.C. § 300101 et seq.	ACHP	The act preserves historic and archaeological sites in the United States of America. The act created the National Register of Historic Places, the list of National Historic Landmarks, and the State Historic Preservation Offices.
Lacey Act 16 U.S.C. § 3371 et seq.	NMFS, USFWS (interstate, inter-country)	Prohibits the importation, exportation, transportation, sale, receipt, acquisition, or purchase of any fish or wildlife or plant taken, possessed, transported, or sold in violation of any law, treaty, or regulation of the United States or any Indian tribal law whether in interstate or foreign commerce.
Coastal Zone Management Act 16 U.S.C. § 1451 et seq.	OCM	The act provides for the management of the nation's coastal resources, including the Great Lakes. The goal is to preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone, including preserving visual aesthetics.
Magnuson-Stevens Fishery Conservation and Management Act 16 U.S.C. § 1801 et seq.	NMFS, PFMC	The primary law that governs marine fisheries management in U.S. Federal waters, it fosters the long-term biological and economic sustainability of marine fisheries, using a transparent and public process of science, management, innovation, and collaboration with the fishing industry.
Unauthorized Aids to Maritime Navigation; Penalty 14 U.S.C. § 83	USCG	No person, or public body, or instrumentality, excluding the armed services, shall establish, erect, or maintain any aid to maritime navigation in or adjacent to the waters subject to the jurisdiction of the United States without first obtaining authority to do so from the Coast Guard.

Name	Agency Jurisdiction	Relevance to Facilities Sited in an AOA
Navigation and Navigable Waters 33 CFR Chapter 1	USCG	Regulations to safeguard navigation on the high seas and navigable waters of the U.S, including administration of the U.S. Aids to Navigation System.
National Defense 32 CFR 211	DOD Siting Clearinghouse / DHS	Regulations for initiating a formal DoD review of proposed projects to determine if they pose an unacceptable risk to the national security of the United States.
National Aquaculture Act 16 U.S.C. 2801 et seq.	DOI, DOC, USDA	Establishes aquaculture as a national policy priority for the United States.
Concentrated Aquatic Animal Production point source pollution 40 CFR 122.24 and .25	EPA	Defines concentrated aquatic animal production facilities for regulation as point sources subject to the CWA NPDES permit program.
Veterinary Feed Directive 21 CFR part 558	FDA	Outlines the process for authorizing use of VFD drugs. Eliminates the use of medically important antibiotics for production purposes (e.g., growth promotion and feed efficiency), use is permitted only under the professional supervision of a licensed veterinarian.
National Shellfish Sanitation Program 21 U.S.C. 372, 42 ; U.S.C. 243	FDA	Promotes and improves the sanitation of shellfish (oysters, clams, mussels and scallops) moving in interstate commerce through federal/state cooperation and uniformity of State shellfish programs.
Ports and Waterways Safety Act 46 U.S.C. §70001 et seq.	USCG	Authorizes the U.S. Coast Guard to establish vessel traffic service/separation schemes for ports, harbors, and other waters subject to congested vessel traffic.
National Invasive Species Act P.L. 104-332	NISC	Provides for ballast water management to prevent the introduction and spread of nonindigenous species into the waters of the United States.
Oil Pollution Act 33 U.S.C. § 2702	USCG, BOEM/BSEE	The Act aims to prevent, prepare, and respond to potential oil spills. Among various requirements, it gives BOEM the authority to oversee industry structures in the OCS.

Name	Agency Jurisdiction	Relevance to Facilities Sited in an AOA
Ocean Dumping Act 33 U.S.C. § 1401	USACE, EPA, USCG, and NOAA	Prohibits dumping into the ocean material that would unreasonably degrade or endanger human health or the marine environment unless a permit is issued.
Occupational Safety and Health Act 29 U.S.C. § 651	OSHA	Establishes occupational hazards standards, including occupational noise; meeting standards for employees is the responsibility of the employer.
Executive Orders		
Executive Order 13158 - Marine Protected Areas	DOI, DOC	Considers impacts on any area of the marine environment that Federal, state, territorial, tribal, or local laws or regulations have reserved to provide lasting protection for part or all of the natural or cultural resource within the protected area.
Executive Order 13112 - Invasive Species	NISC	Implements relevant programs and authorities to prevent, detect, and respond to the spread of invasive species.
Executive Order 13840 - Ocean Policy to Advance the Economic, Security, and Environmental Interests of the United States	OPC	Maintains and enhances benefits to the Nation through improved public access to marine data and information, efficient interagency coordination on ocean-related matters, and engagement with marine industries, the science and technology community, and other ocean stakeholders, recognizes and supports Federal participation in regional ocean partnerships.
Executive Order 13751 - Safeguarding the Nation From the Impacts of Invasive Species	NISC	Amends Executive Order 13112 and directs actions to continue coordinated Federal prevention and control efforts related to invasive species.
Executive Order 13921 – Promoting American Seafood Competitiveness and Economic Growth	Multiple Federal Agencies	Promotes American seafood competitiveness and economic growth, and calls for the expansion of sustainable U.S. seafood production. Also requires the Secretary of Commerce to identify geographic areas containing locations suitable for commercial aquaculture, and complete a PEIS.

Name	Agency Jurisdiction	Relevance to Facilities Sited in an AOA
Executive Order 14276 -- Restoring American Seafood Competitiveness	Multiple Federal Agencies	Provides additional measures to promote domestic seafood production, sale, and trade.
Potential State Coordination or Consideration		
Coastal Zone Management Act 16 U.S.C. chapter 33 section 1451 et seq	CCC	Permit applicants shall provide a certification to the permitting agency that proposed activities comply with enforceable policies of the state coastal zone management program.
National Historic Preservation Act 16 U.S.C. chapter 1A subchapter II section 470 and Section 106 of the National Historic Preservation Act of 1966, as amended (26 54 U.S.C. 306108) (36 CFR §§ 800.2(c)(1)]	SHPO	Review process for all projects that may impact eligible sites or resources.
California Ambient Air Quality Standards (CAAQS) est. 1962, last updated 2008; California Air Quality Management Plan (AQMP) under the California Clean Air Act, and Section 328 of the Federal Clean Air Act	CARB	The regulations delegate California the authority to oversee the CAA National standards for California, and develop their own air quality standards. Section 328 requires control of air pollution from OCS sources located within 25 miles of states' seaward boundaries to be comparable to that of onshore areas.
California Ocean Protection Act of 2004 (COPA; Division 26.5 of the CA Public Resources Code Sections 35500-35515)	Cal-OPC, SLC	Establishes the Ocean Protection Council, which helps to coordinate and fund actions to protect and manage California's ocean and coastal resources.
Fish and Game Code (Section 2118)	CDFW	Regulations and permitting for the import, transport, possess, or release alive into CA of certain wild animal species.

Chapter 6: List of Preparers

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Tables

Table 5: Federally-Protected Species with Potential to Occur in the AOA Alternative Areas

A. Mysticetes (baleen whales)

Table 5-A1: Protected Mysticete Status

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
Blue Whale (Balaenoptera musculus) Eastern North Pacific Stock	FE, MMPA	Not designated	Historic whaling, entanglement, vessel strikes	Loss of prey base due to oceanographic changes, anthropogenic noise, entanglement	Mexico/Central America to Gulf of AK	Winter
Fin Whale (Balaenoptera physalus) California-Oregon-Washington Stock	FE, MMPA	Not designated	Historic whaling, entanglement, vessel strikes	Changes in prey distribution and navigational/migratory cues due to oceanographic changes, anthropogenic noise, entanglement	Possibly Baja California, Mexico to Gulf of AK; stock may migrate seasonally, but could be resident population in southern CA	Winter
Humpback Whale (Megaptera novaeangliae) Central America DPS Central America / Southern Mexico and California-Oregon-Washington Stocks	FE, MMPA	48,521 sq. nm of marine habitat in the North Pacific within the portions of the CA Current Ecosystem off the coasts of WA, OR, and CA	Historic whaling, entanglement, vessel strikes, harassment, anthropogenic noise	Changes in navigational/migratory cues and prey distribution due to oceanographic changes, entanglement, increased risk of vessel strikes and/or harassment	Central America to southern British Columbia	Winter

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
Humpback Whale (Megaptera novaeangliae) Mexico DPS Mainland Mexico and California-Oregon-Washington Stocks	FT, MMPA	116,098 sq. nm of marine habitat in the North Pacific including areas in the eastern Bering Sea, Gulf of AK, and CA Current Ecosystem	Historic whaling, entanglement, vessel strikes, harassment, anthropogenic noise	Changes in navigational/migratory cues and prey distribution due to oceanographic changes, entanglement, increased risk of vessel strikes and/or harassment	Pacific coast of Mexico to the Aleutian Islands	Winter
Gray Whale (Eschrichtius robustus) Eastern North Pacific Stock	MMPA	N/A	Historic whaling, entanglement, vessel strikes, anthropogenic noise	Altered prey distribution and navigational cue disruption from melting sea ice/oceanographic changes, habitat impacts, ocean noise, vessel strikes, pollution	Pacific coast of Mexico to the Northern Bering and Chukchi Seas	Winter
Gray Whale (Eschrichtius robustus) Western North Pacific Stock	FE, MMPA	Not designated	Historic whaling, entanglement, vessel strikes, anthropogenic noise, habitat degradation from oil and gas development	Changes in navigational/migratory cues and prey distribution due to oceanographic changes, habitat impacts, ocean noise, vessel strikes, oil and gas development, pipeline infrastructure	East coast of Asia from China to the eastern coast of Russia	Winter
Minke Whale (Balaenoptera acutorostrata) California-Oregon-Washington Stock	MMPA	N/A	Historic and current whaling, entanglement, vessel strikes, anthropogenic noise, hunting	Changes in navigational cues and prey distribution due to oceanographic changes, entanglement, increased risk of vessel strikes and harassment, biotoxins from harmful algal blooms	Stock seems to establish home ranges; present in CA year-round	Winter

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
North Pacific Right Whale (*Eubalaena japonica*) Eastern North Pacific Stock	FE, MMPA	36,800 sq. miles of marine habitat in the Gulf of AK and southeast Bering Sea	Historic whaling, entanglement, vessel strikes, anthropogenic noise	Prey distribution changes and loss of critical habitat, biotoxins from harmful algal blooms, oil and gas development, entanglement, vessel strikes, ocean noise	Baja California, Mexico to the Bering Sea	Winter
Sei Whale (Balaenoptera borealis) Eastern North Pacific Stock	FE, MMPA	Not designated	Historic whaling, entanglement, vessel strikes	Changes in prey distribution and navigational/foraging cues due to oceanographic changes, ocean noise, entanglement	WA-OR-CA; very rare any further south than CA	Winter

Table 5-A2: Protected Mysticete Potential to Occur in AOAs

Species/Stock	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
Blue Whale (Balaenoptera musculus) Eastern North Pacific Stock	Krill	Winters off Mexico/Central America; Summer feeding off U.S. west coast (i.e. Channel Islands, Southern CA waters); Calving grounds in Gulf of CA; Migrate seasonally from summer feeding and winter breeding grounds	Filter feeding in productive areas	June-December	N/A	Somewhat Likely	Somewh at Likely	Somewh at Likely
Fin Whale (Balaenoptera physalus) California-Oregon-Washington Stock	Krill, small schooling fish, squid	Typically found in deep, offshore waters; Location of winter breeding grounds unknown; Summer feeding near poles; Tropical/subtropical calving mid-winter	Filter feeder, feeds in large, mixed species groups	Summer/Fall but potentially year-round	N/A	Somewhat Likely	Somewh at Likely	Somewh at Likely
Humpback Whale (*Megaptera novaeangliae*) Central America DPS Central America / Southern Mexico and California-Oregon-Washington Stocks	Krill, other crustaceans, small fish	Winter breeding off Central America/Southern coastal Mexico; Summers feeding off U.S. west coast including CA, OR, and WA	Filter feeding, group bubble net feeding, often nearshore and potentially near aquaculture gear	Summer	N/A	Likely	Likely	Likely

Species/Stock	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
Humpback Whale (*Megaptera novaeangliae*) Mexico DPS Mainland Mexico and California-Oregon-Washington Stocks	Krill, other crustaceans, small fish	Winter breeding off Pacific coast of Mexico and Revillagigedo Islands; Transits the Baja California Peninsula; Spends summers feeding across broad range from CA to AK	Filter feeding, group bubble net feeding, often nearshore and potentially near aquaculture gear	Summer	N/A	Likely	Likely	Likely
Gray Whale (Eschrichtius robustus) Eastern North Pacific Stock	Benthic and epibenthic invertebrates	Summer feeding off U.S. west coast (from Bering and Chukchi Seas to Northern CA); Fall migration south along U.S. west coast; Winter breeding / calving off coast of Baja, Mexico; Spring migration north along U.S. west coast	Known for curiosity / approaching vessels, benthic feeders, solo travelers, possibly migrating closer to shore in SCB than previously thought	Unknown	N/A	Likely	Likely	Likely
Gray Whale (Eschrichtius robustus) Western North Pacific Stock	Benthic and epibenthic invertebrates	Primarily found along the coast of eastern Asia; Stocks were thought to be isolated but recent data shows that some whales likely migrate across the eastern Pacific	Known for curiosity / approaching vessels, benthic feeders, solo travelers	Unknown	N/A	Somewhat Likely	Somewhat Likely	Somewhat Likely

Species/Stock	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
Minke Whale (Balaenoptera acutorostrata) California-Oregon-Washington Stock	Crustaceans, plankton, small schooling fish	Can be found in coastal/inshore as well as oceanic/offshore areas; Likely non-migratory; Often seen over continental shelves	Active at surface, can approach vessels (esp. stationary), swim at high speeds, can be found in coastal areas	Year-round	N/A	Likely	Likely	Likely
North Pacific Right Whale (*Eubalaena japonica*) Eastern North Pacific Stock	Zooplankton (copepods, shrimp)	Migration unknown but thought to feed in summer in northern latitudes and migrate south to warmer waters in the winter (i.e. southern CA); Critical habitat in SE Bering Sea; Calving grounds not known in the eastern north Pacific; Most nursery grounds are in coastal waters	Skim feeding, very rarely sighted species	Migrates to warmer waters (i.e. southern CA) during winter	N/A	Unlikely	Unlikely	Unlikely
Sei Whale (Balaenoptera borealis) Eastern North Pacific Stock	Plankton, small schooling fish, cephalopods	Typically found far in deep, offshore waters in temperate seas (i.e. not associated with coastal areas); Breeding grounds unknown; Unpredictable distribution - can be found in an area and then not return for decades	Unpredictable behavior while foraging	Unknown	N/A	Unlikely	Unlikely	Unlikely

B. Odonotcetes (toothed whales, dolphins, and porpoises)

Table 5-B1: Protected Odontocete Status

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
Sperm Whale (Physeter macrocephalus) California-Oregon-Washington Stock	FE, MMPA	Not designated	Historic whaling, entanglement	Vessel strikes, entanglement, anthropogenic noise, pollution: oil spills, contaminants, marine debris	Wide global distribution - this stock is WA-OR-CA	Spring and Summer
Baird's Beaked Whale (*Berardius bairdii*) California-Oregon-Washington Stock	MMPA	N/A	Historic whaling, entanglement, anthropogenic noise, marine debris, predation	Entanglement, consuming marine debris, anthropogenic noise	Pacific coast of Mexico to AK	Summer
Cuvier's Beaked Whale (Ziphius cavirostris) California-Oregon-Washington Stock	MMPA	N/A	Current whaling, entanglement, anthropogenic noise	Entanglement, anthropogenic noise	Baja California, Mexico to AK	Year-round, often during spring
Dwarf Sperm Whale (*Kogia sima*) California-Oregon-Washington Stock	MMPA	N/A	Entanglement, vessel strikes, marine debris	Increased vessel strikes, entanglement, consuming marine debris, anthropogenic noise, disease	Pacific Northwest and CA, limited data	December to March

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
Killer Whale (Orcinus orca) West Coast Transient Stock	MMPA	N/A	Commercial whaling, entanglement, overfishing, habitat loss	Entanglement, anthropogenic noise, oil spills, contaminant pollution	AK to CA	No distinct season
Killer Whale (Orcinus orca) Eastern North Pacific Offshore Stock	MMPA	N/A	Commercial whaling, entanglement, overfishing, habitat loss	Entanglement, anthropogenic noise, oil spills, contaminant pollution	AK to CA	No distinct season
Short-Finned Pilot Whale (*Globicephala macrorhynchus*) California-Oregon-Washington Stock	MMPA	N/A	Current whaling, entanglement, vessel strikes	Increased vessel strikes, entanglement	WA to CA	Unknown
Pygmy Sperm Whale (*Kogia breviceps*) California-Oregon-Washington Stock	MMPA	N/A	Historic whaling, entanglement, vessel strikes, marine debris	Increased vessel strikes, entanglement, consuming marine debris, anthropogenic noise	Pacific Northwest and CA, limited data	Peaks in March-August

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
Common Bottlenose Dolphin (Tursiops truncatus) California Coastal Stock	MMPA	N/A	Entanglement, habitat destruction and degradation, toxic algal blooms, harassment	Further habitat degradation, entanglement, pollution, anthropogenic noise	San Quintin, Mexico to Central CA	No distinct season
Common Bottlenose Dolphin (Tursiops truncatus) California-Oregon-Washington Offshore Stock	MMPA	N/A	Entanglement, habitat destruction and degradation, toxic algal blooms, harassment	Further habitat degradation, entanglement, pollution, anthropogenic noise	Baja, California, Mexico to WA	No distinct season
Long-Beaked Common Dolphin (*Delphinius capensis*) California Stock	MMPA	N/A	Current whaling, entanglement, toxic algal blooms, anthropogenic noise	Entanglement	Baja California, Mexico to Central CA	Spring to Fall
Short-Beaked Common Dolphin (*Delphinius delphis*) California-Oregon-Washington Stock	MMPA	N/A	Current whaling, entanglement	Entanglement	Southern coast of Mexico to WA	Spring and Fall

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
Northern Right Whale Dolphin (Lissodelphis borealis) California-Oregon-Washington Stock	MMPA	N/A	Current whaling, entanglement, anthropogenic noise	Entanglement, increased anthropogenic noise	Northern Baja California, Mexico to Gulf of AK	Unknown
Risso's Dolphin (Grampus griseus) California-Oregon-Washington Stock	MMPA	N/A	Current whaling, entanglement, anthropogenic noise, pollution	Entanglement, increased risk of anthropogenic noise and contaminants	Baja California, Mexico to WA	Possibly year-round
Striped Dolphin (Stenella coeruleoalba) California-Oregon-Washington Stock	MMPA	N/A	Current whaling, entanglement, disease	Entanglement, pollution-disease vectors	Baja California, Mexico to OR	Unknown
Pacific White-Sided Dolphin (*Lagenorhynchus obliquidens*) California-Oregon-Washington, Northern, and Southern Stocks	MMPA	N/A	Entanglement, anthropogenic noise	Entanglement, anthropogenic noise	Southern CA to AK	Late Spring to Fall

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
Dall's Porpoise (*Phocoenoides dalli*) California-Oregon-Washington Stock	MMPA	N/A	Current whaling, entanglement, anthropogenic noise, pollution	Entanglement, increased risk of anthropogenic noise and contaminants	Baja California, Mexico to Bering Sea	Early Spring and late Summer

Table 5-B2: Protected Odontocete Potential to Occur in AOAs

Species	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
Sperm Whale (Physeter macrocephalus) California-Oregon-Washington Stock	Deep water fish, squid, sharks, skates	Mostly occur in deep waters offshore; Migrations not predictable or well understood; Some populations appear to have adult males making long oceanic migrations w/ females and juveniles remaining in warm, tropical waters year-round	Feeding occurs in deep waters, surface logging between dives	Year-round, peak abundance April-June and August-November	N/A	Unlikely	Unlikely	Unlikely
Baird's Beaked Whale (*Berardius bairdii*) California-Oregon-Washington Stock	Fish, crustaceans, sea cukes, squid, octopus	Prefer cold, oceanic waters deeper than 3,300 feet but can occasionally be found nearshore along narrow continental shelves; Sightings are rare; Uncertain migration patterns	Surface logging between dives, sightings are rare	Late Spring to early Fall	N/A	Unlikely	Unlikely	Unlikely
Cuvier's Beaked Whale (*Ziphius cavirostris*) California-Oregon-Washington Stock	Cephalopods, fish, crustaceans	Temperate, subtropical, and tropical waters; Prefer deep pelagic (greater than 3,300 feet) waters; May favor current and current boundaries; Migration patterns unknown	Deep divers, rare displays at surface which hinders visibility	Unknown	N/A	Unlikely	Unlikely	Unlikely

Species	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
Dwarf Sperm Whale (*Kogia sima*) California-Oregon-Washington Stock	Cephalopods, fish, crustaceans	Deep waters and along continental slopes, in temperate and tropical seas; Movement patterns unknown	Echolocation, logging, no confirmed sightings on U.S. west coast	Unknown	N/A	Unlikely	Unlikely	Unlikely
Killer Whale (*Orcinus orca*) West Coast Transient Stock	Marine mammals, squid, fish	Both open seas and coastal waters; Their habitat can overlap with resident and offshore populations along the U.S. west coast	Coordinated group hunting, preying upon marine mammals in shallow waters	Unknown	N/A	Unlikely	Unlikely	Unlikely
Killer Whale (*Orcinus orca*) Eastern North Pacific Offshore Stock	Marine mammals, squid, fish	Often occur more than 9 miles offshore, though not exclusively offshore; Can be found in coastal nearshore waters and can overlap with other populations along U.S. west coast	Coordinated group hunting, preying upon marine mammals	Unknown	N/A	Unlikely	Unlikely	Unlikely
Short-Finned Pilot Whale (*Globicephala macrorhynchus*) California-Oregon-Washington Stock	Squid	Deep temperate and tropical waters; Can occur near continental shelf; No known movement patterns; There was a resident population near Santa Catalina Island prior to El Niño in 1982-83.	High speed dives chasing squid, travel and forage in large groups, can occur in abundant squid areas	Unknown	N/A	Unlikely	Unlikely	Unlikely

Species	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
Pygmy Sperm Whale (*Kogia breviceps*) California-Oregon-Washington Stock	Cephalopods, fish, crustaceans	Off coasts and along continental shelves in temperate, subtropical, and tropical seas; No information on movement patterns	Echolocation, logging at surface, rarely sighted along U.S. west coast	Unknown	N/A	Unlikely	Unlikely	Unlikely
Common Bottlenose Dolphin (*Tursiops truncatus*) California Coastal Stock	Fish, squid, crustaceans	Often found within 1 km of shore in coastal waters such harbors, bays, and estuaries; Oceanographic events may affect residency patterns	Shallow water coordinated group feeding, echolocation	Year-round	N/A	Likely	Likely	Likely
Common Bottlenose Dolphin (*Tursiops truncatus*) California-Oregon-Washington Offshore Stock	Fish, squid, crustaceans	Temperate and tropical waters; Have been found at distances greater than a few kilometers from the mainland and throughout the Southern California Bight	Coordinated group feeding, echolocation	Year-round	N/A	Somewhat Likely	Somewhat Likely	Somewhat Likely

Species	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
Long-Beaked Common Dolphin (*Delphinius capensis*) California Stock	Small schooling fish, krill, cephalopods	Shallow tropical, subtropical and warmer temperate waters; Within 50 to 100 nautical miles of the coast, and on the continental shelf.	Shallow water feeding	Year-round	N/A	Likely	Likely	Likely
Short-Beaked Common Dolphin (*Delphinius delphis*) California-Oregon-Washington Stock	Schooling fish, cephalopods	Warm tropical to cool temperate waters, primarily offshore; Associated w/ CA current and abundant off CA year-round from nearshore to 300 miles offshore	Night feeding, highly abundant off CA coast	Year-round	N/A	Likely	Likely	Likely
Northern Right Whale Dolphin (*Lissodelphis borealis*) California-Oregon-Washington Stock	Small fish, cephalopods	Temperate waters from outer continental shelf to oceanic regions between 30 and 50 degrees N; May occur closer to coast in deep waters with canyons; Migrate with water temperature	Travel in large groups, sometimes interact with vessel traffic	Fall and Winter	N/A	Likely	Likely	Likely

Species	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
Risso's Dolphin (Grampus griseus) California-Oregon-Washington Stock	Fish, krill, cephalopods	Tropical and warm temperate waters; Commonly seen on shelf in Southern California Bight, and in slope of CA, OR, and WA waters; Prefer deep waters but do inhabit coastal shelves	Night feeding especially in search of squid	Fall and Winter	N/A	Likely	Likely	Likely
Striped Dolphin (Stenella coeruleoalba) California-Oregon-Washington Stock	Fish, cephalopods	Prefer deep, oceanic, tropical to warm temperate waters; Mainly found seaward of continental shelf from 40 to 50 deg. N; Often linked to upwelling and convergent zones; No information on movement patterns	Active at surface, vessel avoidance	Unknown	N/A	Unlikely	Unlikely	Unlikely
Pacific White-Sided Dolphin (*Lagenorhynchus obliquidens*) California-Oregon-Washington, Northern, and Southern Stocks	Small schooling fish, squid	Open ocean and nearshore temperate waters; Primarily found in shelf and slope waters, unlikely to be found close to shore; North-south seasonality	Group feeding/fish herding	Fall and Winter	N/A	Unlikely	Unlikely	Unlikely

Species	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
Dall's Porpoise (*Phocoenoides dalli*) California-Oregon-Washington Stock	Small schooling fish, mid- and deep-water fish, cephalopods	Temperate to boreal waters; Found in shelf, slope, and offshore waters; Prefer depths greater than 600 feet; Migration patterns based on morphology, geography, seasonality, and oceanographic conditions	Night feeding, attracted to fast moving vessels, presumed to use echolocation	Winter	N/A	Unlikely	Unlikely	Unlikely

C. Pinnipeds (seals and sea lions)

Table 5-C1: Protected Pinniped Status

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
CA Harbor Seal (*Phoca vitulina*) California Stock	MMPA	N/A	Entanglement, vessel strike, habitat degradation, pollution, illegal feeding	Entanglement, increased risk of harassment, vessel strikes, pollution, and habitat degradation	Pacific Coast of Mexico to AK	Spring and Summer
Northern Elephant Seal (*Mirounga angustirostris*)* California Breeding Stock	MMPA	N/A	Historic sealing, entanglement, vessel strikes	Entanglement, increased risk of vessel strikes	Southern CA to Gulf of AK	December - March
California Sea Lion (*Zalophus californianus*) United States Stock	MMPA	N/A	Entanglement, human harassment and mortality, toxic algal blooms	Entanglement, increased risk of harassment	Baja California, Mexico to southeast AK	June-August
Guadalupe Fur Seal (Arctocephalus townsendi) Mexico Stock	FT, MMPA ST	Not designated	Historic sealing, entanglement, anthropogenic noise, oil spills, military activity	Entanglement, increased risk of oil spills and ocean noise	Pacific coast of Mexico to southern CA (strandings as far north as WA)	May-August

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
Northern Fur Seal (*Callorhinus ursinus*) California Stock	MMPA	N/A	Historic sealing, entanglement, changes in prey distribution due to fisheries, predation	Entanglement, habitat degradation, possible environmental variation effects such as temperature changes, sea level rise, ocean acidification, and harmful algal blooms	Southern CA to the Bering Sea (CA stock refers to San Miguel and Farallon Islands populations)	June-August

Table 5-C2: Protected Pinniped Potential to Occur in AOAs

Species/Stock	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
CA Harbor Seal (*Phoca vitulina*) California Stock	Fish, shellfish, crustaceans	Temperate coastal habitats, typically stay near their natal area; Found widely on mainland and offshore-island hall out sites including sandbars, rocky shores, and beaches; Mostly non-migratory	Commonly haul out on human structures	Year-round	N/A	Likely	Likely	Likely
Northern Elephant Seal (*Mirounga angustirostris*) * California Breeding Stock	Squid, fish, sharks, rays	Breeding grounds in CA (San Miguel, Santa Rosa, Santa Barbara Islands); Males migrate to feed in Gulf of AK, females feed in the offshore waters of WA, OR, and AK; Adults return to land between March and August to molt, with males returning later than females; Adults return to feeding areas again between the spring / summer molt and winter breeding season	Winter breeding in SCB	December to March	N/A	Likely	Likely	Likely

Species/Stock	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
California Sea Lion (*Zalophus californianus*) United States Stock	Fish, squid	Shallow waters of eastern north Pacific; Primary breeding range is from Channel Islands, CA to central Mexico; Males migrate north to feed as far as Southeast AK; Females stay near breeding grounds until pups are weaned; Females can be found feeding as far north as OR and WA	Take fish from commercial gear, rafting, haul out on human structures, pups left on shore while mother hunts	Year-round	N/A	Likely	Likely	Likely
Guadalupe Fur Seal (Arctocephalus townsendi) Mexico Stock	Coastal and pelagic squid, small pelagic fish	Breeding grounds almost entirely on Guadalupe Island, Mexico, but small breeding populations off Baja California and San Miguel Island, CA	Immature pups can become stranded great distances from breeding grounds	Unknown	N/A	Unlikely	Unlikely	Unlikely
Northern Fur Seal (*Callorhinus ursinus*) California Stock	Variety of midwater fish and squid	Highly pelagic, spend majority of time offshore; Use rocky or sandy beaches for resting, breeding, and molting	Nocturnal, aggressive during breeding	Possibly year-round	N/A	Unlikely	Unlikely	Unlikely

D. Sea turtles

Table 5-D1: Protected Sea Turtle Status

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
Loggerhead Sea Turtle (Caretta caretta) North Pacific Ocean DPS	FE	Not designated	Bycatch, loss of nesting habitat, vessel strikes, harvesting turtles and eggs, marine debris	Entanglement, loss of nesting habitat, increased risk of vessel strikes, marine debris, changes in beach morphology, sand temperature, and food distribution	North Pacific Ocean, bound by the equator and the 60 deg. N parallel	March-June
Green Sea Turtle (Chelonia mydas) East Pacific DPS	FT	Not designated	Wildlife trafficking, bycatch, vessel strikes, habitat loss due to coastal development, disease	Entanglement, habitat loss, increased risk of vessel strikes, oil spills, marine debris ingestion, changes in beach morphology, sand temperature, and food distribution	Northwestern Mexico to southern AK	Late Spring to Summer
Olive Ridley Sea Turtle (Lepidochelys olivacea)	FT	Not designated	Hunting, bycatch, vessel strikes, predation, loss of nesting habitat, marine debris	Entanglement, habitat loss, increased risk of vessel strikes, oil spills, marine debris ingestion, changes in beach morphology, temperature, and food distribution	Northern Chile to southern CA	Variable depending on location

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
Leatherback Sea Turtle (Dermochelys coriacea) Western Pacific	FE SE	16,910 sq. mi of CA coast from Point Arena to Point Arguello E. of 3000m depth contour; 25,004 sq. mi from Cape Flattery, WA to Cape Blanco, OR E. of 2000m depth contour	Hunting, bycatch, vessel strikes, loss of nesting habitat, marine debris	Entanglement, loss of habitat, increased risk of vessel strikes, oil spills, marine debris ingestion, changes in beach morphology/sand temperature, and food distribution	Indo-Pacific region to the Pacific coast of North America	Variable depending on location

Table 5-D2: Protected Sea Turtle Potential to Occur in AOAs

Species/Stock	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
Loggerhead Sea Turtle (Caretta caretta) North Pacific Ocean DPS	Carnivores - mostly benthic invertebrates in coastal habitat	Nest in Japan; Hatchlings and juveniles spend 7 to 15 years in open ocean, trans-Pacific migration to foraging grounds in Mexico and Central America; Spend years maturing, later migrating back to nest in Japan; Rarely seen in southern CA during anomalously warm periods	Forage in nearshore areas later in life	Unknown	N/A	Unlikely	Unlikely	Unlikely
Green Sea Turtle (Chelonia mydas) East Pacific DPS	Herbivores - algae, seagrasses	Common from NW Mexico to southern CA; Nest in Mexico and migrate to CA nearshore areas to forage - San Diego bay especially; Adults migrate every 2 to 5 years from foraging to nesting grounds where they originally hatched; Hatchlings live in pelagic zones for several years, juveniles then migrate to foraging grounds	Beach nesting, foraging in nearshore areas	Unknown	N/A	Somewhat Likely	Likely	Likely
Olive Ridley Sea Turtle (Lepidochelys olivacea)	Omnivores - algae, lobster, crab, tunicates, and mollusks	Mainly a tropical pelagic species, also known to inhabit coastal areas and forage in deep waters of the Pacific; Nesting occurs throughout range, but large population in Costa Rica; Can be seen in CA	Beach nesting, benthic foraging	Unknown	N/A	Unlikely	Unlikely	Unlikely

Species/Stock	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
Leatherback Sea Turtle (Dermochelys coriacea) Western Pacific	Soft-bodied open ocean prey such as jellyfish and salps	Pelagic but feed and migrate in coastal waters; Nesting in Indo-Pacific region; Trans-Pacific migration to forage off of the U.S. coast; Critical foraging habitat off of WA, OR, and CA; Spend most of life in open ocean	Foraging in nearshore areas	Spring and Summer	N/A	Unlikely	Unlikely	Unlikely

E. Sharks, rays and fish

Table 5-E1: Protected Sharks, Rays and Fish Status

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	FT	Not designated	Bycatch, harvest for fin trade	Vulnerable to depletion due to low reproductive output	Globally in tropical and subtropical waters	Unknown
Scalloped Hammerhead Shark (Sphyrna lewini) Eastern Pacific DPS	FE	Not designated	Bycatch, harvest for fin trade	Pollution and degradation of water quality could threaten juvenile and nursery habitats	Globally in temperate and tropical seas; this stock occurs in the eastern Pacific Ocean	Unknown
Giant Manta Ray (Manta birostris)	FT	Not designated	Bycatch, commercial fishing for international gill plate trade	Vulnerable to depletion due to low reproductive output	Globally in tropical, subtropical, and temperate waters	Unknown
Steelhead Trout (*Oncorhynchus mykiss*)* Southern California DPS	FE SC	Ventura River, Coyote Creek, and Santa Clara River	Habitat loss due to development, overfishing, urban and agricultural land use practices, blocked spawning access	Habitat loss, disruption of return to natal waterways, changes of ocean and river conditions due to environmental variation	Coastal basins from the Santa Maria River to the U.S./ Mexico border	Winter - during high flow

Table 5-E2: Protected Sharks, Rays and Fish Potential to Occur in AOAs

Species/Stock	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	Primarily bony fish and cephalopods	Prefer offshore waters but typically found high in water column near surface	Tend to remain at the surface, more likely to encounter threats	Unknown	N/A	Unlikely	Unlikely	Unlikely
Scalloped Hammerhead Shark (Sphyrna lewini) Eastern Pacific DPS	Bony fish, cephalopods, sharks, rays	Occurs over continental and insular shelves as well as adjacent deep waters; Highly mobile, partly migratory	-	Unknown	N/A	Unlikely	Unlikely	Unlikely
Giant Manta Ray (Manta birostris)	Euphausiids, copepods, mysids, shrimp	Commonly found offshore in oceanic waters and in productive coastal areas; Also observed in estuarine waters, oceanic inlets, and within bays and intercoastal waterways; Migration varies and the population structure is not well understood	Seasonally visit productive coastlines with upwelling, may be found aggregating in shallow waters to feed	Unknown	N/A	Unlikely	Unlikely	Unlikely
Steelhead Trout (*Oncorhynchus mykiss*)* Southern California DPS	Invertebrates, small forage fish, crustaceans	Gravel bottom, fast flowing rivers and streams for spawning; Estuaries and nearshore areas for juvenile feeding; Open ocean during adult development prior to returning to natal grounds	Anadromous fish (steelhead) co-occur and sometimes interbreed with freshwater resident fish (rainbow trout)	Winter to Spring	N/A	Unlikely	Unlikely	Unlikely

F. Invertebrates

Table 5-F1: Protected Invertebrates Status

Species/Stock	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
White Abalone (Haliotis sorenseni)	FE	Not designated	Commercial fishing, disease, low reproduction rates	Possible habitat loss/degradation	Punta Abreojos, Baja California, Mexico to Point Conception, CA	Unknown
Black Abalone (Haliotis cracherodii)	FE	360 sq. km of habitat along the CA coast and offshore islands (including Channel Islands)	Commercial fishing, illegal harvest, disease, low reproduction rates	Possible habitat loss/degradation, oil spills, sedimentation events	Bahai Tortugas and Isla Guadalupe, Mexico to Point Arena, CA	Unknown

Table 5-F2: Protected Invertebrates Potential to Occur in AOAs

Species/Stock	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
White Abalone (Haliotis sorenseni)	Various algae	Small numbers along mainland coast of CA and on a few offshore islands and banks; Live on rocky substrate alongside sand channels; Can be found at depths of 5 to 180 feet; Slow moving bottom dwellers	May be found in kelp rich areas, broadcast spawners	Year-round	N/A	Unlikely	Unlikely	Unlikely
Black Abalone (Haliotis cracherodii)	Various algae	Rocky intertidal and shallow subtidal reefs along the CA and Baja California coast; Slow moving bottom dwellers to about 18 feet deep	May be found in kelp rich areas, broadcast spawners	Year-round	N/A	Unlikely	Unlikely	Unlikely

Birds

Table 5-G1: Protected Birds Status

Species	Federal/State Protections	Critical Habitat	Historic and Current Threats	Predicted Threats	Historic Range	Breeding Season
California Least Tern (Sterna antillarum browni)*	FE, MBTA SE	Not designated	Loss of nest habitat, invasive plants, human disturbance, lack of resources, predation	Increased disturbance and habitat loss in shoreline areas, urban development	Pacific coast of Mexico to central CA	April - September
Western Snowy Plover (Charadrius alexandrinus)* Pacific Coast Population DPS	FT, MBTA	24,527 acres along the Pacific Coast of WA, OR, and CA	Habitat loss from coastal development, recreation	Further loss of habitat, sea level rise, oil spills	Along coasts of WA, OR, CA and Mexico	March to September
Short-Tailed Albatross (*Phoebastria albatrus*)*	FE, MBTA	Not designated	Hunting, plastic pollution, entanglement, habitat destruction	Oil spills, increased exposures to plastics, contaminants	From Japan east to the Bering Sea/Gulf of AK, and south to CA	Winter

Table 5-G2: Protected Birds Potential to Occur in AOAs

Species	Primary Diet	Primary Habitat	Behaviors	Known Seasonal Abundance	PO Alt. 1	PO Alt. 2	PO Alt. 3	PO Alt. 4
California Least Tern (Sterna antillarum browni)*	Small fish and nearshore prey	Nesting limited to colonies in San Francisco Bay, Sacramento River delta, and areas along the coast from San Luis Obispo County to San Diego County; Wintering locations unknown but may be in Mexico or Central America	Nests on open, sandy areas along coast, migratory	Spring to Fall	N/A	Unlikely	Unlikely	Unlikely
Western Snowy Plover (Charadrius alexandrinus)* Pacific Coast Population DPS	Invertebrates including insects and crustaceans	Breeds on sparsely vegetated sandy beaches and dry salt flats; In the winter mostly found on sandy beaches; Short north-south migration to winter areas for Pacific coast breeders	Sensitive to disturbance while nesting, nest on sand and open spaces	Year-round	N/A	Unlikely	Unlikely	Unlikely
Short-Tailed Albatross (*Phoebastria albatrus*)*	Squids, crustaceans, various fishes	Breeding occurs primarily on several remote islands in the western Pacific; During non-breeding season range along the Pacific Rim from southern Japan to the west coast of North America	Attracted to fishing operations for feeding	Unknown	N/A	Unlikely	Unlikely	Unlikely

*Indicates species that were not included in the species list considered during site characterization in the Atlas.

Table 6: Fisheries Gear Calendar

Fisheries Description					Seasonal Likelihood of Occurrence			
List of Fisheries	Gear Type	MMPA Category	Est. # of Participants	Effort Distribution / General Season	**Winter** (Dec. 1 - Feb. 28)	**Spring** (Mar. 1 - May 31)	**Summer** (June 1 - Aug. 31)	**Fall** (Sept. 1 - Nov. 30)
POT/TRAP FISHERIES								
CA SPINY LOBSTER TRAP FISHERY*	Pot / Trap	II	189	**Distribution:** U.S./Mexico border to Pt. Conception, including areas around the Channel Islands. **General Season:** Early Oct. - mid-Mar.	Likely	Likely	Unlikely	Likely
CA SPOT PRAWN POT FISHERY*	Pot / Trap	II	22	**Distribution:** U.S./Mexico border to Central CA **General Season:** Northern CA: Aug. 1 - Apr. 30 and Southern CA: Feb. 1 - Oct. 30	Likely	Likely	Likely	Likely
CA ROCK CRAB POT FISHERY*	Pot / Trap	III	113	**Distribution:** Entire CA coastline, including offshore islands **General Season:** Year-round	Likely	Likely	Likely	Likely

Fisheries Description					Seasonal Likelihood of Occurrence			
List of Fisheries	Gear Type	MMPA Category	Est. # of Participants	Effort Distribution / General Season	**Winter** (Dec. 1 - Feb. 28)	**Spring** (Mar. 1 - May 31)	**Summer** (June 1 - Aug. 31)	**Fall** (Sept. 1 - Nov. 30)
WA/OR/CA SABLEFISH POT FISHERY	Pot / Trap	II	144	**Distribution:** In Federal waters off WA, OR, and CA **General Season:** Tier endorsed limited entry: Apr. 1 - Dec. 31 Open access and non-tier endorsed limited entry: Year-round	Likely	Likely	Likely	Likely
WA/OR/CA HAGFISH POT FISHERY*	Pot / Trap	III	63	**Distribution:** Coastline of WA, OR, and CA **General Season:** Year-round	Possible *	Possible *	Possible *	Possible *
CA NEARSHORE FINFISH TRAP FISHERY †	Pot / Trap	III	42	**Distribution:** Entire CA coastline, up to 5 miles offshore. Effort typically occurs in CA state waters **General Season:** Year-round	Likely	Likely	Likely	Likely
CA DUNGENESS CRAB POT FISHERY	Pot / Trap	I	471	**Distribution:** Northern and Central CA **General Season:** Northern CA: Dec. 1 - July 15 Central CA: Nov. 15 - June 30	Possible *	Possible *	Possible *	Possible *

Fisheries Description					Seasonal Likelihood of Occurrence			
List of Fisheries	Gear Type	MMPA Category	Est. # of Participants	Effort Distribution / General Season	**Winter** (Dec. 1 - Feb. 28)	**Spring** (Mar. 1 - May 31)	**Summer** (June 1 - Aug. 31)	**Fall** (Sept. 1 - Nov. 30)
CA COONSTRIPE SHRIMP POT FISHERY*	Pot / Trap	II	9	Distribution: Northern CA General Season: May 1 - Oct. 31	Unlikely	Unlikely	Unlikely	Unlikely
CA TANNER CRAB POT FISHERY*	Pot / Trap	III	1	Distribution: Northern CA General Season: Unspecified	Unlikely	Unlikely	Unlikely	Unlikely
HOOK AND LINE FISHERIES								
WA/OR/CA GROUNDFISH, BOTTOMFISH, LONGLINE/SET LINE FISHERY	Long Line / Set Line	III	314	**Distribution:** In Federal waters off WA, OR, and CA **General Season:** Main effort is Apr. - Oct. but can occur year-round	Possible *	Possible *	Possible *	Possible *
WA/OR/CA PACIFIC HALIBUT LONGLINE FISHERY	Long Line / Set Line	III	130	Distribution: Entire EEZ off WA, OR, and CA General Season: June - July	Unlikely	Unlikely	Possible *	Unlikely

Fisheries Description					Seasonal Likelihood of Occurrence			
List of Fisheries	Gear Type	MMPA Category	Est. # of Participants	Effort Distribution / General Season	**Winter** (Dec. 1 - Feb. 28)	**Spring** (Mar. 1 - May 31)	**Summer** (June 1 - Aug. 31)	**Fall** (Sept. 1 - Nov. 30)
CA/OR/WA NON-ALBACORE HMS HOOK AND LINE FISHERY	Troll; Pole and Line	III	124	**Distribution:** Primarily in SCB, with little effort north of Pt. Conception **General Season:** Allowed year-round, but majority of effort occurs late spring - early winter	Likely	Likely	Possible	Possible
WA/OR/CA ALBACORE SURFACE HOOK AND LINE/TROLL FISHERY	Troll; Pole and Line	III	556	**Distribution:** Coastline of WA, OR, and CA **General Season:** Allowed year-round, but most effort occurs late summer - early fall	Possible *	Possible *	Possible *	Possible *
CA/OR/WA SALMON TROLL FISHERY	Troll	III	1030	**Distribution:** Coastline of WA, OR, and CA **General Season:** Varies, primarily during summer / fall with area specific spring effort at times	Unlikely	Possible *	Possible *	Possible *
WA/OR/CA GROUNDFISH/ FINFISH HOOK AND LINE FISHERY	Troll; Pole and Line; Vertical Long line; Stick Gear	III	689	Distribution: Coastline of WA, OR, and CA General Season: Year-round	Likely	Likely	Likely	Likely

Fisheries Description					Seasonal Likelihood of Occurrence			
List of Fisheries	Gear Type	MMPA Category	Est. # of Participants	Effort Distribution / General Season	**Winter** (Dec. 1 - Feb. 28)	**Spring** (Mar. 1 - May 31)	**Summer** (June 1 - Aug. 31)	**Fall** (Sept. 1 - Nov. 30)
CA HALIBUT, WHITE SEABASS, YELLOWTAIL HOOK AND LINE/HANDLINE FISHERY*	Troll; Pole and Line; Handline	III	388	**Distribution:** Coastline of CA, effort generally occurs in CA state waters **General Season:** Year-round ; white seabass fishery is closed south of Pt. Conception from Mar. 15 - June 15	Likely	Likely	Likely	Likely
CA DEEP SET BUOY GEAR FISHERY*	Standard and Linked Deep Set Buoy Gear	*Not yet listed in MMPA List of Fisheries	Unknown	**Distribution:** In Federal waters within the SCB. Little effort typically occurs north of Pt. Conception. **General Season:** Year-round but effort occurs late July - Nov.	Likely	Likely	Likely	Likely
AK/WA/OR/CA COMMERCIAL PASSENGER FISHING VESSEL FISHERY*	Hook and Line; some Pot/Trap	III	7000+ (321-CA)	**Distribution:** Can occur in both state and Federal waters **General Season:** Varies by state, species group, etc.	Likely	Likely	Likely	Likely
NET FISHERIES								

Fisheries Description					Seasonal Likelihood of Occurrence			
List of Fisheries	Gear Type	MMPA Category	Est. # of Participants	Effort Distribution / General Season	**Winter** (Dec. 1 - Feb. 28)	**Spring** (Mar. 1 - May 31)	**Summer** (June 1 - Aug. 31)	**Fall** (Sept. 1 - Nov. 30)
CA THRESHER SHARK/ SWORDFISH DRIFT GILLNET FISHERY	Drift Gillnet (>/=14 in. mesh)	II	21	**Distribution:** U.S./Mexico border to OR **General Season:** Feb. 1 - Apr. 30 occurs >200 nm offshore ; May 1 –-Aug. 14 occurs >75 nm offshore ; Aug. 15 - Jan. 31 occurs >12 nm from shore ; numerous smaller closures including a Loggerhead sea turtle closure in SCB during El Niño years.	Likely	Unlikely	Likely	Likely
CA YELLOWTAIL, BARRACUDA, WHITE SEABASS DRIFT GILLNET FISHERY*	Drift Gillnet (>/=3.5 in. and <14 in. mesh)	II	20	**Distribution:** In Federal waters primarily south of Pt. Conception, including effort around San Clemente and San Nicolas Islands **General Season:** Year-round	Likely	Likely	Likely	Likely

Fisheries Description					Seasonal Likelihood of Occurrence			
List of Fisheries	Gear Type	MMPA Category	Est. # of Participants	Effort Distribution / General Season	**Winter** (Dec. 1 - Feb. 28)	**Spring** (Mar. 1 - May 31)	**Summer** (June 1 - Aug. 31)	**Fall** (Sept. 1 - Nov. 30)
CA HALIBUT, WHITE SEABASS, AND OTHER SPECIES SET GILLNET FISHERY*	Set Gillnet (>3.5 in. mesh)	II	39	**Distribution:** In Federal waters from U.S./Mexico border to Monterey Bay **General Season:** Year-round; White seabass catch prohibited south of Pt. Conception Mar. 15 - June 15	Likely	Likely	Likely	Likely
CA HALIBUT BOTTOM TRAWL FISHERY*	Bottom Trawl	III	23	**Distribution:** Generally within Federal waters off central CA from Pt. Reyes to Pt. Sal, and throughout the SCB; effort in CA waters occurs in the California Halibut Trawling Grounds (CHTG) which is 1-3nm from shore between Port Arguello and Point Mugu **General Season:** Year-round in Federal waters; CA season is June 16 – Mar. 14 (within CHTG only)	Likely	Likely	Likely	Likely

Fisheries Description					Seasonal Likelihood of Occurrence			
List of Fisheries	Gear Type	MMPA Category	Est. # of Participants	Effort Distribution / General Season	**Winter** (Dec. 1 - Feb. 28)	**Spring** (Mar. 1 - May 31)	**Summer** (June 1 - Aug. 31)	**Fall** (Sept. 1 - Nov. 30)
CA SEA CUCUMBER TRAWL FISHERY*	Bottom Trawl	III	11	**Distribution:** San Diego to Pt. Conception **General Season:** Year-round in Federal waters w/ exception of warty sea cucumber trawling closure Mar. 1 - June 14; closed in CHTG Mar. 1 - June 15	Likely	Likely	Likely	Likely
WA/OR/CA SHRIMP TRAWL FISHERY*	Bottom Trawl	III	130	**Distribution:** Coastline of WA, OR, and CA; generally within Federal waters with some effort in OR and WA state waters **General Season:** Apr. 1 - Oct. 31 ; Southern CA fishery for ridgeback and golden prawns is closed from June 1 - Sept. 31	Unlikely	Likely	Unlikely	Likely
WA/OR/CA GROUNDFISH TRAWL FISHERY	Midwater Trawl; Bottom Trawl	III	118	**Distribution:** In Federal waters off WA, OR, and CA **General Season:** Year-round	Possible *	Possible *	Possible *	Possible *

Fisheries Description					Seasonal Likelihood of Occurrence			
List of Fisheries	Gear Type	MMPA Category	Est. # of Participants	Effort Distribution / General Season	**Winter** (Dec. 1 - Feb. 28)	**Spring** (Mar. 1 - May 31)	**Summer** (June 1 - Aug. 31)	**Fall** (Sept. 1 - Nov. 30)
CA ANCHOVY, MACKEREL, SARDINE PURSE SEINE FISHERY	Purse Seine	III	53	**Distribution:** Occurs in Federal waters throughout CA coast but primarily operates in San Diego, Oceanside, Dana Point, San Pedro, and Monterey **General Season:** Northern anchovy and Jack mackerel: Jan. 1 - Dec. 31 ; Pacific sardine and Pacific mackerel: July 1 - June 30; *Pacific sardine fishery has been closed since 2015.*	Likely	Likely	Likely	Likely
CA SQUID PURSE SEINE FISHERY†	Purse Seine	III	68	**Distribution:** Primarily southern and central CA coast **General Season:** North of Pt. Conception: Apr. - Sept. South of Pt. Conception: Oct. - Mar.	Likely	Likely	Likely	Likely
CA SQUID DIP NET FISHERY*	Brail Gear; Dip Net	III	19	**Distribution:** Primarily southern and central CA coast **General Season:** North of Pt. Conception: Apr. - Sept. South of Pt. Conception: Oct. - Mar.	Likely	Likely	Possible	Likely

Fisheries Description					Seasonal Likelihood of Occurrence			
List of Fisheries	Gear Type	MMPA Category	Est. # of Participants	Effort Distribution / General Season	**Winter** (Dec. 1 - Feb. 28)	**Spring** (Mar. 1 - May 31)	**Summer** (June 1 - Aug. 31)	**Fall** (Sept. 1 - Nov. 30)
CA TUNA PURSE SEINE FISHERY	Purse Seine	III	14	**Distribution:** Primarily in Federal waters off CA coast **General Season:** Typically May-Oct. during years when target species enter SCB	Unlikely	Possible	Possible	Possible
CA HERRING SET GILLNET FISHERY*	Set Gillnet	III	11	**Distribution:** Operates in and near San Francisco Bay, Crescent City Harbor, Humboldt Bay, and Tomales Bay **General Season:** Jan. 2 - Mar. 15	Unlikely	Unlikely	Unlikely	Unlikely
MECHANICAL/HAND COLLECTION FISHERIES								
CA SWORDFISH HARPOON FISHERY	Harpoon	III	21	**Distribution:** Typically concentrated off San Diego in early season and shifts as far north as OR in later season **General Season:** May - Dec.	Possible	Likely	Likely	Likely

Fisheries Description					Seasonal Likelihood of Occurrence			
List of Fisheries	Gear Type	MMPA Category	Est. # of Participants	Effort Distribution / General Season	**Winter** (Dec. 1 - Feb. 28)	**Spring** (Mar. 1 - May 31)	**Summer** (June 1 - Aug. 31)	**Fall** (Sept. 1 - Nov. 30)
CA/OR/WA DIVE COLLECTION FISHERY*	Dive; Scuba	III	186	**Distribution:** Coastline of CA, OR, and WA **General Season:** Year-round with species specific area/time restrictions	Likely	Likely	Likely	Likely
WA/OR/CA HAND / MECHANICAL COLLECTION FISHERY*	Mechanical, Hand Collection	III	320	**Distribution:** Coastline of CA, OR, and WA **General Season:** Varies by state with area/time restrictions **mechanical devices to harvest mollusk prohibited in CA (hand only)*	Likely	Likely	Likely	Likely
CA/WA KELP, SEAWEED, AND ALGAE FISHERY*	Mechanical, Hand Collection	III	4	**Distribution:** Coastline of CA and WA **General Season:** Varies by state with area/time restrictions	Unlikely	Unlikely	Unlikely	Unlikely

Fisheries Description					Seasonal Likelihood of Occurrence			
List of Fisheries	Gear Type	MMPA Category	Est. # of Participants	Effort Distribution / General Season	**Winter** (Dec. 1 - Feb. 28)	**Spring** (Mar. 1 - May 31)	**Summer** (June 1 - Aug. 31)	**Fall** (Sept. 1 - Nov. 30)

Notes:

All information is from the most recent profiles of the NOAA MMPA 2024 List of Fisheries.

Est. # of Participants was last updated in 2023 and reflects fishery-wide participants (i.e. not SCB specific). Participants are considered as all permit holders (88 FR 16899); this PEIS does not further divide participants to vessels or individuals.

Definitions:

“Occurrence”: for the purposes of this table, occurrence is intended to mean active fishing effort or fishing transect in or near the Alternative Areas

“Likely:” Peak season fishing can occur within SCB during this time of year

“Possible:” Outside of peak season, but fishing allowed year-round and could occur within SCB during this time as well

“Possible *:” Majority of effort occurs outside of SCB, but historic fishery distribution does include SCB

“Unlikely:” Outside of general season and/or historic fishery distribution does not include SCB

SCB: Southern California Bight

CHTG: California Halibut Trawling Grounds

*Fisheries managed by California (i.e., not Federally-managed fisheries)

†Fisheries managed by both Californa and NMFS

Table 7: Federal Fishery Management Plans in the SCB

SPECIES COVERED UNDER THE FMP	PREDICTED THREATS	BEHAVIORS	PO ALT. 1	PO ALT. 2	PO ALT. 3	PO ALT. 4
Coastal Pelagic Species (CPS) FMP CPS are schooling fish ranging from the shore to the open ocean. CPS occur in the water column from 0-1,000 meters, typically found above the continental shelf.						
Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), Jack mackerel (*Trachurus symmetricus*), Northern anchovy (*Engraulis mordax*), Market squid[1] (*Doryteuthis opalescens*), Krill[2](*euphausiid sp*.) Ecosystem Component Species[3]: Pacific herring (*Clupea pallasii*), Jacksmelt (*Atherinopsis californiensis*)	Fluctuating oceanographic conditions including water temperatures, currents, upwelling, and the timing of changes to these relative to CPS life histories could affect their recruitment, distribution, and abundance.	CPS play an important role in the CA Current ecosystem as a critical food source for marine mammals, sea birds, and larger fish. Market squid abundance is known to rapidly expand in cool and productive oceanographic conditions associated with La Niña events, and contract in warm and unproductive regimes associated with El Niño events.	N/A	LIKELY CPS seining occurs within the SCB and can occur specifically within the Santa Barbara channel and surrounding Channel Islands. Port Hueneme and Ventura Harbor are main ports in southern CA for CPS finfish and market squid fisheries. The market squid dipnet/brail fishery can occur here as well.	LIKELY CPS bait fishing is allowed and other commercial CPS fishing occurs near boundary line. Port of LA is a major landing port for CPS.	LIKELY

SPECIES COVERED UNDER THE FMP	PREDICTED THREATS	BEHAVIORS	PO ALT. 1	PO ALT. 2	PO ALT. 3	PO ALT. 4

NOTES

1 Market squid fishery management was taken over by CFGC in 2011.

2 All Krill harvest is prohibited under CPS FMP.

3 Ecosystem Component species are not targeted, but incidental stock landings can be monitored.

4 For a complete list of the Rockfish species included in the Groundfish FMP, please see PFMC's most recent Groundfish SAFE report.

DEFINITIONS

FMP: Fishery Management Plan

Behaviors: Relevant behaviors that may lead to interactions with aquaculture operations.

PO: Potential to Occur within one of the Alternative areas (Alternative 2: Santa Barbara Channel, Alternative 3: Santa Monica Bay, Alternative 4: Both geographic areas).

CPS: Coastal Pelagic Species

HMS: Highly Migratory Species

DSBG: Deep Sea Buoy Gear

DGN: Drift gill net

Highly Migratory Species (HMS) FMP

Open ocean, pelagic and nearshore coastal zones are all important, although HMS are most often found offshore. HMS often inhabit areas with distinct temperature and nutrient gradients, such as nutrient-rich waters influenced by upwelling. HMS exhibit significant migratory patterns throughout the Pacific Ocean, are highly adaptable to oceanic conditions, and range widely in search of prey and suitable breeding grounds.

SPECIES COVERED UNDER THE FMP	PREDICTED THREATS	BEHAVIORS	PO ALT. 1	PO ALT. 2	PO ALT. 3	PO ALT. 4
Tunas: Albacore tuna (*Thunnus alalunga*), Yellowfin tuna (*Thunnus albacares*), Bigeye tuna (*Thunnus obesus*), Skipjack tuna (*Katsuwonus pelamis*), Pacific bluefin tuna (*Thunnus orientalis*) Sharks: Common thresher shark (*Alopias vulpinus*), Shortfin mako shark *(Isur*us oxyrinchus), Blue shark (*Prionace glauca*) Billfish/swordfish: Striped marlin *(Kajikia audax*), Broadbill swordfish (*Xiphias gladius*) Other: Dorado (Coryphaena hippurus) Ecosystem Component Species[3]: Bigeye thresher shark (*Alopias superciliosus*), Common mola (*Mola mola*), Escolar (*Lepidocybium flavobrunneum*), Lancetfishes (*Alepisauridae*), Louvar (*Luvarus imperialis*), Pelagic sting ray (*Dasyetis violacea*), Pelagic thresher shark (*Alopias pelagicus*), Wahoo (*Acathocybium solandri*)	Alterations in ocean temperatures and currents can impact the distribution and abundance of prey. Changes such as alterations in upwelling patterns could affect the overall ecosystem dynamics for HMS. Being upper level predators, they are prone to accumulating toxins within their tissues, so pollution and contaminants could be a concern. Shifting migration routes could occur as ocean conditions change.	Being highly migratory and predominantly pelagic, HMS may be less vulnerable to coastal development than other species, but not immune. As high-level predators, any changes to the food web disrupting key organisms upon which they depend could negatively affect HMS.	N/A	LIKELY The majority of DSBG, Harpoon, and Hook and Line effort occurs within the SCB south of Pt. Conception, as does most DGN effort. (UNLIKELY fisheries components under the same FMP): Some DGN trips occur north of Pt. Conception, and far offshore near the outer boundary of the EEZ. West Coast-based longline fishing only occurs outside the EEZ. The WA/OR/CA Albacore Surface Hook and Line/Troll Fishery is focused in OR and WA.	LIKELY Drift Gillnet is allowed in SMB. There is a conditional time/area closure called the Loggerhead Conservation Area, which closes part of the SCB to DGN fishing during El Niño conditions. This conditional closure area overlaps in part with the SMB.	LIKELY

SPECIES COVERED UNDER THE FMP	PREDICTED THREATS	BEHAVIORS	PO ALT. 1	PO ALT. 2	PO ALT. 3	PO ALT. 4
Groundfish FMP With a few exceptions, groundfish live on or near the ocean floor. Most species are coastwide stocks. Some of them vary in concentration from north to south, and some are common from the U.S./Canada border to the U.S./Mexico border. Groundfish inhabit a variety of depths, ranging from intertidal and nearshore to waters as deep as 3,500 meters. Most individual species tend to localize by depth more than latitude.						

West Coast rockfish[4]:(65+ species) Flatfish: Arrowtooth flounder (*Atheresthes stomias*), Butter sole (*Isopsetta isolepis*), Curlfin sole (*Pleuronichthys decurrens*), Dover sole (*Microstomus pacificus*), English sole *(Parophrys vetulus*), Flathead sole (*Hippoglossoides elassodon*), Pacific sanddab (*Citharichthys sordidus*), Petrale sole (*Eopsetta jordani*), Rex sole (*Glyptocephalus zachirus*), Rock sole (*Lepidopsetta bilineata*), Sand sole (*Psettichthys melanostictus*), Starry flounder (*Platichthys stellatus*) Roundfish: Cabezon (Scorpaenichthys marmoratus), Kelp greenling (Hexagrammos decagrammus), Lingcod (Ophiodon elongatus), Pacific cod (Gadus macrocephalus), Pacific whiting (Merluccius productus), Sablefish (Anoplopoma fimbria) Sharks and Skates: Big skate (*Beringraja binoculata*), Longnose skate (*Beringraja rhina*), Leopard shark (*Triakis semifasciata*), Spiny dogfish (*Squalus suckleyi*) Ecosystem Component Species[3]: Shortbelly rockfish (*Sebastes jordani*), Aleutian skate (*Bathyraja aleutica*), Bering/sandpiper skate (Bathyraja interrupta), California	Oceanographic fluctuations such as sea temperature changes, altered currents, and changes in upwelling productivity can directly impact shifts in the abundance and distribution of groundfish.	Structures associated with aquaculture could serve as artificial habitats for groundfish, attracting or repelling certain species. Waste byproducts from aquaculture operations could alter the benthic habitat critical to local groundfish populations.	N/A	LIKELY Santa Barbara is a major port for Groundfish landings, with Sablefish being an important component. The ATLAS (Morris et al. 2021) showed Vessel Monitoring data from multiple Groundfish fisheries to overlap with the larger, overall North study area considered in the Atlas at varying degrees, especially Pot/ Trap gear and Line gear.	LIKELY Port of LA is a landing port for Groundfish fisheries. The ATLAS (Morris et al. 2021) showed Vessel Monitoring data from multiple Groundfish fisheries to overlap with the larger, overall Central North study area considered in the Atlas at varying degrees, especially Open Access Line gear.	LIKELY

SPECIES COVERED UNDER THE FMP	PREDICTED THREATS	BEHAVIORS	PO ALT. 1	PO ALT. 2	PO ALT. 3	PO ALT. 4
skate (*Raja inornata*), Roughtail/black skate (*Bathyraja trachura*), All other skates except Big and Longnose skate (Endemic species in the family *Arhynchobatidae*), Pacific grenadier (*Coryphaenoides acrolepis*), Giant grenadier (*Coryphaenoides pectoralis*), All other grenadiers (Endemic species in the family *Macrouridae*), Finescale codling *(Antimora microlepis*), Ratfish (*Hydrolagus colliei*), Soupfin shark (*Galeorhinus zyopterus*)						

SPECIES COVERED UNDER THE FMP	PREDICTED THREATS	BEHAVIORS	PO ALT. 1	PO ALT. 2	PO ALT. 3	PO ALT. 4
Salmon FMP These are anadromous fish that migrate between marine and aquatic environments.						

SPECIES COVERED UNDER THE FMP	PREDICTED THREATS	BEHAVIORS	PO ALT. 1	PO ALT. 2	PO ALT. 3	PO ALT. 4
Chinook or king salmon (Oncorhynchus tshawytscha),coho or silver salmon (O. kisutch),pink salmon (O. gorbuscha), chum (O. keta), sockeye (O. nerka), steelhead (O. mykiss), sea-run cutthroat (O. clarki) Ecosystem Component Species: Round herring (Etrumeus teres), Thread herring (Opisthonema libertate, O. medirastre), Mesopelagic fishes (Families: Myctophidae, Bathylagidae, Paralepididae, and Gonostomatidae), Pacific sand lance (Ammodytes Personatus), Pacific saury (Cololabis saira), Silversides (Atherinopsidae), Smelts (Osmeridae), Pelagic squids (Families: Cranchiidae, Gonatidae, Histioteuthidae, Octopoteuthidae, Ommastrephidae except Humboldt squid (Dosidicus gigas), Onychoteuthidae, and Thysanoteuthidae)	Changes such as alterations in upwelling patterns could affect the overall survivability and reproduction of salmon.	Salmon are occasionally found in the southern California Bight, but that area is not part of their core range. Steelhead may be found in Southern California freshwater streams.	N/A	NOT LIKELY Generally low levels of salmon fishing occur south of Point Conception There are no directed fisheries for steelhead in the Alternative area.	NOT LIKELY Generally low levels of salmon fishing occur south of Point Conception There are no directed fisheries for steelhead in the Alternative area.	NOT LIKELY

List of Appendices

1. **Possible Mitigation for Offshore Aquaculture Operations**
2. **List of Mass Mortality Events in the California Current Ecosystem**
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4. **Potential Effects of Environmental Variation on Federally-Protected Species and Habitat**
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Appendix 1: Possible Mitigation for Offshore Aquaculture Operations

The FPEIS does not examine or propose any avoidance, minimization, or monitoring measures for aquaculture development and operations which may be sited in an AOA. Mitigation measures would be project specific. Mitigation measures may be identified in future project-specific permitting and environmental regulatory reviews. Avoidance, mitigation, and monitoring measures could be imposed under various permits, consultations, and statutes, such as the ESA, MBTA, FWCA, and MMPA. For example, consultation under Section 305(b)(2) of the MSA may result in recommendations to help avoid, minimize, or otherwise offset adverse impacts on essential fish habitat. Compliance with the USDA Animal and Plant Health Inspection Service (APHIS) rules and guidance could minimize potential adverse impacts to wild fish stocks.

Basic mitigation measures for aquaculture operations are usually associated with feed and operational practices, stock densities, waste management, and disease. Every project and operation is unique in terms of site environmental conditions, equipment, and harvest species. As the industry grows and knowledge increases, reference documents are becoming more available to help operators with siting, design, operation, and management of aquaculture facilities, which will help minimize environmental impacts. Several of these documents also provide comprehensive overviews of the complex permitting and environmental review process for aquaculture (finfish, shellfish, and seaweed) operations sited in federal waters. The following references provide useful information for project proponents:

- Guide to Permitting Marine Aquaculture in the United States (NMFS 2022a)
- Technical Guide to Marine Aquaculture Gear (Feldman 2025)
- Guide to Leasing, Permitting, and Authorizing Commercial Aquaculture Operations off the California Coast (Southern California Offshore Aquaculture Interagency Working Group 2025)
- An Aquaculture Opportunity Atlas for the Southern California Bight (Morris et al. 2021)
- OceanReports Tool
- West Coast Region ESA Section 7 Mapper
- Essential Fish Habitat Mapper
- Basis-of-Design Technical Guidance for Offshore Aquaculture Installations In the Gulf of Mexico (Fredriksson and Beck-Stimpert 2019)
- National Aquaculture Health Plan and Standards, 2021-2023 (USDA 2021)
- Marine Cage Culture and the Environment: Twenty-first Century Science Informing a Sustainable Industry (Price and Morris 2013)
- Guide to Federal Aquaculture Grant and Financial Assistance Services (NMFS 2021)

We have reviewed the available information and found there are various possible mitigation measures that could be considered for future aquaculture facility development and operations. Some of these potential mitigation measures are discussed below. The potential mitigation measures discussed here are neither prescriptive nor comprehensive, and are provided as examples.

Minimizing Potential Impacts on the Benthic Environment
Siting and designing facilities using baseline environmental survey results and depositional modeling could help minimize potential impacts to the benthic community. Conducting a visual survey of the seafloor prior, during, and after removing anchors and equipment may reduce impacts because adjustments could be considered early in the permit stage. Pre-, during, and post-construction monitoring can be used to monitor changes to baseline conditions, and make necessary changes to operations to

minimize impacts. Other potential measures include operational best management practices like limitations on antifouling treatment, restrictions for gear and anchors, and site-specific modeling and monitoring (e.g., depositional modeling; sediment monitoring for dissolved oxygen, carbon, total organic [TOC], hydrogen sulfide, sediment oxygen demand, nitrogen, particle size distribution, phosphorus, solids, and total volatile solids at and around the site).

Minimizing Potential Impacts on Oceanography, Marine Protected Areas, and Special Resource Areas
Pre-construction sampling, ongoing monitoring within and around farm sites, and modeling could assist in predicting potential impacts of individual operations. Environmental models (e.g., deposition, hydrodynamic, water quality, genetic dispersion) could be used to forecast impacts. The use of these models could help with project-specific planning and the development of appropriate mitigation (e.g., design modifications or monitoring protocols). The potential impacts of changes in vessel traffic, which could impact sensitive habitats, would be considered and mitigated as appropriate.

Minimizing Potential Impacts on Water Quality
Proper site selection is an important first step to avoid and minimize water quality impacts. Spatial planning and siting are essential management tools for reducing potential water quality impacts associated with aquaculture (Tlusty et al. 2005; Stenton-Dozey et al. 2013; Price et al. 2015; Gentry et al. 2017). Proactive spatial planning is essential for successful and sustainable aquaculture development because biological interactions, human use, and environmental impacts (e.g., water quality) vary significantly with location (Gentry et al. 2017), which can help with cage design, layout, and spacing.

In addition to site selection, the most effective and practicable means for maintaining and/or improving water quality is implementing practices that are based on research, field-testing, and expert knowledge. The magnitude and severity of water quality related impacts are often associated with the physical environmental parameters (e.g., mean temperature, current velocity, and depth) of the site and operations (e.g., stocking density, feed conversion ratio, cage design and orientation) (Stenton-Dozey et al. 2013). Understanding and applying best management practices for operations can minimize many potential water quality related impacts.

Several federal regulatory programs help minimize water quality impacts. For instance, the EPA establishes, monitors, and enforces the NPDES permit program to ensure point sources that discharge pollutants of concern do not exceed regulatory national standards. The NPDES program has specific regulations that apply to discharges from animal aquaculture, which includes monitoring for pollutants of concern, total suspended solids, solids, biological wastes (metabolic waste, unconsumed feed), floating and submerged matter, five-day biochemical oxygen demand, dissolved oxygen, nutrients (phosphorus and nitrogen), ammonia, drugs that are unconsumed or unmetabolized, and chemicals, such as antifouling agents. A proposed facility may be considered a Concentrated Aquatic Animal Production (CAAP) facility if the facility produces more than 100,000 pounds of aquatic animals annually. CAAP performance standards and effluent-limit guidelines consist of a series of management practices designed to control pollutant discharges. In addition to compliance with NPDES, aquaculture operations will need to comply with other state and federal laws and water quality control plans as applicable. For example, NSSP language mandates that if gear may attract birds or mammals, farms must have an operational plan to deter them so that water quality (and sanitation) are protected from their potentially accumulating feces. Minimization measures to prevent spills, fires, or other sources of hazardous materials would likely be required as part of a USACE Section 10 permit for all types of aquaculture. Measures may include procedures, supplies to manage and clean up any chemical and fuel spills or leaks, incident reporting agreements, and responsible parties.

The aquaculture industry continues to advance fish farming technology, and improve management practices and performance standards to reduce the environmental footprint (Rust et al. 2014). Optimizing feed formulation, quality and feed management practices are essential operational measures for reducing water quality impacts because low feed conversion ratios (less efficient at converting feed to animal biomass) are associated with increased nutrient loadings. Over the years, innovative aquaculture operators have experimented with different feed types, strategies, and deployment methods to optimize harvest and profit while reducing waste so it is possible these tactics could be applied to reduce impacts (Shipton and Hasan 2013; Rust et al. 2014). Establishing a routine monitoring program could help identify any water quality related issues and should minimize potential impacts. BMPs may include steps for reporting the accidental release of contaminants, excess feed or waste material, and methods of containment.

Mitigation measures could also include implementing emergency response plans (ERPs) to minimize water quality impacts during unexpected hazards, disasters, and emergencies. For instance, HABs can suddenly develop over the course of a few days or a week, so future aquaculture operators need to have a plan if they need to temporarily relocate their operations (i.e., cages) away from a HAB event. ERPs need to be reviewed, updated, and aquaculture operators would train and practice procedures with staff so they are well prepared and ready to respond to an emergency situation.

Minimizing Potential Impacts on Air Quality and Aesthetics
Given the relatively small volume of emissions from future aquaculture operations, it is unlikely mitigation measures for reducing impacts on air quality would be necessary. However, as required, all potential aquaculture projects would need to comply with the EPA's National Ambient Air Quality Standards (NAAQS) (42 U.S.C. § 7403, 78 FR 3086) and local air district emission significance thresholds regardless of their siting location. Despite the low risk of impacting air quality, random air monitoring or fixed station daily monitoring at the aquaculture facility could be implemented to ensure the NAAQS are within limits. Other types of potential mitigation measures could be implemented should the standards be exceeded, such as modifying the feed, vessel, and engine types or restricting the type of operation (finfish vs bivalves or macroalgae), structure (e.g., submerged cages and longlines), and lighting (number, type, duration, and shield-use). It is anticipated most air emissions would occur from the diesel-fueled equipment and vessels so the age, fuel type, equipment, and number of vessels would be considered during planning. Siting studies that include simulated viewshed images can be used to site farms so as to minimize potential aesthetic impacts.

Minimizing Potential Impacts on the Acoustic Environment
Consultation in accordance with ESA Section 7, MBTA, FWCA, and MMPA may consider impacts on the acoustic environment and identify required avoidance, minimization or mitigation measures.

Minimizing Potential Impacts on Fish and Invertebrates, including Essential Fish Habitat
Implementation of EFH conservation recommendations pursuant to Section 305(b)(2) of MSA may help avoid, minimize, mitigate, or otherwise offset adverse impacts on essential fish habitat. In addition to the measures discussed above to reduce impacts on the physical environment, compliance with the following Federal rules and regulations surrounding animal health, biosecurity planning and disease control may require mitigation measures that would also be expected to minimize potential adverse impacts to fish and invertebrates:
- FDA Veterinary Feed Directives;
- USDA APHIS biosecurity plans;
- NSSP's model ordinances for project operations, FDA jurisdiction (codes enforced by the state);
- Biotoxin management plan according to NSSP HACCP guidance; and
- rules and regulations for "seed" sourcing from licensed facilities, and necessary certifications upon transport to offshore sites through the Regional Shellfish Seed Biosecurity Program.

Plans that may be encouraged or required for permitting include an operational plan; monitoring plan for abundance and distribution of non-native fouling organisms; marine biotoxin contingency plan; marine biotoxin management plan; harvester training; vibrio risk assessment (for shellfish); reports of accidental release of contaminants, excess feed or waste material (for finfish); and (depending on the market), additional measures that may be required under a NOAA Seafood Inspection Program (SIP) contract.

The Atlas incorporated setbacks from certain habitats or management areas, which could be refined based on site-specific, comprehensive site analyses, baseline environmental surveys and adaptive management. Actions and technologies to reduce the attractiveness of farms to wild species may mitigate adverse impacts associated with wildlife aggregations. Siting facilities in areas with strong currents for nutrient dispersal may reduce the potential for adverse interactions with wild species (Bath et al. 2023). Also, removing dead or dying fish from cages promptly reduces the attraction to predators (CDFW 2010).

Aquaculture operators have strategies to prevent escapes, such as strategic site selection and engineering designs, regular monitoring and response plans, and sterilization and selective breeding of finfish, and avoiding the cultivation of species outside of their native range (Nelson et al. 2019; Purcell et al. 2025c; Rhodes et al. 2023a). If operations in an AOA are assumed to grow native or naturalized species, choosing species strategically by certain life-history characteristics and tailoring operations can minimize potential genetic impacts from fish escapes or released reproductive material. Careful engineering and rigorous testing of equipment to withstand severe ocean conditions and other circumstances can help reduce the risk of escapes. Structural failures are the most common way Atlantic salmon escape, followed by operational-related failure (Jensen et al. 2010). Fredriksson and Beck-Stimpert (2019) reported system analyses should include hydrostatic and stability calculations, static tension configurations, and dynamic load assessments. Potential scenarios and conditions through construction, harvests, maintenance, storms, and biofouling may be factored into load assessments. Sunny et al. (2024) showed how extreme waves and currents can be factored into aquaculture design.

Various biosecurity measures and best practices can be implemented to reduce the risk for pathogen transfer from cultured stocks to wild species. Some of these include siting in an area conducive to the species-specific needs (e.g., temperature, light, water quality, and flow), which is critical for reducing disease. Other ways to reduce the risk of disease are sourcing disease-free broodstock and seed, rearing healthy stocks, maintaining appropriate cultivation densities, and minimizing handling (Rhodes et al. 2023b). The FAO (2020) recommends daily health checks can facilitate finding an outbreak, and although potentially costly to implement, cost-benefit analysis for biosecurity preparedness can help establish effective surveillance measures. The development of operational practices and technologies to reduce the attractiveness of aquaculture operations to wild species are continuously being developed like predator exclusion plans and devices, such as above and below water mesh or net barriers; depending on the barrier characteristics it can be coupled with routine monitoring for wild species interactions (Rhodes et al. 2023a). Visual deterrence methods can also be used for spotting wild species, such as flashing lights. Advancements in technology allow for video surveillance to monitor culture systems for excess feeding mortalities of cultured stock, which could be coupled with artificial intelligence (AI). Hydrodynamic-biological coupled dispersion models could also help operators understand pathogen transfer dynamics and develop risk management strategies (Taranger et al. 2014; Rhodes et al. 2023a).

Biofouling (the accumulation of microorganisms and macroorganisms on surfaces) is a common issue for all types of aquaculture operations that can contribute to stress and disease from reduced water flow, growth, and survival; biofouling may also harbor pathogens (Rhodes et al. 2023a, b). Thus, desiccation or periodic air-drying of aquaculture infrastructure is a common practice used by aquaculture operators to manage biofouling; desiccation is a common practice among oyster farms.

Cultivated seaweed/macroalgae is susceptible to vibrio pathogens, including bacteria, protists, and viruses. Biosecurity measures that have proven effective in the cultivation of seaweed in Asia include using uninfected propagules, removing biofouling from seaweed and cultivation ropes, and early identification of infected stock (Cottier-Cook et al. 2022). Rhodes et al. (2023) noted that disease transmission between cultured and wild macroalgae is still poorly understood and requires additional research, but highlighted the importance of siting and monitoring of water quality and other environmental factors, such as nutrients, light, temperatures and salinity; local hydrodynamics are the main determinant in cultivated seaweed health and disease prevention.

Minimizing Potential Impacts on Federally-Protected Species and Habitat
EFH consultations would be used to identify recommended actions to avoid, minimize, and mitigate adverse impacts to EFH, as explained below in the section on potential impacts on fish and invertebrates. Compliance with any and all consultation requirements in accordance with ESA Section 7, MBTA, FWCA, and MMPA may be required to minimize adverse impacts on protected species and their habitats. This process may consider factors including the risk of entanglement, near-term and long-term effects of competing ocean uses, shipping, noise, and other ocean-based activities. Examples of mitigation for secondary entanglement used in the offshore wind industry includes regular cleaning and maintenance of gear. Gear and engineering guides may be used to develop entanglement mitigation (Moore and Wieting 1999; Fredriksson and Beck-Stimpert 2019; and Sunny et al. 2024).

Monitoring and reporting requirements for gear maintenance and line tension may be important to reduce the risk of entanglement and marine debris. For example, weighted lines under a breaking tension less than 1,700lbs may reduce the risk of serious injuries from entanglement (Gladics et al. 2017; Knowlton et al. 2016; VPD 2018; and USACE 2021). Some research suggests that changing the color of line may improve visibility and decrease entanglements, but the response to color appears to be species-specific (Hamilton and Baker, 2019). Ensuring all lines are under sufficient tension and regular monitoring for damaged lines and gear has been required under previous USACE permits. Reporting interactions with marine life immediately could be required under USACE permits, which could be conducted by qualified observers. Qualified marine wildlife observers could provide the following:

- Monitor vessel activity and in-water work;
- Monitor safe distance requirements for protected species;
- Monitor compliance and instruct construction personnel on how to properly interact with protected species if encountered during operations; and
- Monitor operation and maintenance of structures and systems.

Remote monitoring could be possible in the future. USACE and NOAA recently decided that, based on the state of technology and the size of the facility, remote monitoring was not a practicable approach to reduce the risk of gear entanglement at an 86-acre (35 ha) kelp aquaculture operation (USACE 2021). Instead, the agencies required weekly monitoring of the site during the first month following installation and every two-weeks thereafter as part of the USACE permit conditions.

Other mitigation approaches to reduce impacts could include using codes of conduct or mitigation measures adapted from other marine industries. For example, NMFS works with the fishing industry and other partners to develop regulations, monitoring plans, engineering studies, and gear modifications to reduce bycatch of sea turtles, marine mammals, sea birds, and non-target fish (NMFS 2022a). Measures include line cutting devices, timed buoy releases, and marked gear. Marked gear may be required. Setting or maintaining gear at night may help mitigate some predation activity for birds (Gladics et al. 2017). Also, vessel speed restrictions could be imposed within an AOA to reduce the risk of a vessel collision with a whale or other protected species (WhaleSafe 2022; Syed 2023).

Actions and technologies to reduce the attractiveness of farms to wild species may also mitigate adverse impacts to protected species (Rhodes et al. 2023a). Siting facilities in areas with strong currents for nutrient dispersal may reduce adverse interactions with protected species (Bath et al. 2023). Curtailing the growth of biofouling on nets would probably reduce wild species aggregations. Based on experience, removing dead or dying fish from cages promptly reduces the attraction to predators (CDFW 2010). Setting lines below the surface of the water can prevent bird predation (Gladics et al. 2017). Additional examples of wildlife mitigation strategies are based on the best available science and knowledge gained from proposed, current, and previous marine aquaculture facilities in the U.S. and abroad. Wildlife mitigation methods are found in the following documents

- Section III. Special Conditions of the CCC Staff Report on Carlsbad Aquafarms, Inc. lists recommendations from the State for a nearshore shellfish operation in the SCB (CCC 2019).
- Section 2.6 on pp. 26 and 27 of Olesiuk et al. (2012) discusses how to eliminate or mitigate noise as a stressor from aquaculture in Canada.
- Table 2 on pp. 211 and 212 of Kemper et al. (2003) summarizes mitigation for each type of conflict reviewed for marine mammals and seabirds, and some mitigation methods are detailed on pp. 219 through 222.
- Mitigation measures for protected species associated with vessel strikes and different types of gear in the water is described in Section 2.2.2 on pp. 2-17 through 2-28 of the NOAA Northwest Fisheries Science Center (NWFSC) PEA for Fisheries Research (2018).

Minimizing Potential Wild Fish Stock Impacts

Implementation of EFH conservation recommendations pursuant to Section 305(b)(2) of MSA may help avoid, minimize, mitigate, or otherwise offset adverse impacts on essential fish habitat. Compliance with USDA Animal and Plant Health Inspection Service (APHIS) rules and guidance would also be expected to minimize some potential adverse impacts to wild fish stocks. Provided examples of mitigation strategies are based on the best available science and knowledge gained from proposed, current, and previous marine aquaculture facilities within and outside the U.S., or are standard practices in other marine industries. See the measures discussed for Federally-protected species and habitat above, which could minimize potential impacts to marine life.

Given the uncertainty and natural variability associated with open water ecosystems and the responses to new offshore aquaculture operations, adaptive management could be considered (Price and Morris 2013; Rust et al. 2014; and CDFW 2019). It is possible an adaptive management approach could reduce reactionary responses and strengthen the sustainability of offshore marine aquaculture (CDFW 2019). The Atlas incorporated setbacks from certain habitats or management areas, which could be refined based on site-specific, comprehensive site analyses, baseline environmental surveys and adaptive management. An example of how aquaculture equipment may be spaced to mitigate impacts is provided in Table 10 on p. 30 of Aguilar-Manjarrez et al. (2017). As discussed above, actions and technologies to reduce the attractiveness of farms to wild species may mitigate adverse impacts associated with wildlife aggregations. Siting facilities in areas with strong currents for nutrient dispersal may reduce the potential for adverse interactions with wild species (Bath et al. 2023). Also, removing dead or dying fish from cages promptly reduces the attraction to predators (CDFW 2010).

Aquaculture operators are required to have strategies to prevent escapes, as stated in previous sections above. Choosing species with wild populations that have long adult lifespans, overlapping generations, and large population size in the region may buffer and help with genetic impacts (Tringali and Bert 1998; Katalinas et al. 2019). FADs may also effectively mitigate adverse effects of fish escapes from large and diverse fish assemblages often found near pens, leading to high mortality of any escaped fish (Dempster et al. 2009; Dempster et al. 2018; Arechavala-Lopez et al. 2018; and Purcell et al. 2025c). Mitigation

measures to reduce ecological, interspecific impacts of escapes have included limiting the number of marine releases of juvenile fish annually. Example BMPs for fish releases from the State are listed in section 6.7.6 of the White Seabass Enhancement Plan (CDFG 2010). Careful engineering and rigorous testing of equipment to withstand severe ocean conditions and other circumstances can help reduce the risk of escapes. Structural failures are the most common way Atlantic salmon escape followed by operational-related failure (Jensen et al. 2010). Fredriksson and Beck-Stimpert (2019) reported system analyses should include hydrostatic and stability calculations, static tension configurations, and dynamic load assessments. Potential scenarios and conditions through construction, harvests, maintenance, storms, and biofouling may be factored into load assessments. Sunny et al. (2024) showed how extreme waves and currents can be factored into aquaculture design.

Minimizing Potential Impacts on Commercial and Recreational Fishing
To mitigate adverse impacts on commercial fisheries, see measures discussed above for Fish and Invertebrates, including fish habitat buffers and appropriate distances between facilities and with respect to commercial and recreational fishing. The spatial analysis in the Atlas was intended to help minimize conflict with commercial fishing operations and other ocean users to avoid collisions with nets or anchor systems. Comprehensive, project-based site analyses during permitting decisions could help to avoid documented high-use, high-value areas for commercial fishing. Temporal considerations could also be applied to this approach. For example, construction windows that overlap with fishing seasons could be avoided to minimize any area closures for safety and reduce vessel traffic. Strong stakeholder input in project-specific planning would be necessary for these mitigation measures to be successful.

A carrying capacity strategy has been proposed to cooperatively manage commercial fisheries and marine aquaculture in Chile, Turkey, Japan, and in New Zealand, which might work in the U.S. (Hoagland et al. 2003; Mikkelsen 2007; and Aguilar-Manjarrez et al. 2017). Such a framework would manage for maximum overall economic yield, while accounting for the tradeoffs between rights to fishing quotas and rights to geographic space. Lester et al. (2018) modeled that a trade-off, strategic development of up to 25% of the maximum value of mussel farms (used as a proxy for offshore shellfish aquaculture) could reduce the adverse impact in annuity losses to the halibut fishery from greater than $100,000 to less than $4,000 annually, while still generating new value of about $2 billion to the aquaculture sector. Additional modeling methods to estimate a carrying capacity between marine aquaculture and commercial fishing effort are described in Hoagland et al. (2003) and in Mikkelsen (2007); these types of models could potentially be used to create parameters for project-specific footprints and production sizes in an AOA, for additional information see Aguilar-Manjarrez et al. (2017). Potential conflicts between commercial fisheries and offshore aquaculture might be minimized using models.

Mitigation measures already discussed for fish and commercial fisheries may also be useful to reduce potential adverse impacts with recreational fisheries. The AOA programmatic NEPA planning approach is designed to incorporate local knowledge through multiple opportunities for public participation. According to the NMFS National Saltwater Recreational Fisheries Summit Report (2022), the following could help with developing mitigation measures for future projects, including collecting baseline physical and biological data early in the process, long-term monitoring to ensure adverse impacts, ensuring anglers are aware of scoping and public comment opportunities to share their fishing locations and concerns, creating task forces (or similar groups) that can help to coordinate local involvement in federally-permitted processes, and consideration of compensation funds.

Minimizing Potential Impacts on Market and Regional Food System
Compliance with applicable rules and regulations and BMPs associated with aquaculture project siting, construction, operations, maintenance, and decommission may optimize efficiency and mitigate costs to

operators and investors and may reduce potential environmental impacts, which could also support a more low-cost product as well as mitigate potential costs to fisheries.

Collaborative business pathways could mitigate the potential lost advantage of local or regional small businesses to participate in the AOA planning process. These include opportunities for research, private-public collaborations in research and market diversification. A collaborative, distribution process may create a multiplier of positive economic impact and create additional value by involving the activity of additional business and associated jobs (Wright 2020). New marketing techniques, and the creation of different market segments for wild-capture products has historically mitigated for the adverse impacts of competition between cultured and wild-harvested products, and helped stabilize prices for wild-capture fish after the introduction of farmed species to seafood markets (Nelson et al. 2019). Comprehensive market analyses based on project design and goals may help mitigate cost and adverse impacts to local and regional markets. For example, aquaculture project designs could report the details of production, including species, weight, product type (frozen, fresh, fileted, and round), and to the extent possible, the destination markets of products during the application process and operations. This information would help decision makers understand the potential effects on wild-capture fisheries and markets (PFMC 2022a).

Minimizing Potential Impacts on Ports and Working Waterfront

Strong stakeholder input and surveys could be considered in project-specific planning, which could help with minimizing impacts to ports and waterfronts. Federal permitting agencies do not have authority to enforce state or local laws so permit applicants may need to consult with relevant State agencies to ensure that all state required procedures, permits, and fees are anticipated and adhered to, such as for moving products through state waters and landing products at state ports. Strong stakeholder input in project-specific planning, with proactive community engagement to ensure that the people most affected by the permit have input, may help minimize impacts to communities.

Minimizing Potential Impacts on Tourism Economies

Potential mitigation and BMPs/SOPs to minimize or avoid potential adverse impacts to tourism and recreation, based on previous aquaculture permitting and AOA public scoping, could include the following:

- Gathering comprehensive site analyses information (e.g., identification of known recreation sites within a specified distance);
- Incorporating stakeholder input on project-specific planning (e.g., consultation with the Coastal Commission or other applicable agency and/or authorized officer(s) of identified recreation areas); and
- Developing and implementing deconfliction measures (e.g., scheduling construction and installation to avoid heavy recreational use periods, including major holidays).

Minimizing Potential Impacts on Oil, Gas and Wind Energy Development, and other Offshore Activities and Infrastructure

In general, potential mitigation and best management practices for minimizing impacts associated with offshore activities are related to safety and navigation hazards. Best management practices could include emergency and safety plans in case inclement weather or an accident occurs to help reduce impacts, such as a potential oil and sewage pipeline rupture.

Minimizing Potential Impacts on Public Health and Safety

Future projects would comply with all navigation and vessel regulations and all permit requirements (e.g., 33 C.F.R. 1223 vessel operating requirements, COLREGs, CG-2554 Private Aids to Navigation permit, USACE Section 10 permit) adopted to ensure the right of the public to free navigation on all navigable

waters of the United States as defined by 33 C.F.R. Part 329. However, engineering considerations to minimize the risk of failure for offshore aquaculture equipment could include evaluating the buoyancy components and mooring systems, the design of anchoring systems (cables, chains, shackles, and anchors) in consideration of average conditions and storms, construction and material requirements for basic (e.g., mesh, cages, and lines) equipment (Fredriksson and Beck-Stimpert 2019). Potential mitigation or compliance measures could include the following:

- Appropriate markings for infrastructure and operations (PATONs);
- Notification to and coordination with USCG, and the use of Local Notices to Mariners;
- Notification to NOAA's Office of Coast Survey has been required as a standard special condition Nor Section 10 structures and would likely be included with projects sited in an AOA;
- Site-specific planning (e.g., Navigation Safety Risk Assessment Plan, mapping of currents and projections of marine debris).
- Monitoring and reporting requirements for gear maintenance and line tension (checking, maintaining, and replacing equipment on a regular basis);
- Best practices regarding gear configurations and deployment (e.g., grow lines for shellfish operations weighted and incapable of floating to the surface, gear with the smallest footprint possible, GPS transponders on gear, secure placement, and crew training);
- Immediately reporting any interactions or accidents, such as interactions with non-project vessels and/or gear deployed by those vessels and any loss of aquaculture gear or other infrastructure associated with the facility;
- Insurance, bonding requirements, or other financial guarantees to ensure necessary gear cleanup and/or any damages; and
- Recommendations or requirements for aquaculture vessels to be equipped with AIS.

Compliance with USCG navigation safety requirements under 33 C.F.R. 66 for work, including buoys, lights, notice to mariners, maintaining distance, and other regulatory standards are expected to reduce risk of collisions and other mishaps at sea. However, adopting some of the corrective and preventative considerations developed for mariners in the USCG Quality Action Team's report on Reducing Fall-Overboard Crew Fatalities may minimize risk to human safety on offshore structures and associated vessels (USCG 2012). Considerations for project site designs and gear configurations could use public information about USCG search and rescue methods to minimize emergency response times and to minimize potential conflicts with other USCG emergency operations.

Engineering designs, proof of concepts, monitoring and maintenance plans, response and contingency plans for spills may also mitigate public health and safety risks related to gear failures and marine debris. Mooring strategies based on prevailing ocean conditions may also help maintain gear integrity. A Basis-of-Design is a standard document used in the U.S. to communicate the engineering criteria, techniques, reasoning and decisions employed to develop an aquaculture system in the offshore environment (Fredriksson and Beck-Stimpert 2019). The Basis-of-Design document includes at a minimum, the following information:

- Site characteristics and environmental conditions;
- System analysis and loading;
- Design factors to address uncertainty;
- Replacement period and risk;
- Specification of components;
- System layout and technical drawings;
- Auxiliary equipment; and
- Deployment and operational protocols.

Additional requirements that may help minimize impacts could include ensuring that all equipment lines remain taut and in good working condition; net pens are routinely cleaned and maintained; and any derelict fishing gear or marine debris that may collect on the facility is removed and disposed of at an appropriate onshore facility to minimize risk of gear failure or interactions with marine debris in the ocean. To mitigate the risk of gear failures, structural performance monitoring has been required as a permit condition for a kelp farm in California (USACE 2021), including post-construction and post-removal surveys. Fredriksson et al. (2023) provides a modeling approach to analyze the performance of macroalgae line tension under exposed oceanographic conditions and physical processes that may apply to farming systems with high volume growth. Mooring system response as a function of current and wave forcing magnitudes and directionality is an area that needs substantial attention to reduce uncertainty during the design process (Fredriksson et al. 2023).

Marine Debris Management and Monitoring Plans may minimize the risk of aquatic pollution. Insurance plans, bond requirements, or other financial guarantees can ensure project operators have funds available for any necessary gear clean-up and potential damages from gear failure or marine debris (PFMC 2022a; Sea Grant 2022; and Fujita et al. 2023). Previously permitted aquaculture operations in Federal waters off the Southern California coast were required to implement a Lost/Damaged Fishing Gear Compensation Plan as well as a surety bond or similar letter of credit as a condition for their consistency certification from the State (CCC 2014, Ocean Rainforest pers. comm. February 2023). The State of Maine requires all commercial leaseholders to carry a bond large enough to pay for gear recovery (DMR 2004). Similar measures may be proposed for future facilities sited in Federal waters. Gear marking, and immediate reporting of lost gear may also mitigate impacts from marine debris. West coast fisheries are required to use unique markings, and similar standards, which could be applied to aquaculture gear. Buffer zones and temporary exclusions during certain activities would minimize potential impacts to public safety around aquaculture facilities.

Compliance with the following regulatory measures and/or state-recommended mitigation may minimize the risk of adverse public health impacts; recordkeeping and inspectional access are essential components of a HACCP-type seafood system (60 FR 65096). Developing a biosecurity plan can help with minimizing impacts associated with seafood safety (Rhodes et al. 2023b). As briefly discussed, controlling biofouling could help mitigate public health and safety concerns associated with animal husbandry. Also, incorporating suggestions from public comments, and other offshore planning stakeholder engagement in the region can help develop mitigation measures by applying regional knowledge from those who are most familiar with the local conditions at a project site within an AOA. Health safety regulatory mechanisms and programs that would apply to aquaculture seafood products include the following:

- Use of Good Manufacturing Practices, Hazards Analysis, and Preventative Controls under FDA regulations that apply to all seafood;
- Compliance with the NOAA Fisheries Seafood Inspection Program;
- Compliance with FDA critical control points and other consultation requirements for seafood products with FDA and the State;
- Compliance with FDA veterinary drug use requirements and guidance for human health topics; and
- Consideration of compliance with FGC §5654, which details protocols and recommendations from the OEHHA to minimize public health risks associated with seafood consumption following aquatic oil spills in California.

The following resources could also help with minimizing health concerns:

- Figure 1 on p. 87 of Janasie (2023) shows a flowchart to help determine what food safety measures would apply to a seaweed farm.

- Best management practices in biosecurity for seaweed and macroalgae (including lab-based enclosed systems) are reviewed on pp. 22 and 23 of Rhodes et al. (2023).
- An example of best practices for macroalgae operations and maintenance are described in Section 3 on pp. 20 through 28 of Mooney-McAuley et al. (2016).

Minimizing impacts on seafood safety can also be achieved via cooperative programs. The NSSP manages seafood safety of shellfish through partnerships among states, and provides guidance on classification of growing areas based on product and water quality testing through regular updates of the Guide for the Control of Molluskan Shellfish (FDA 2020). Guidance for operators to manage the potential presence of human pathogens and the potential presence of toxic substances in shellfish meats are detailed on pp. 32 through 39 of the Guide. The latest version contains provisions for aquaculture harvest in federal waters (3–200 miles from shore), including marine biotoxins. Thresholds for domoic acid and other toxin levels are set by the USDA to trigger actions for shellfish tissues in California (Harvey et al. 2023). Data is then compiled by the California Department of Public Health (DPH) from samples collected by a variety of local, tribal, and state partners (CDFW 2010; Harvey et al. 2023). Additional existing programs and protocols applicable to shellfish aquaculture that would minimize the risk of seafood safety impacts in shellfish aquaculture include the following:

- Human health and quality control aspects of the National Shellfish Sanitation Program (NSSP) and Interstate Shellfish Sanitation Conference model ordinances;
- FDA HACCPs;
- USDA seafood labeling rules and standards;
- USDA National Bioengineered Food Disclosure Standard;
- NOAA Fisheries Seafood Inspection Program;
- Protocols and recommendations for aquaculture harvests following an oil spill, mandated in State waters under FGC §5654; and
- Other consultation requirements for seafood products with the State, as water quality impacts to coastal waters could also affect offshore aquaculture growing areas.

Another approach to reduce impacts could be through established state programs. The EPA, FDA, and USDA have issued guidelines for fish and shellfish consumption that may contain mercury. The federal advisory can be found online at https://www.epa.gov/mercury/guidelines-eating-fish-contain-mercury. Programs and protocols to finfish and IMTA aquaculture that would minimize risks of seafood safety impacts include:

- 50 C.F.R. § 260 (A) Inspection and Certification of Establishments and Fishery Products for Human Consumption, in accordance with the Agricultural Marketing Act (1946, amended 2016);
- FDA HACCPs;
- FDA veterinary drug use requirements and guidance for human health topics;
- USDA seafood labeling rules and standards;
- USDA National Bioengineered Food Disclosure Standard;
- NOAA Fisheries Seafood Inspection Program;
- protocols and recommendations for aquaculture harvests following an oil spill, mandated in State waters under FGC §5654; and
- other consultation requirements for seafood products with the State, as water quality impacts to coastal waters could also affect offshore aquaculture growing areas.

Minimizing Potential Tribal Resources and Cultural Practice Impacts

To minimize potential tribal resources and cultural practices it would be essential that tribal engagement be conducted as early as possible so mitigation measures can be developed and implemented during the review process.

Minimizing Potential Non-Tribal Cultural and Traditional Practice Impacts
Similarly, public engagement is not only important, but may be required by state and federal agencies. Mitigation described above for other resources may also reduce adverse effects to resources that are important to communities and their well-being.

Minimizing Potential Archeological Resources Impacts
There is a legal framework for documenting and avoiding archaeological resources. Minimizing impacts to archeological resources is well established, and procedures similar to those for other offshore infrastructure development (e.g., oil and gas and offshore wind) would be expected for offshore aquaculture (Poti et al. 2020). Impacts could be reduced by designing and installing equipment in areas away from archaeological resources. Most impacts are expected to be avoided through requirements associated with the identification and avoidance of archaeological resources and the reporting requirements for inadvertent discoveries that minimize likelihood of looting or other damage from outside sources as projects are proposed and surveys are conducted. Engagement with Tribes, SHPO, THPOs, and ACHP will also help reduce potential impacts to archaeological resources.

Minimizing Potential Cumulative Impacts
To minimize potential cumulative impacts associated with aquaculture operations, siting is probably the most important factor to consider during the project review phase. NMFS applied suitability analysis and public input to avoid and minimize potential impacts associated with identifying potential AOAs. Although many significant impacts were avoided through this process, it is anticipated that mitigation measures would be applied at the project-level to further avoid, minimize, and offset impacts in conjunction with authorization processes and statutory compliance for each project. There is potential for aquaculture operations to contribute to vessel traffic and its impacts, water quality reduction, disease, marine debris, fisheries displacement, and other effects in accumulation with other actions. Mitigation aimed at specific impacts (e.g., vessel strike guidance and water quality standards) would minimize the increment of impact associated with cumulative effects. The final mitigation requirements would be imposed during the authorization and consultation processes that are outside the scope of this FPEIS. It is highly likely that mitigation would be imposed to reduce direct, indirect, and cumulative impacts as part of authorization processes, achieving at minimum, statutory requirements, and other applicable laws.

Appendix 2: List of Mass Mortality Events in the California Current Ecosystem

Stranding Location/Date: SBC Summer 2023

Species: California sea lion, Longnose common dolphin

Attributed/Probable Cause: Harmful algal bloom

Citation: https://www.fisheries.noaa.gov/feature-story/toxic-algal-bloom-suspected-dolphin-and-sea-lion-deaths-southern-california

Stranding Location/Date: SBC Summer 2022

Species: California sea lion

Attributed/Probable Cause: Harmful algal bloom

Citation: https://www.fisheries.noaa.gov/feature-story/toxic-algal-bloom-spreads-along-california-coast-poisoning-sea-lions

Stranding Location/Date: Central/Southern California Summer 2022

Species: California brown pelican

Attributed/Probable Cause: Starvation/undetermined

Citation: https://wildlife.ca.gov/News/Archive/cdfw-provides-update-on-california-brown-pelican-stranding-event#gsc.tab=0

Stranding Location/Date: U.S. West Coast 2019-2023

Species: Gray whale

Attributed/Probable Cause: Undetermined

Citation: https://www.fisheries.noaa.gov/national/marine-life-distress/2019-2023-gray-whale-unusual-mortality-event-along-west-coast-and

Stranding Location/Date: Southern California Summer 2017

Species: multiple species of pelagic birds

Attributed/Probable Cause: Domoic acid poisoning (HABs)

Citation: https://www.independent.com/2017/04/25/scores-birds-sea-lions-suffering-likely-domoic-acid-poisoning/

Stranding Location/Date: California, Oregon, Washington 2015-2021

Species: Guadalupe fur seal, Northern fur seal (2015 only)

Attributed/Probable Cause: Malnutrition, ecological factors (prey availability/oceanographic conditions)

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

Stranding Location/Date: California 2013-2016

Species: California sea lion

Attributed/Probable Cause: Malnutrition in juveniles due to ecological factors (prey shifts)

Citation: https://www.fisheries.noaa.gov/national/marine-life-distress/2013-2016-california-sea-lion-unusual-mortality-event-california

Stranding Location/Date: California 2014-2016

Species: multiple species of pelagic birds

Attributed/Probable Cause: unproductive prey, starvation

Citation: Harvey et al. 2023

Appendix 3: Protected Resources Data Considered in the

This Appendix is reproduced from Appendix II (pp. B17-B27) of An Aquaculture Opportunity Area Atlas for the Southern California Bight.

APPENDIX II - WCR-PRD DATA LAYERS

WCR-PRD staff evaluated the best scientific information available for the distributions of vulnerable ESA-listed species within the four proposed southern California AOA Atlas study areas (North, Central North, Central South, and South) for the purpose of identifying available data for use in the suitability modeling and characterization phases of the development of the AOA Atlas and subsequent Programmatic Environmental Impact Statement. Some ESA-listed species did not have quantitative data layers available (at all or of sufficient resolution) at the time of this consideration and thus could not be included in the suitability modeling but will be included in the characterization descriptions within the development of the southern California AOA Atlas. These include ESA-listed sea turtles, giant manta ray, oceanic whitetip shark, scalloped hammerhead, Guadalupe fur seal, ESA-listed salmonids and sturgeon, and Gulf grouper.

Available species distribution model layers for ESA-listed sperm whales, sei whales, and North Pacific right whales were not included because of their rarity in the study areas or that they typically occur in waters deeper than the Atlas study areas. Similarly, the specific distribution model and "biologically important areas" for gray whales, which includes the unlisted Eastern North Pacific gray whales and the endangered Western North Pacific gray whale DPSs, was not included in the WCR-PRD data layer primarily because the layer "blankets" the entire Southern California Bight and thus provides no meaningful contrast between or within the four study areas in terms of relative suitability. Further, while the endangered Western North Pacific gray whale might receive a very low score on the basis of its status and trend (see Table 1. in the cover memo), WCR-PRD determined that applying this score to a data layer that both blankets the study areas and is also predominantly used by the Eastern North Pacific gray whale DPS was not likely to result in meaningful conservation benefits for the endangered DPS through the suitability modeling effort. The Western North Pacific DPS will be flagged during the characterization step to ensure users of the Atlas are informed of the potential presence of this rare and critically endangered species when considering siting suitability.

Other marine mammals protected under the MMPA, such as coastal delphinids, were not included in the data layers at this time but certain stocks are flagged below to ensure their inclusion in subsequent characterization steps for the proposed Atlas study areas. All of the species, including those with data layers in the spatial model, will be further discussed during the Site Characterization phase of the AOA process.

Following the approach laid out in the memo, Table 3 presents the recommended scores for ESA-listed species evaluated by WCR-PRD that are known to occur within the southern California Atlas study areas, as determined by species status and trend. These scores are reflective of relative differences in statutory protection, status, and trend, and are consistent with WCR-PRD Congressional reporting through the Government Performance and Results Act (GPRA) process, except where local study area information is known. Given data availability and time constraints, only the scores for the blue whales, the endangered humpback whale, and the humpback whale critical habitat are included in the data layers submitted. Information and scores for other species are provided in Tables 4 (ESA) and 5 (MMPA) as reference and for use as appropriate in Site Characterization.

Table 3. ESA-listed species known to occur within the southern California region and their recommended scores, as determined by species status and trend, for use in the suitability model.

Species	*Status and Trend*	*Score*	*Notes for Study Areas*
Blue whale	Endangered, stable	0.2	Global trend is unknown, local stock assessment is stable
Humpback whale Central America DPS	Endangered, unknown	0.2	Designated critical habitat areas are scored a 0.2 as well.

Table 4. ESA-listed species known to occur within the southern California region but not included in the suitability model. Scores, as determined by species status and trend, are provided for informational purposes for consideration in site characterization descriptions.

Species	*Status and Trend*	*Score*	*Notes for Study Areas*
Humpback whale Mexico DPS	Threatened, unknown	0.4	
Fin whale	Endangered, stable	0.2	Global trend is unknown, local stock assessment is stable
WNP Gray whale	Endangered, small	0.1	very rare
North Pac Right whale	Endangered, small	0.1	very rare
Sei whale	Endangered, small	0.1	rare
Sperm whale	Endangered, small	0.2	offshore
Guadalupe fur seal	Threatened, increasing	0.5	
Loggerhead sea turtle	Endangered, unknown	0.2	occurs in the area during warm water events such as El Nino
Green sea turtle	Threatened, increasing	0.5	coastal and bays/estuaries
Olive Ridley sea turtle	Endangered, increasing	0.3	Rare, strandings documented
Leatherback sea turtle	Endangered, declining	0.1	Rare in SoCal, strandings documented
Oceanic Whitetip shark	Threatened, declining	0.4	offshore
Giant Manta Ray	Threatened, declining	0.4	offshore
Scalloped Hammerhead	Endangered, declining	0.1	Southern California is northern extent of current distribution
White Abalone	Endangered, declining	0.1	rocky substrates
Black Abalone	Endangered, declining	0.1	rocky substrates
Gulf Grouper	Endangered, unknown	0.2	Very rare, San Diego area primarily

Table 5. MMPA stocks known to occur within the southern California region but not included in the suitability model. Scores, as determined by species status and trend, are provided for informational purposes for consideration in site characterization descriptions.

Species	*Status and Trend*	*Score*	*Notes for Study Areas*
ENP Gray whale	large	0.8	

Minke whale	small	0.7	
Baird's beaked whale	large	0.8	offshore
Cuvier's beaked whale	large	0.8	offshore
Dwarf Sperm whale	unknown	0.6	offshore - not strategic
Transient killer whale	small	0.7	offshore
Short finned pilot whale	small	0.7	somewhat offshore
Pygmy sperm whale	large	0.8	offshore
CA coastal bottlenose dolphin	small	0.7	nearshore
Long beaked common dolphin	large	0.8	localized distribution in AOA
Short beaked common dolphin	large	0.8	nearshore and offshore
Northern right whale dolphin	large	0.8	offshore
Risso's dolphin	large	0.8	nearshore
Striped dolphin	large	0.8	offshore
Pacific white sided dolphin	large	0.8	nearshore
Dall's porpoise	large	0.8	nearshore
CA harbor seal	large	0.8	
CA sea lion	large	0.8	
Northern fur seal	large	0.8	

The WCR-PRD data layers presented below represent the best available data which WCR-PRD was able to access and evaluate within the timeline available to complete this work. If future iterations of the suitability model are planned, we would encourage the modelers to request an updated version of the protected species distribution layers described below.

DATA AVAILABLE FOR CONSIDERATION

The study areas within the southern California region have been split into four zones: North (approximately between Lompoc and Point Mugu), Central North (off of Santa Monica and Redondo Beach), Central South (off of Long Beach), and South (approximately off the San Diego and Point Loma areas). WCR-PRD reviewed the available information for these four zones and identified multiple data layers for use in the North study area and a data layer for use in the Central North, Central South, and South study areas. NCCOS provided four separate Atlas

grids for the study areas described above, dividing the region into four subregions: North, Central North, Central South, and South. WCRO-PRD combined PRD layers within each subregion and then merged the four subregions for comparison of scoring approaches, noting that although PRD data can be compared between areas, Atlas study areas will be modeled independently and may not be comparable for the "Cumulative Suitability Model" given potential differences in data types between areas.

Three primary types of data layers were evaluated to provide protected species scores for the Atlas study areas. The first of these are the cetacean "biologically important areas" (BIA) layers developed by NMFS in collaboration with regional and species experts.[47] In particular, these include the humpback whale and blue whale BIAs that co-occur with the southern California Atlas study areas, as depicted below in Figure 16.

Several caveats related to the identification of BIAs are important to note here and should be kept in mind when using BIAs in environmental assessments or impact analyses:

1. Only known areas and periods of biological importance were identified; other areas that are biologically important to cetaceans could exist within the U.S. EEZ but not be included here due to insufficient information.

2. The quantity and type of data from within the U.S. EEZ used to define the Important Areas were spatially and temporally heterogeneous. The types of data used included sighting, acoustic, tagging, genetic, and photo identification data.

3. The Important Area designation is not equivalent to habitat or range. For distinctly migratory species or populations, Important Areas highlight specific locations and periods within which critical behaviors occur and likely represent only a fraction of the overall range.

The second type of data layer is the final designated critical habitat for humpback whales. As a result of the 2016 revisions to the ESA-listing of humpback whales, NMFS has designated critical habitat for the Central America and Mexico DPSs of humpback whales (86 FR 21082)[48,49]. A portion of this critical habitat falls within the Southern California Bight and overlaps most of the North study area. Critical habitat is defined as those areas "essential to the conservation of the species" and designations include identification of physical and biological features important to species recovery. For humpback whales, the primary feature is prey: Prey species, primarily euphausiids (*Thysanoessa, Euphausia, Nyctiphanes*, and *Nematoscelis*) and small pelagic schooling fishes, such as Pacific sardine (*Sardinops sagax*), northern anchovy (*Engraulis mordax*), and Pacific herring (*Clupea pallasii*), of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth.

Critical habitat differs from BIAs in several important ways. First, it receives protection under the ESA as a separate entity and consultations conducted on Federal actions within critical

47 This data is provided at https://cetsound.noaa.gov/important and the accompanying Aquatic Mammals special edition, accessible at https://www.aquaticmammalsjournal.org/images/files/AM_41_1_Complete_Issue.pdf .

48 https://www.federalregister.gov/documents/2021/04/21/2021-08175/endangered-and-threatened-wildlife-and-plants-designating-critical-habitat-for-the-central-america

49 Maps and GIS data for this designation are posted at https://www.fisheries.noaa.gov/resource/map/humpback-whale-critical-habitat-maps-and-gis-data.

habitat are required to have considered the level and severity of impacts to critical habitat even if the actions occur when the animals for which that habitat is designated are not present. BIAs have no such separate consideration under the ESA. Second, critical habitats encompass all areas essential to the conservation of a species that require special management considerations and in this instance include a wider area of expected whale forage and aggregations of whales than that covered by the BIAs.

The third type of data layer available are the species distribution models developed by Becker et al (2020).[50] This data layer was evaluated for use in the unified, single data layer provided to NCCOS but was not included specifically in the data layer. WCR-PRD considered the predicted densities for blue, fin, and humpback whales within the Southern California Bight and specifically within the Atlas study areas to determine if there were areas of higher predicted densities not covered by either the BIA data layers or the designated critical habitat for humpback whales. As part of this effort, WCR-PRD considered the minimum, maximum, mean and standard deviation of the predicted estimates within the study areas. After comparison with the areas covered by the designated humpback whale critical habitat and the BIA data layers, WCR-PRD decided to not add the species distribution model layers (or certain grid cells within those predictions) to the single layer provided to NCCOS for the following reasons:

1. The areas of highest predicted densities were almost entirely covered within either the BIAs or the humpback whale critical habitat, ensuring those highest predicted density areas would receive a protected species score in the suitability model.

2. Scores for the humpback whale critical habitat would also be multiplied with scores of humpback whale BIA, and also the blue whale BIA where there was overlap, to provide an overall lower protected species score in those areas. This provides some contrast within study areas for the purpose of considering suitability.

3. For blue whales, there are some areas of high predicted densities in the South study area outside of the blue whale BIA layer. WCR-PRD considered adding these areas to the single data layer but preliminary assessment of this area for other uses indicates that the entire area may not rank as suitable for an AOA at all. As a result, adding further low scores to address the protected species in this area is unlikely to change the overall suitability of this area.

4. For fin whales, the areas of highest density are encompassed within areas already receiving one or more low scores for humpback and/or blue whales and no further meaningful contrast between portions of study areas is likely to be gained by scoring those higher density fin whale areas at this time.

[50] https://repository.library.noaa.gov/view/noaa/27826

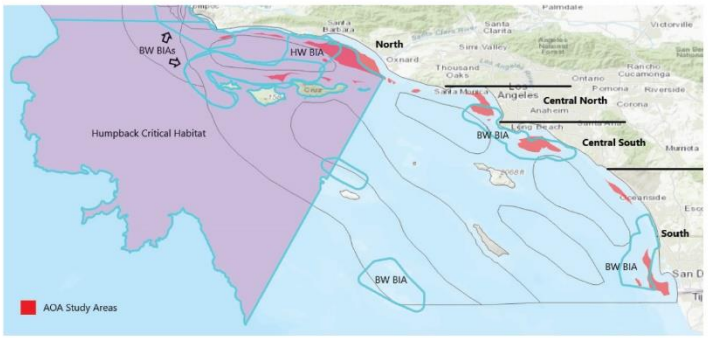


Figure 16. Cetacean Biologically Important Areas and Humpback critical habitat (blue outlines) and Aquaculture Opportunity Area study areas in red.

FINAL COMBINED WCR-PRD DATA LAYER

There are four submodels in the NCCOS Atlas model, which assess suitability related to: 1) National Security, 2) Industry Navigation and Transportation, 3) Aquaculture and Commercial Fishing, and 4) Natural Resources. These submodels are combined to calculate a "Cumulative Suitability Model" that is then used to identify clusters of the most suitable areas within each of the four study areas. Within the most suitable clusters, a precision siting model will be used to identify multiple aquaculture opportunity area options within each of the four study areas, which will be characterized and used to inform development of preliminary alternatives that will be considered in the PEIS.

WCR-PRD's understanding is that NCCOS does not impose any relative weighting on the submodels before combining their scores into the "Cumulative Suitability Model." Submodel comparisons in the AOA Atlas are unweighted because multiple types of aquaculture are proposed and NCCOS believes comparisons can be more effectively made during later phases in the process. The use of submodels is designed to avoid more numerous data layers having greater control over final model outcomes, such that each submodel contributes an equal amount to the final suitability score. Because the final suitability scores compare very different types of activities, the overall score does not have an empirical meaning; however, the relative rank of the scores is important to determining which sites are more suitable. Therefore, it is important that the ranked scores of the areas in the WCR-PRD Layer of the Natural Resources submodel are reflective of where WCR-PRD is more or less concerned with regards to the vulnerability of protected species.

Based on discussions between WCR-PRD and NCCOS, for the southern California Atlas study areas protected species scores within the unified data layer would be calculated using the product method (versus geometric mean or arithmetic mean) to ensure that the final score for grid cells with multiple protected species layers would reflect the lowest possible score versus areas with a single protected species or no quantitative species data at all.

In conclusion, WCR-PRD is providing a data layer based on combining the humpback whale BIA, humpback whale critical habitat, and blue whale BIAs data layers and calculating the product of the scores from overlaps between those layers to NCCOS for the Atlas process (Figure 17). This layer is intended for use in the southern California Atlas mapping and siting process only. Future project or site-specific siting processes should benefit from consideration of other available information specific to that area and proposed activity.

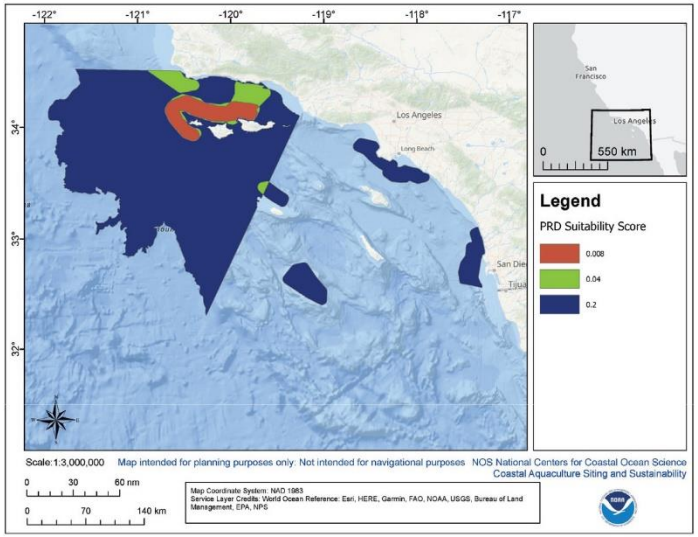


Figure 17. WCR-PRD-recommended southern California Atlas data layer, generated by combining layers for humpback whales, blue whales, and humpback critical habitat using the Product method. The legend provides the results of the protected species scoring and highlights areas that are of relatively higher concern with regards to species status, population size, and trajectory. Consideration should also be given to neighborhood characterization as other protected species may also occur within these areas but were not included in the scoring model.

SITE CHARACTERIZATION CONSIDERATIONS

The following is a brief discussion of certain ESA-listed species and MMPA stocks that should be included within the site characterization with reference to available information on range and status of the species. Tables 4 and 5 above provide a summary list of ESA-listed species and MMPA stocks. Here, WCR-PRD provides more specific information on some of these species and stocks below. This includes information collected or developed by scientists at the Southwest Fisheries Science Center as cited below. The following is not an exhaustive summary of species and information that should be considered but selected vulnerable species that should be highlighted. For example, not all marine mammal stocks listed in Table 4 are discussed further below.

LARGE WHALES

Blue Whales and Humpback Whales - Although the data layer submitted covers primarily these two species, it should be noted elsewhere in the AOA Atlas that both species may be found throughout the Atlas study areas depending on season and oceanographic conditions. For example, Figure 18 depicts the species distribution model results from Becker *et al.* (2020)[51] for the blue whale in the Southern California Bight. This species is predicted to occur (and sightings by survey vessels and citizen scientists corroborate) in areas outside of the BIAs.

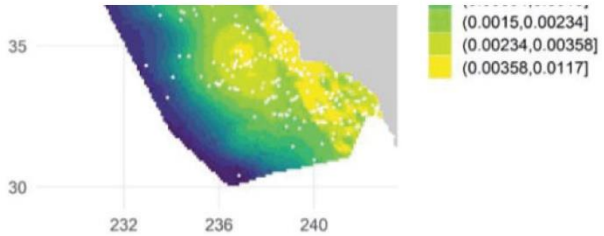


Figure 18. Screen capture excerpt of blue whale density predictions, taken from Becker et al (2020, Figure 2-k). Densities are reported as means in animals/km^2.

Gray Whales - Both Eastern and Western North Pacific gray whales occur in the Atlas study areas. While the ENP population has been removed from the list of threatened and endangered species by virtue of its recovery, the ENP population remains very small and is critically endangered. Animals from this population have been tracked along the coast of California, including into southern California waters and NMFS considers impacts to this species when consulting on Federal actions under the ESA. The recommended score for the WNP population

[51] Becker, E.A., K.A. Forney, D.L. Miller, P.C. Fiedler, J. Barlow, J.E. Moore. 2020. Habitat-based density estimates for cetaceans in the California Current Ecosystem based on 1991–2018 survey data. U.S. Dept. of Commerce, NOAA Technical Memorandum 78 p. https://doi.org/10.25923/3znq-yx13

would be a 0.1, whereas the recommended score for the ENP population would be a 0.8 on the basis of its status. As noted above, a BIA layer for "gray whales" exists for this species but was not included in the suitability model.

Fin Whales - Fin whales are an ESA-listed endangered species that occurs within the Atlas study area. Becker *et al* (2020) published updated species distribution models including one for fin whales. A screen capture of the model results is included here in Figure 3. Fin whales have a recommended score of 0.2 (the same as blue whales and Central America DPS humpback whales) on the basis of their status and trend information. As can be seen in Figure 19, based on NOAA survey data, they also occur within and adjacent to the Atlas study areas, although at higher densities per km2 in more offshore areas. Fin whales are similar in size, shape, and foraging behavior as blue whales and thus share similar risks from entanglement or forage quality and accessibility impacts.

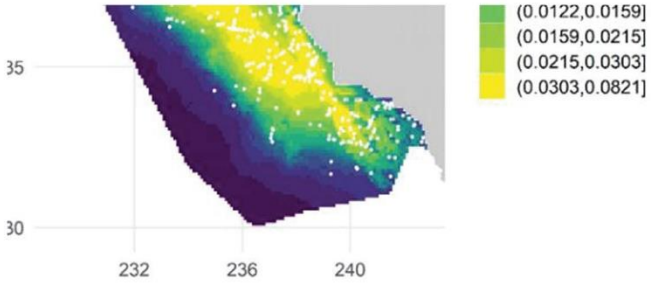


Figure 19. Screen capture excerpt of fin whale density predictions, taken from Becker et al (2020, Figure 2-l). Densities are reported as means in animals/km^2.

SEA TURTLES

There are four sea turtle species that could potentially be found in the AOA study areas. Three primary species can potentially occur in the area, including green turtles, loggerhead turtles, and leatherback turtles. Below is a summary for each, including comments about the relative probability that they could be found in the AOA study areas. In addition, the olive ridley turtle occurs sporadically in the region, although data are restricted to beach strandings of live and dead turtles. This summary is intended to provide a broad visual portrayal of the distributions and movements of sea turtles in the region. Scientists at NOAA SWFSC are happy to provide original source data upon request.

Green turtles

There are four areas of known year-round presence for green turtles (recommended score 0.5) in coastal waters of the SCB, including San Diego Bay, La Jolla Cove, Seal Beach National Wildlife Refuge, and San Gabriel River. In addition, NOAA-SWFSC has managed a sea turtle sightings database that records sea turtle reports provided by the public (Fig. 20).

In general, green turtles are a largely coastal-dwelling species and reports by the public (See figure below) as well as NOAA research have found turtles to mostly occur in nearshore habitats. There are, however, telemetry data that depict movements in slightly more offshore areas as turtles a) move out of Seal Beach NWR into deep waters of Anaheim Bay (n=2; Fig. 21), b) transition between San Diego Bay and Orange County (n=1; Fig. 22), and c) migrate between foraging areas in southern California and nesting beaches in Mexico (n=4, Fig. 23).

For the most part, green turtle presence is restricted to the coast, except for when individuals are conducting reproductive migrations. The AOA Central South study area is one where green turtles may occur, albeit in low numbers, near Anaheim Bay where green turtles tagged in Seal Beach have visited on occasion (Fig. 21).

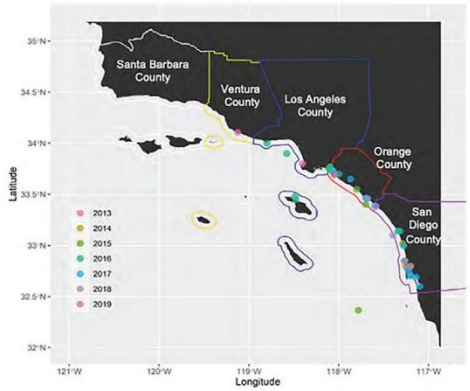


Figure 20. Location of public-reported green turtle sightings in the southern California Bight. From Hanna et al. (2021)[52].

[52] Hanna, M.E., E.M. Chandler, B.X. Semmens, T. Eguchi, G.E. Lemons, J.A. Seminoff. 2021. Citizen sourced sightings and underwater photography reveal novel insights about green sea turtle distribution and ecology in southern California. Frontiers in Marine Science 8:671061.



Figure 21. Map of kernel home range estimates for two green turtles included as part of the inshore Seal Beach NWR tracking project that departed the Refuge and moved into Anaheim Bay. Data from Hanna et al. (2020) interim report to Navy[53].

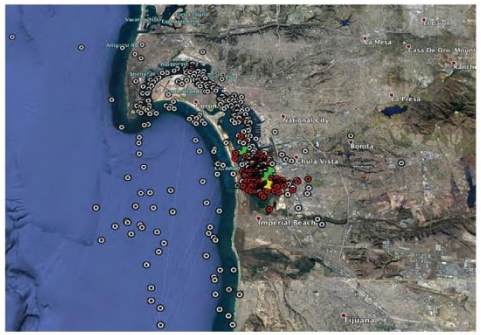


Figure 22 Satellite-tracked locations (circles) and putative track lines (gray lines) of 4

[53] Hanna, M.E., J. Bredvik, S.E. Graham, B. Saunders, J.A. Seminoff, T. Eguchi and C. Turner Tomaszewicz. 2020. Movements and habitat use of green sea turtles at the Seal Beach National Wildlife Refuge, CA. Prepared for Naval Weapons Station Seal Beach, California, September 2020.

green turtle during migration between the San Diego Bay foraging area and nesting sites in southern Mexico. Data from Dutton et al. (2019)[54] and NOAA Unpubl. data.

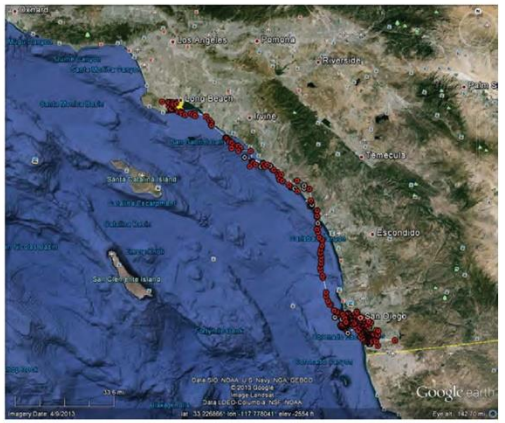


Figure 23. Satellite-tracked movements of a juvenile green turtle from San Diego Bay to Orange County. NOAA Unpubl. data.

Leatherback Turtles

The epicenter of leatherback turtle (recommended score of 0.1) presence in California waters is the Monterey Bay – Gulf of Farallon region of the central coast. Leatherbacks occur here largely during late summer through fall, arriving to take advantage of seasonal sea jelly blooms. Knowledge of their locations and movements is based on aerial surveys in central California and to the north as well as satellite telemetry (Figs. 24 and 25) undertaken during NOAA field research. A subset of these data as well as additional data points are included on the OBIS Seamap website (https://seamap.env.duke.edu/species/173843).

[54] Dutton, P.H., R.A. LeRoux, E. LaCasella E, J.A. Seminoff, T. Eguchi , and D.L. Dutton. 2019. Genetic analysis and satellite tracking reveal origin of the green turtles in San Diego Bay. Marine Biology 166:3



Figure 24. Satellite tracked movements of a leatherback turtle in the southern California bight region. This individual was tagged in 2019 and was the second smallest leatherback captured during many years of NOAA research. The track was unusual relative to previous tracks and the animal may have been 'exploring' the environment. NOAA Unpubl. data.

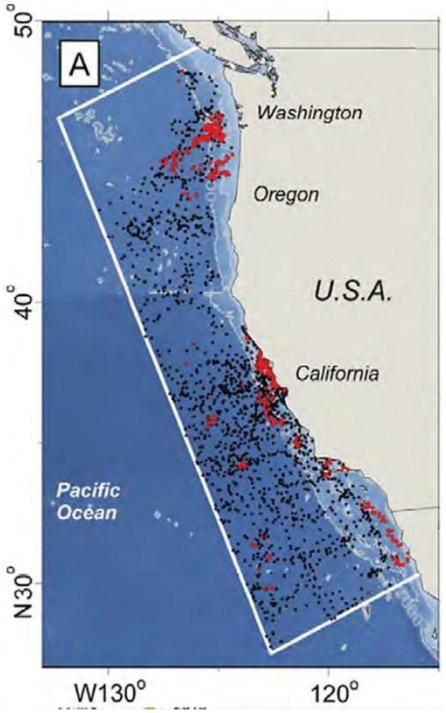


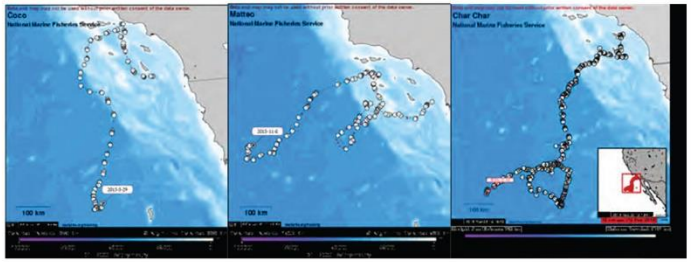
Figure 25. Leatherback telemetry locations with Area Restricted Search behavior (red dots) and transit behavior (black dots) along the U.S. West Coast. Modified from Figure 5 in Benson et al. (2011)[55].

[55] Benson,S.R., T. Eguchi, D.G. Foley, K.A. Forney, H. Bailey, C. Hitipeuw, B.P. Samber, R.F. Tapilatu, V. Rei, P. Ramohia, and J. Pita. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles, Dermochelys coriacea. Ecosphere. 2(7):1-27.

Although leatherbacks can be found in the southern California bight, this occurs largely as turtles are transiting through the area. No local movements are considered to be 'resident' activity. This species has been documented as killed or injured in fishery entanglements and vessel strikes (NOAA Fisheries 2008[56], Lewison et al. 2014[57], NOAA Fisheries GARFO and NEFSC 2015[58], Hamelin et al. 2017[59]) and thus may face similar threats from aquaculture gear and operations (Price et al. 2017[60], Bath et al. in review[61]).

Loggerhead turtles

Loggerhead distribution and movements along the U.S. west coast are largely confined to waters of the southern California Bight. Data are derived from satellite telemetry (n=3; Fig. 26), NOAA aerial surveys (Fig. 27), NOAA ship-based surveys (Fig. 28), and loggerhead turtle sightings reported by the public (Fig. 29). Additional data are included in the OBIS Seamap database (Fig. 30). Of all sea turtle species, loggerheads are the most likely to occur within the proposed AOAs. However, loggerhead presence in the area is sporadic, and centered on warm water periods. During normal or cool years, the probability of loggerhead presence is low.



[56] NOAA Fisheries (2008) Summary report of the workshop on interactions between sea turtles and vertical lines in fixed-gear fisheries. Schwartz ML (ed.) Rhode Island Sea Grant, Narragansett, RI 54pp

[57] Lewison RL, Crowder LB, Wallace BP, Moore JE, Cox T, Zydelis R, McDonald S, DiMatteo A, Dunn DC, Kot CY, Bjorkland R, Kelez S, Soykan C, Stewart KR, Sims M, Boustany A, Read AJ, Halpin P, Nichols WJ, Safina C (2014) Global patterns of marine mammal, seabird, and sea turtle bycatch reveal taxa-specific and cumulative megafauna hotspots. PNAS USA. 111(14):5271-5276

[58] NOAA Fisheries Greater Atlantic Regional Fisheries Office (2015) Sea turtles and vertical lines in the northeast region: issue statement and research needs. NMFS, GARFO and NEFSC

[59] Hamelin KM, James MC, Ledwell W, Huntington J, Martin K (2017) Incidental capture of leatherback sea turtles in fixed fishing gear off Atlantic Canada. Aquatic Conserv: Mar Freshw Ecosyst 27:631-642

[60] Price CS, Morris JA Jr., Keane E, Morin D, Vaccaro C, Bean D (2017) Protected species and marine aquaculture interactions. US Dep Commer NOAA Tech Memo NOS NCCOS 211

[61] Bath GE, Price CA, Riley KL, Morris JA (In review) Review: Marine aquaculture and the environment: Protected species interactions. Target journal: Aquaculture Environment Interactions

Figure 26. Satellite-tracked movements of 3 juvenile loggerhead turtles encountered in the southern California bight. The turtles 'Coco' and 'Char Char' were rehabilitated individuals, whereas Matteo was caught during NOAA field research.

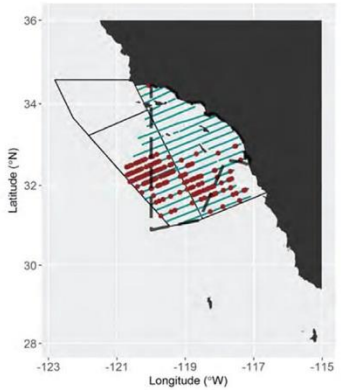
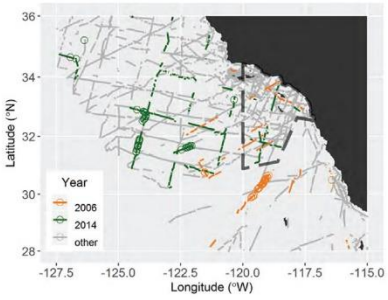


Figure 27. Loggerhead locations determined via NOAA aerial surveys in fall 2015. Blue lines indicate surveyed tracklines. Modified from Eguchi et al. (2018)[62].



[62] Eguchi, T., S. McClatchie, C. Wilson, S.R Benson, R.A. LeRoux, and J.A. Seminoff. 2018 Loggerhead turtles (Caretta caretta) in the Northeast Pacific Ocean; distribution, anomalous warming, and drift gill net fishery closure off southern California. Frontiers in Marine Science. 5:452.

Figure 28. Summary of loggerhead sightings during NOAA 'big-white-ship' cruises to the eastern Pacific.

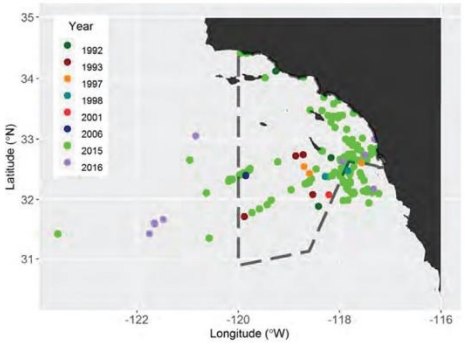


Figure 29. Location and timing of sea turtle sightings (mostly loggerheads) reported by the public to the NOAA sightings hotline. The year 2015 (green) was the time of a large influx of loggerheads into the bight, and most of these data points likely represent loggerheads. Data from Eguchi et al. (2018) Front. Mar. Sci.

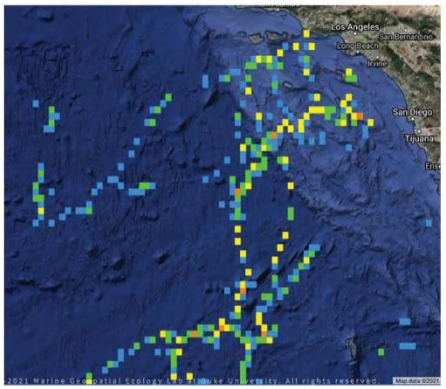


Figure 30. Summary of loggerhead locations reported in the OBIS Seamap database (https://seamap.env.duke.edu/species/173830).

OTHER SPECIES/STOCKS FOR CHARACTERIZATION

Giant Manta Rays

Giant manta rays are a threatened species (recommended score 0.4) that occurs in the Southern California Bight. The giant manta ray is a migratory species, and seasonal visitor along productive coastlines with regular upwelling. The timing of these visits varies by region and seems to correspond with the movement of zooplankton, current circulation and tidal patterns, seasonal upwelling, seawater temperature, and possibly mating behavior. Giant manta rays also appear to exhibit a high degree of plasticity in terms of their use of depths within their habitat. During feeding, giant manta rays may be found aggregating in shallow waters at depths less than 10 meters. However, tagging studies have also shown that the species conducts dives of up to 200 to 450 meters and is capable of diving to depths exceeding 1,000 meters. This diving behavior may be influenced by season and shifts in prey location associated with the thermocline. The giant manta ray is found worldwide in tropical, subtropical, and temperate bodies of water and is commonly found offshore, in oceanic waters, and in productive coastal areas. The species has also been observed in estuarine waters, oceanic inlets, and within bays and intercoastal waterways. As such, giant manta rays can be found in cool water, as low as 19°C, although temperature preference appears to vary by region. Giant manta rays are intentionally and unintentionally caught in fisheries, including purse seine and gillnet fisheries. Aquaculture

gear that mimics these types of gear may pose a risk to giant manta rays. Figure 31 shows the range of giant manta rays and indicates their expected presence in the southern California area.



Figure 31. Areas of occurrence (lighter blue) and expected occupancy (darker blue). Excerpted from Figure 3 in: https://doi.org/10.7717/peerj.3027 (Lawson et al 2016)[63] , specific figure is: https://doi.org/10.7717/peerj.3027/fig-3

Scalloped hammerhead shark

The scalloped hammerhead shark can be found in coastal warm temperate and tropical seas worldwide. Distribution in the eastern Pacific Ocean extends from the coast of southern California (U.S.), including the Gulf of California, to Ecuador and possibly Peru (Compagno 1984)[64], and off of the waters of Hawaii (U.S.) and Tahiti. Southern California waters are considered the northernmost extent of the range of the endangered Eastern Pacific DPS (recommended score 0.1). Little information is available on the occurrence of this species in coastal California waters. Major threats include overfishing and bycatch in a variety of fisheries, including trawl, gillnet, purse seine, and longline.

Guadalupe fur seals (and pinnipeds in general)

Guadalupe fur seals (recommended score 0.5) are regular visitors to the Southern California Bight and have been sighted on the Channel Islands, including the presence of newborn pups and juveniles. The species is currently experiencing an Unusual Mortality Event within strandings of sick and emaciated individuals all along the U.S. West Coast.[65]

63 Lawson JM, Walls RHL, Fordham SV, O'Malley M, Heupel MR, Stevens G, Fernando D, Budziak A, Simpfendorfer C, Davidson LNK, Ender I, Francis M, Notarbartolo di Sciara G, Dulvy NK (2016) Sympathy for the devil: A conservation strategy for devil and manta rays. doi:10.7717/peerj.3027

64 Compagno, L. J. (1984). FAO species catalogue. v. 4:(2) Sharks of the world. An annotated and illustrated catalogue of shark species known to date. pt. 2: Carcharhiniformes.

65 2015–2021 Guadalupe Fur Seal Unusual Mortality Event in California, Oregon and Washington

The range of the species is shown in Figure 32 and indicates the species potential presence throughout the Bight. However, these animals would generally be considered as infrequent visitors in the coastal waters of the Bight.



Figure 32. Core and maximum range of the Guadalupe fur seal. NMFS Status Review (in review)

Across the globe, pinnipeds face some level of threat from interactions with various types of aquaculture facilities and operations ranging from little to no threat to killings depending on the

nature of the farm and associated operations (Kemper et al. 2003[66], Forrest et al. 2007[67], Price et al. 2017, Callier et al. 2018[68], Bath et al. in review). California sea lions and harbor seals (recommended score 0.8) are two species that are numerous and common occupants in the Bight, especially in nearshore and coastal waters. Both species are frequently seen near fishing operations and have been incidentally caught or entangled in fishing gear (FAO 2021[69]), aquaculture gear (Kemper et al. 2003, Forrest et al. 2007, Clement 2013[70], Callier et al. 2018, Bath et al. in review), and other lines or structures in the water worldwide (Kovacs et al. 2012[71]). Aquaculture operations likely cannot avoid siting within areas that include these species, but special attention should be paid to both the design, maintenance, and operation of facilities to reduce attractants or create conditions that could lead to the death or serious injury of these animals (Clement 2013, Price et al. 2017, Bath et al. in review). All pinnipeds are protected under the MMPA and take is illegal outside of specific exceptions or authorizations.

Common Bottlenose dolphin

This MMPA stock, specifically the Offshore Stock,[72] does occur within the Atlas study area (Figure 33). This stock is highlighted here for several reasons. First, although the recommended score for this stock would be 0.8 per the PR scoring approach, this stock has a relatively low abundance estimate and the Potential Biological Removal level for this stock is 11 animals per year (in comparison, the California/Oregon/Humpback whale stock which includes animals listed as endangered and threatened is currently 16.7 animals in U.S. waters). Bottlenose dolphins have been documented as interacting with aquaculture gear throughout the world, including incidents that have resulted in the death or serious injury of the animals (Clement 2013, Price et al. 2017, Callier et al. 2018, Bath et al. In review). As a result, although it may not be possible to provide specific sighting locations within Federal waters that would avoid or minimize the chances of interactions with common bottlenose dolphins, aquaculture planners and operators should take this species into careful consideration when designing, building, and operating aquaculture facilities as the stock would be vulnerable to declines and increased time

[66] Kemper CM, Pemberton D, Cawthorn M, Heinrich S, Mann J, Würsig B, Shaughnessy P, Gales R (2003) Aquaculture and marine mammals: co-existence or conflict? In: Gales N, Hindell M, Kirkwood R (eds) Marine mammals: fisheries, tourism, and management issues. CSIRO Publishing: Collingwood, Victoria, Australia 208-225

[67] Forrest B, Keeley N, Gillespie P, Hopkins G, Knight B, Govier D (2007) Review of the ecological effects of marine finfish aquaculture: final report. Nelson, NZ: Cawthron Institute Report No 1285

[68] Callier MD, Byron CJ, Bengtson DA, Cranford PJ, Cross SF, Focken U, Jansen HM, Kamermans P, Kiessling A, Landry T, O'Beirn F, Petersson E, Rheault RB, Strand Ø, Sundell K, Svåsand T, Wikfors GH, McKindsey CW (2018) Attraction and repulsion of mobile wild organisms to finfish and shellfish aquaculture: a review. Rev Aquac 10:924-949 https://doi.org/10.1111/raq.12208

[69] FAO (2021) Fishing operations. Guidelines to prevent and reduce bycatch of marine mammals in capture fisheries. FAO Technical Guidelines for Responsible Fisheries No.1, Suppl. 4. Rome. https://doi.org/10.4060/cb2887en

[70] Clement D (2013) Literature review of ecological effects of aquaculture: effects on marine mammals. Nelson, NZ: Cawthron Institute

[71] Kovacs K, Aguilar A, Aurioles D, Burkanov V, Campagna C, Gales N, Gelatt T, Goldsworthy S, Goodman S, Hofmeyr G, Harkonen T, Lowry L, Lydersen C, Schipper J, Sipilä T, Southwell C, Stuart S, Thompson D, Trillmich F (2012) Global threats to pinnipeds. Marine Mammal Science. 28. 414-436. 10.1111/j.1748-7692.2011.00479.x.

[72] https://media.fisheries.noaa.gov/dam-migration/po2016dobn-cowos_508.pdf

to reach its optimum sustainable population if multiple animals are killed or seriously injured each year.

Other species with similar predicted ranges in the study areas are the short-beaked and long-beaked common dolphins and the Risso's dolphin. Of these, only the Risso's dolphin has a PBR (46 animals per year) near the range of the offshore common bottlenose dolphin.

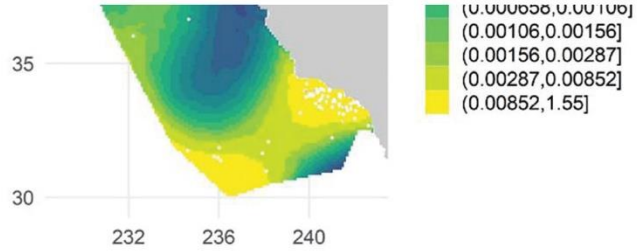


Figure 33. Screen capture excerpt of common bottlenose dolphin density predictions, taken from Becker et al (2020, Figure 2-g). Densities are reported as means in animals/km^2.

Appendix 4: Potential Effects of Environmental Variation on Federally-Protected Species and Habitat

A. Sea Turtles

Changes to climate and oceanographic processes may lead to decreased productivity in different patterns of prey distribution and availability. Such changes could affect sea turtles that are dependent on those affected prey. Sea turtle migration, feeding, and breeding locations may be influenced by factors such as ocean currents and water temperature (Patrício et al. 2021).

B. Marine Mammals

Climate and oceanographic change may affect habitat availability, food availability, and home range of cetaceans (Evans and Bjorge 2013). Changes to climate and oceanographic processes may lead to decreased prey productivity and different patterns of prey distribution and availability (Gulland et al. 2022). Site selection for whale 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). Such changes could affect whales that are dependent on affected prey, such as Southern Resident killer whales that may be affected by changes in salmon prey. Different species 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 environmental variation (Learmonth et al. 2006). Stranding patterns of cetaceans in the Pacific Northwest from 2000-2019 have been linked to increasing sea-surface temperatures, and stranding is linked to patterns of disease and food availability (Warlick et al. 2022). Some changes may be positive, such as new suitable habitat availability for some species (Learmonth et al. 2006).

Environmental variation may affect pinnipeds and sea otters at sea where they forage as well. Changes in ocean currents, ocean acidification, and other alterations in climate cycles, such as changes in the frequency of El Niño events, are likely to alter ocean food webs and affect the abundance and diversity of prey items (Adame et al. 2020). These changes may also affect susceptibility to diseases (Gulland et al. 2022).

C. White and Black Abalone

Abalone in southern California are heavily dependent on kelp for both habitat and food, and kelp forests are sensitive to oceanographic conditions associated with nutrients within the water column. Warming ocean temperatures are causing declines in nutrients available to kelp forests and also causing increased incidence of disease. NMFS (2020c) concluded that elevated water temperatures can affect black abalone by reducing survival and growth and influencing disease transmission, kelp growth, and harmful algal blooms. NMFS (2008) found that the potential for environmental variation to affect white abalone was unclear, but warmer water could result in increased incidence of withering syndrome and decreased kelp growth. The effects of climate impacts on oceanographic conditions, including temperature, have strong implications for abalone aquaculture. Warmer temperatures, hypoxic conditions, and changes in ocean salinity and pH have similar effects on abalone culture, resulting in reduced growth and reproductive rates, and greater frequency of disease (Morash and Alter 2015).

D. Birds

A recent global assessment of threats to seabirds concluded the top three threats to seabird populations were invasive species, fisheries interactions resulting in mortality as bycatch, and environmental variation

(Dias et al. 2019). Similar to other animal groups, birds may experience shifts in or contractions of habitat availability and food availability as a result of environmental variation. Within the CCE, increased variability of forage availability, including krill and anchovies, driven by warming ocean temperatures and changes in upwelling has been associated with declines in abundance of 23 species-groups of seabirds (Sydeman et al. 2015). These declines have been observed since at least the late 1980s (Veit et al. 1996). A recent analysis showed that seabird biodiversity in CCE marine sanctuaries increased with latitude and decreased with greater distance from shore, with the Channel Islands near the proposed AOAs showing lower seabird density relative to other marine sanctuaries further north in the CCE (Russel et al. 2023).

E. ESA-listed Fish

The CCE includes a variety of ESA-listed fish, including some populations of salmon and steelhead, oceanic whitetip sharks, and scalloped hammerhead sharks. Salmon and steelhead breed in freshwater rivers, which are being affected by environmental variation, which in turn is affecting salmon and steelhead. Siegel and Croizer (2020) conducted a review of the literature on Pacific salmon and environmental variation and found changes in steelhead age and size composition that may be related to environmental variation. They also reported some salmon prey species are changing in abundance and distribution. Increases in stream temperature, sea surface temperature, and ocean acidification were climate-related stressors reported to be likely to impact populations (Siegel and Crozier 2020).

Oceanic whitetip and scalloped hammerhead sharks are oceanic species. NMFS (2020d) reported that the CCE is a hotspot for scalloped hammerheads in the Pacific Ocean. A study of several chondrichthyes species that occur on the Great Barrier Reef suggested that hammerheads were less vulnerable to environmental variation than most of the species evaluated (Chin et al. 2010). Based on this and other evidence, NOAA concluded that there was not evidence to suggest a present or threatened destruction, modification, or curtailment of the scalloped hammerhead's habitat or range as a result of environmental variation (Miller et al. 2014b). For oceanic whitetip sharks, NOAA's draft recovery plan concludes that environmental variation may affect these sharks but there is not enough information about their sensitivity to climate factors and the species resilience to conclude that environmental variation is a threat at this time, though the potential effects are highly uncertain (NMFS 2024h).

Appendix 5: Sea Grant's Integrated Financial Model for Kelp Aquaculture

A collaboration with Keene State College, series of YouTube videos

Video 1: Introduction, Business Model https://youtu.be/cCE6YA6nIyA

Video 2: Start up nursery https://youtu.be/gYsdvEwarKc

Video 3: Start up farm https://youtu.be/OV8aQJ213ec

Video 4: Operating expenses https://youtu.be/B7mCz6G0Hkk

Video 5: Beginning balance sheet and funding https://youtu.be/leQJeKBywGk

Video 6: Financial statements https://youtu.be/wVMxZJyAPjA

Video 7: Enterprise budget, breakeven, sensitivity analysis https://youtu.be/bZ8LwWn0wP0

Video 8: What-if analysis https://youtu.be/hlKrdAc23p8

Appendix 6: Response to Public Comment

A. Introduction

NOAA Fisheries would like to thank the elected officials, Native American tribes, federal regulatory and state resource agencies, business and community leaders, organizations, and individuals for taking the time to review the Draft PEIS, attend the public meetings, and submit comments on the document. Public informational meetings and public participation are an essential aspect of the environmental review process. This appendix contains a summary of the comments received on the DPEIS and NOAA Fisheries' responses.

On November 15, 2024, NOAA Fisheries released the Draft PEIS for the identification of Aquaculture Opportunity Areas in U.S. Federal waters off of Southern California. The Notice of Availability initiated a 90-day public comment period from November 22, 2024 - Feb. 20, 2025 (89 FR 92681, November 22, 2024). The NEPA review process requires agencies to allow the public the opportunity to comment on a Draft PEIS. This appendix describes the Draft EIS public comment processing methodology and definitions, includes responses to comments received on the Draft PEIS, and describes where specific updates to the Final PEIS are found in the document.

NOAA Fisheries reviewed and considered all written and oral public submissions received during the Draft PEIS public review and comment period. The goal was to identify comments to be addressed in the Final EIS and to categorize those comments based on the applicable resource areas or NEPA topics. This categorization scheme allowed subject matter experts to review comments directly related to their areas of expertise. The full text of all public comment submissions received on the Draft PEIS can be viewed in Appendix 7.

B. Methodology

Terminology

The following terminology is used throughout this Appendix:

Submission: The entire content submitted by a single person or group at a single time. For example, a 10-page letter from a citizen, an email with a portable document format (PDF) attachment, and a transcript of an oral comment given at a public hearing meeting were each considered to be a submission.

Comment Submittals

Federal agencies, state/local/tribal governments, and the general public had the opportunity to provide comments on the Draft PEIS via the following mechanisms: (1) Electronic submissions via Government regulations on docket number NOAA-NMFS-2024-0051; (2) Hard-copy comment letters submitted to NOAA Fisheries via traditional mail; (3) Verbal comments recorded during the virtual public meetings; or (4) electronic submissions via email to socalaoa.wcr@noaa.gov.

NOAA Fisheries held two virtual public meetings via Webex on January 23, 2025 from 1-3 p.m. Pacific Time and January 28, 2025 from 5-7 p.m. Pacific Time to provide an overview on the PEIS, and solicit verbal comments to inform preparation of the Final PEIS. The public meetings were free and open to the public with no reservations required.

Comment Processing

NOAA Fisheries staff downloaded and reviewed all submissions from regulations.gov. These submissions were provided in Hypertext Markup Language (html) format, while attachments provided by stakeholders as part of their Government regulations submission were typically provided in PDF or Microsoft Word format. Emails were exported to PDF and physical mail was scanned to PDF. Text from

all formats was parsed, coded, and exported into a single spreadsheet that served as the primary submission database. The full text of all submissions provided by all methods is provided in Appendix 7. Each submission was assigned a unique submission identification number, which was retained throughout the comment management process. The submission database also included information about each submission, including the submitter's name, submission date, and the submitter's affiliation if provided. Submission IDs used either the tracking number assigned by regs.gov, or for other submission types, the type-YMD-Count (email E-YMD-Count, oral O-YMD-Count, hard copy mail M-YMD-Count). Table 6-1 provides an index of all submission IDs to aid individual commenters and organizations in finding the locations in Tables 6-2 through 6-13 where their comments are addressed. When one individual spoke multiple times at the same public meeting, or when submissions were determined to be duplicates provided via different methods (e.g., the same letter provided via FDMS and email), the response in this appendix is consolidated and provided via one singular submission ID associated with that individual commenter.

The NOAA Fisheries project team carefully reviewed all comments received. Within each comment submittal, substantive comments were identified for consideration of possible updates to the FPEIS analysis. Generally, substantive comments included items such as questions related to the alternatives analysis and components of the proposed action; resource-specific methodology, analysis, or impact conclusions; or the use, adequacy, or accuracy of data used to support the analysis. The PEIS analysis was updated as warranted based on comment review. Comment responses were developed for every comment based on the above-described comment review and PEIS update process. Responses identify, as appropriate, sections of the FPEIS where revisions were made or details on where additional information is provided within the FPEIS.

Responses to all comments received on the Draft PEIS are included in this section. Comment responses are organized by topic category. Many of the comments received during the Draft PEIS public comment period can be grouped into larger categories. In these instances, the themes of the comments are summarized and a response is provided for the entire category. Some comments require a more detailed response. In these cases, the entire comment is provided in Tables 6-2 through 6-13 with a response specific to that comment. Responses to additional comments from cooperating and participating agencies are also presented here, due to the relationships with those entities outlined in EO 13921.

Table 6-1. Comment ID – Names/Organizations

Submission ID Number	Name/Signatures	Self-Identified Stakeholder Interest, Agency/Organization Name
E-20250220-04	Alan Alward, Frank Emerson, Steve Scheiblauer	Co-Chairs, Alliance of Communities for Sustainable Fisheries
m3x-as13-f9k1	Amphibian Refuge	Amphibian Refuge
m76-mnng-wpbx	Anonymous or no name given	
m78-k3ds-f575	Anonymous or no name given	
E-20250215-01	Anonymous or no name given	
m7e-40b7-icjr	Ashley Eagle-Gibbs	Center for Food Safety (Primary), Don't Cage our Oceans, Santa Barbara Channelkeeper, Los Angeles Waterkeeper, Environmental Defense

Submission ID Number	Name/Signatures	Self-Identified Stakeholder Interest, Agency/Organization Name
		Center, Ashley Eagle-Gibbs, Esq., Executive Director, Environmental Action Committee of West Marin
E-20250220-15	Ava Schulenberg	Executive Director, California Lobster & Trap Fishermen's Association
E-20250220-13	Ava Schulenberg, Chris Voss	Ava Schulenberg - Assistant Director, Chris Voss - President, Commercial Fishermen of Santa Barbara
O-20250128-03	Barbara Holzman (oral submission)	Professor Emeritus, San Francisco State University
E-20250205-01	Barbara Holzman (written submission)	PhD, Professor Emerita, SF State University
E-20250122-07	Becka Doering	
m78-g022-3dvf	Becky Winchester	
E-20250212-01	Bill Woodbridge	
E-20250207-01	Bob Crocco	
E-20250122-01	Brandon Hopper	
E-20250126-01	Carl Bender	
E-20250211-03	Carol Millar	Co-owner, Millar and Associates Plans and Permits
E-20250220-01	Carolyn Chaney	Social Justice Ministry of Live Oak Unitarian Universalist Congregation of Goleta, CA
E-20250122-02	Christopher Lincoln	Concerned citizen, Flying Fish Productions
m75-b1s2-vyup	Cooper Bond	
E-20250219-01	Dave Colker	Executive Director, Ventura County Commercial Fishermen's Association
M-20250211-01	David Mendelson	Channel Island Marine and Wildlife Institute Volunteer and lead rescuer
E-20250130-01	Deane Plaister	
m6f-r8tq-xlet	Dr. Anthony Knight	
m77-1d51-hccj	Eliza Hammari	
m7d-w5k1-71cg	Elizabeth Purcell	Environmental Policy Coordinator, Turtle Island Restoration Network
O-20250123-05	Emily Parker	Coastal and Marine Scientist, Heal the Bay
E-20250215-02	Gabrielle DeMarco	
O-20250123-02	Gary Burke	Board Member, Commercial Fishermen of Santa Barbara
m66-u1ha-euaj	Giulia Malerbi	Head of Global Policy, Aquatic Life Institute
E-20250220-06	Glen Spain, Chris Voss	Glen Spain - NW Regional Director and General Legal Counsel for Pacific Coast Federation of Fishermen's Associations (PCFFA) and Institute for Fisheries Resources (IFR). Chris Voss - President, Commercial Fishermen of Santa Barbara and Board Member of PCFFA and IFR

Submission ID Number	Name/Signatures	Self-Identified Stakeholder Interest, Agency/Organization Name
E-20250205-02	Gus Albertsen	
E-20250123-04	Haewon	Professor, UCSB
m7e-6cbo-2lpq	Hans Cole	VP – Environmental Activism, Patagonia, Inc.
E-20250210-01	Irene Cooke	
m6s-aixn-615a	James Kelly	
m73-khm0-23qz	James Mitchell	Legislative Director, Don't Cage Our Oceans, North American Marine Alliance
m4r-095c-tuk9	Jane Elmore	
E-20250213-03	Jane Fehrenbacher	
O-20250128-02	Jeff Maassen (oral submission)	Santa Barbara based Sea Urchin Diver, DOD contractor
m6h-d9ln-8uj3	Jeff Maassen (written submission)	Commercial Fisherman, Sea Urchin Diver
E-20250122-05	Jennifer Reinish	
E-20250220-12	Jessica Rauch, Brian Pendleton	Jessica Rauch, CMC - Executive Assistant to GM/Clerk to the Board, Ventura Port District ; Brian Pendleton, CSDM, General Manager, Ventura Port District
m4q-ekrw-vylo	John Langford III	
E-20250123-02	Judith Smith	
E-20250220-07	Kaira Wallace	Regulatory and Community Engagement Associate, Ocean Rainforest
E-20250220-14	Kaitlyn Kalua	Kaitlyn Kalua - Deputy Director, California Ocean Protection Council ; Also staff of: California Department of Fish and Wildlife ; California Coastal Commission ; California State Lands Commission
E-20250123-01	Katharine Gerhardt	
E-20250220-02	Kerry Griffin, Merrick J. Burden	Kerry Griffin - Staff Officer, Pacific Fishery Management Council ; Merrick Burden - Executive Director, Pacific Fishery Management Council
E-20250213-02	Kim Golden	
E-20250224-01	Kimberly Ambert, Kerry Griffin, Brad Pettinger	Kimberly Ambert - Administrative Specialist ; Kerry Griffin - Staff Officer, Brad Pettinger - Council Chair, Pacific Fishery Management Council
E-20250123-03	Kristy Porteous	
E-20250211-02	Malka Drucker	
m7c-w9e7-lozg	Mati Waiya	Tribal Chair, Coastal Band of the Chumash Nation Tribal Council
E-20250211-01	Melissa Riparetti-Stepien	

Submission ID Number	Name/Signatures	Self-Identified Stakeholder Interest, Agency/Organization Name
m7d-zkn2-yel6	Merrick J. Burden	Executive Director, Pacific Fishery Management Council
E-20250220-09	Michael Lee, Tony Vaught	Michael Lee - Executive Director, Tony Vaught - President, California Aquaculture Association
m7c-cjci-nvgc	Michael M. Okoniewski	Secretary, West Coast Pelagic Conservation Group
E-20250220-05	Michael Rust	PhD, Senior Research Fellow, Hubbs Seaworld Research Institute
m5o-n6q5-cgue	Micheal Frances Smith	
E-20250122-04	Michelle Rainville	
O-20250123-04	Mike Okoniewski	Coastal Pelagic Species Advisory Subpanel
m7d-3p9a-os44	Miranda Herreid	Student, Lewis & Clark Law School
E-20250122-03	Murphy Niu	CS Dept, UCSB
O-20250128-01	Nam Nguyen	
E-20250124-01	Natalie Kilmer	
E-20250220-10	Nate Irwin (duplicated email and FDMS submission)	Policy Associate, Santa Barbara Channelkeeper
O-20250123-06	Nate Irwin (oral submission)	Policy Associate, Santa Barbara Channelkeeper
E-20250122-06	Nathan Garrison	Co-Founder, Sharkbanz.com
m4q-hb2t-4zag	Patricia Armfelt	
E-20250210-02	Peggy Merizalde	Fearless Grandmothers
m7d-blbi-7iwf	R. Chris Stock	President, Stronger America Through Seafood, Inc.
E-20250220-03	Renee Angwin, Jason Giffen	Renee Angwin - Program Manager, Aquaculture, Port of San Diego ; Jason Giffen - Vice President, Planning and Environment, Port of San Diego
m7d-g4zs-p9cd	Sarah Garcia	lifelong resident Ventura County, alumnus of UCSB environmental studies
m7d-j6uc-45hh	Sebastian Belle	President, National Aquaculture Association
m4g-qjro-e74p	Sofia Gutierrez	MS Student, University of California Santa Barbara
E-20250220-08	Stacee Karnya, JoAnne Linnenbrink	Stacee Karnya - Laboratory Manager I, JoAnne Linnenbrink - Sr. Water Biologist, City of Los Angeles Sanitation and Environment
O-20250123-03	Steve Scheiblauer	Alliance of Communities for Sustainable Fisheries
E-20250213-01	Terry Quinn	
E-20250211-04	Tracey Willfong	
E-20250220-11	Zack Gold	Santa Monica native, PhD in marine ecology

C. Comment Responses

Table 6-2. Responses – General Themes

Submission ID Number	Comment/Theme	Response
E-20250220-12 E-20250220-11 E-20250220-09 E-20250220-07 E-20250220-05 E-20250220-03 m7d-j6uc-45hh m7d-blbi-7iwf E-20250215-02 m76-mnng-wpbx m6h-d9ln-8uj3 m66-u1ha-euaj	General support for SoCal AOA	Thank you for your participation in the National Environmental Policy Act process.
m7d-blbi-7iwf E-20250220-05	Support for finfish subalternatives	Thank you for your participation in the National Environmental Policy Act process.
E-20250220-12 E-20250220-07 E-20250220-04 m7d-blbi-7iwf E-20250215-02 E-20250207-01 E-20250130-01 E-20250123-03	Support for shellfish and/or macroalgae subalternatives	Thank you for your participation in the National Environmental Policy Act process.
E-20250205-02 m76-mnng-wpbx m7d-blbi-7iwf	Support for IMTA	Thank you for your participation in the National Environmental Policy Act process.
E-20250220-15 E-20250220-13 m7e-40b7-icjr m7d-w5k1-71cg E-20250220-10 E-20250220-06 m7d-g4zs-p9cd	Generally against SoCal AOAs and/or request selection of the no action alternative	Thank you for your participation in the National Environmental Policy Act process.

m7d-3p9a-os44 m7c-w9e7-lozg E-20250219-01 m78-k3ds-f575 m78-g022-3dvf O-20250128-03 m73-khm0-23qz E-20250211-02 m6s-aixn-615a E-20250205-01 m6f-r8tq-xlet E-20250124-01 E-20250126-01 E-20250123-04 E-20250123-01 E-20250122-04 E-20250122-03 E-20250122-01 E-20250122-02 E-20250122-05 E-20250122-07 M-20250211-01 E-20250123-03 E-20250122-06 E-20250123-02 m4q-hb2t-4zag		
E-20250122-01 E-20250122-02 E-20250122-05 E-20250122-07 M-20250211-01 E-20250123-03 E-20250122-03 E-20250123-04 E-20250130-01 E-20250207-01 E-20250210-01 E-20250211-01 E-20250211-03	Against finfish subalternatives	Thank you for your participation in the National Environmental Policy Act process.

E-20250212-01 E-20250220-01 E-20250210-02 m73-khm0-23qz E-20250213-01 E-20250213-02 E-20250213-03 O-20250123-03 O-20250123-06 E-20250215-01 m7d-3p9a-os44 E-20250220-04 E-20250220-06 E-20250220-10 m7e-40b7-icjr m7e-6cbo-2lpq E-20250220-13 E-20250220-15		
E-20250220-06	Against shellfish/macroalgae subalternatives	Thank you for your participation in the National Environmental Policy Act process.
m73-khm0-23qz E-20250220-11	Against high tropic-level target species	Thank you for your participation in the National Environmental Policy Act process.
m7e-6cbo-2lpq m7e-40b7-icjr E-20250220-03 E-20250215-02 E-20250205-02 E-20250130-01	Supportive of regenerative practices	Thank you for your participation in the National Environmental Policy Act process.
m7e-6cbo-2lpq m7e-40b7-icjr m7d-w5k1-71cg E-20250220-10 E-20250220-06 m78-k3ds-f575	Entanglement	The majority of comments on this theme were related to concerns about the entanglement risk to marine life posed by aquaculture gear itself (e.g., ropes, lines, and net pens), and often expressed concern about potential impacts on marine mammals specifically, though other types of wildlife (e.g. sea turtles, sharks, etc.) were also mentioned. NOAA Fisheries analyzes potential entanglement impacts to various resources from the proposed action and siting aquaculture in AOAs in

m78-g022-3dvf m73-khm0-23qz E-20250212-01 E-20250220-01 E-20250210-02 E-20250210-01 E-20250130-01 m6f-r8tq-xlet E-20250123-04 E-20250122-03 E-20250122-01 E-20250122-02 E-20250122-05 E-20250122-07 M-20250211-01 E-20250123-03 E-20250122-06 E-20250123-02		Section 3.C, including protected species. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Future aquaculture operations proposed within an AOA would need to comply with applicable laws. Chapter 5 summarizes anticipated federal environmental compliance requirements for site specific aquaculture facilities, and includes some state requirements that facilities may wish to consider. The ESA and MMPA, referenced by certain commenters, are included.
m7e-40b7-icjr m7d-w5k1-71cg E-20250220-10 m78-g022-3dvf m73-khm0-23qz m4g-qjro-e74p	Vessel strike	Commenters on this theme generally expressed concern that increased vessel traffic associated with aquaculture operations could lead to increased vessel strikes of marine species, and often expressed concern about potential impacts on marine mammals specifically. NOAA Fisheries analyzes potential vessel strike impacts from the proposed action and siting aquaculture in AOAs to various resources in Section 3.C. As discussed in the PEIS, historically, the risk of direct vessel strikes in aquaculture has been generally considered discountable. Should animals avoid an AOA if aquaculture operations are sited, due to increased aquaculture activity within the AOA, they may end up closer to the shipping lanes or further offshore, and at higher risk to be in the way of large ships and fishing vessels. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Future aquaculture operations proposed within an AOA would need to comply with all applicable laws. Chapter 5 summarizes anticipated federal environmental compliance requirements for site specific aquaculture facilities, and includes some state requirements that facilities may wish to consider. The ESA and MMPA, referenced by certain commenters, are included.
E-20250220-11 m7d-g4zs-p9cd	"Losing" wildlife or population level-impacts	Commenters on this theme stated or implied that adverse impacts from aquaculture would lead to "losing...whale species" or cause "massive die offs of wildlife

E-20250205-02 E-20250205-01		populations". NOAA Fisheries analyzes the potential impacts from the proposed action and siting aquaculture in AOAs to biological resources in Section 3.C. and specifically discussed potential hypothetical population-level impacts on federally protected species and habitat in Section 3.C.i. Section 7 of the ESA requires Federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. The MMPA regulates the incidental take of marine mammals, prescribes the permissible methods of taking and other means of effecting the least practicable adverse impact on marine mammal species or stocks and their habitat, and establishes requirements pertaining to the monitoring and reporting of such taking. NOAA Fisheries analyzes the potential impacts from the proposed action and siting aquaculture in AOAs to protected species in Section 3.C.i. and to socioeconomic resources, including wildlife-associated tourism and other recreation, in Section 3.D. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. NOAA Fisheries may conduct more in-depth analyses under the Endangered Species Act Section 7 consultation process, the MMPA, and other relevant protected species statutes if and when specific aquaculture projects are proposed. Future aquaculture operations proposed within an AOA would need to comply with all applicable laws.
E-20250220-06 E-20250220-10 m7e-40b7-icjr	Marine debris	Commenters on this theme specifically expressed concern about increased marine debris associated with aquaculture operations. NOAA Fisheries analyzes potential marine debris impacts from the proposed action and siting aquaculture in AOAs to various resources in Chapter 3. As described in Chapter 3 of the EIS, offshore aquaculture operations could introduce marine debris into the ocean environment, potentially affecting protected species, water quality, benthic habitats, fish nursery grounds, or other resources. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Future aquaculture operations proposed within an AOA would need to comply with all applicable laws.
m4g-qjro-e74p m76-mnng-wpbx m7e-40b7-icjr	Environmental variation concerns	Some commenters on this theme expressed concern about the potential environmental variation-related emissions associated with aquaculture operations, and one commenter reiterated that environmental variation effects must be considered. As discussed in Sections 3.B.v and 4.A.i, aquaculture operations may have both

		greenhouse gas emissions and/or carbon sequestration potential. Mitigation or adaptation strategies may simultaneously make aquaculture operations more resilient to environmental variation while also lessening the impacts of operations on environmental variation. Overall, it is possible that future aquaculture operations in the proposed AOAs could produce minor impacts associated with greenhouse gas emissions, however the proportion of greenhouse gas emissions from aquaculture is significantly less than emissions from land-based production of livestock and crops or those produced by wild-capture fisheries. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Future aquaculture operations proposed within an AOA would need to comply with all applicable laws, which may include the EPA's National Air Quality Standards and the CA Ambient Air Quality Standards and local air district emission significance thresholds; project-specific air quality modeling may be required.
m7e-40b7-icjr E-20250220-11 E-20250220-10 m7d-3p9a-os44 E-20250215-01 m73-khm0-23qz E-20250211-03 E-20250205-01 E-20250123-01 E-20250122-06	Public health concerns	Commenters on this theme expressed concerns about public health impacts associated with both changes in water quality and associated with the consumption of aquaculture food products. The DPEIS discussed potential impacts from the proposed action and siting aquaculture in AOAs to public health and safety in Section 3.viii. The U.S. has a rigorous process for ensuring seafood products are safe for human consumption. There are seafood safety and sanitation programs, as well as established therapeutic and drug approval systems. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Future aquaculture operations proposed within an AOA would need to comply with all applicable laws. Any aquaculture projects sited in an AOA would need to coordinate appropriate transport, testing, and other established regulatory requirements. Additional language has been added to Section 3.D.viii to enhance the analysis. Conclusions in the Executive Summary have been updated to reflect potential benefits to public health associated with the consumption of seafood.
E-20250130-01 E-20250210-01	Antibiotics and other husbandry materials/therapeutics	Commenters on this theme expressed concerns about potential adverse impacts due to the potential use of antibiotics and other husbandry materials/therapeutics in

E-20250212-01 E-20250220-01 E-20250210-02 m73-khm0-23qz E-20250213-01 m78-g022-3dvf m7d-3p9a-os44 E-20250220-04 E-20250220-10 m7e-40b7-icjr E-20250220-13		aquaculture operations. The DPEIS discussed potential impacts from the use of antibiotics and other husbandry materials/therapeutics on potentially-farmed species (Section 3.C.iv) and public health and safety (Section 3.D.viii). Based on public comments, additional language has been added to the FPEIS to clarify how the use of antibiotics and other husbandry materials/therapeutics may also potentially impact wild fish stocks. However, at present, there are no antibiotics approved by the U.S. Food and Drug Administration (FDA) for use with any marine fish or shellfish species. Any future use of antibiotics in U.S. aquaculture would require rigorous oversight, including FDA approval, veterinary supervision, and strict adherence to withdrawal periods to ensure seafood safety. Modern aquaculture practices emphasize preventative health strategies such as improved genetics, optimized nutrition, and enhanced site management to reduce disease risks without relying on antibiotics.
m7e-6cbo-2lpq m7d-w5k1-71cg E-20250220-10 m7d-3p9a-os44 m75-b1s2-vyup O-20250123-06 E-20250130-01 E-20250122-04 E-20250122-01 E-20250122-02 E-20250122-05 E-20250122-07 M-20250211-01 E-20250123-03 E-20250122-06 E-20250123-02	Concerns with high-energy ocean conditions and/or natural disasters	Many commenters on this theme connected high-energy ocean conditions and infrastructure risks, and often specifically stated that the Santa Barbara Channel was therefore unsuitable for aquaculture. The DPEIS did acknowledge that siting aquaculture in higher energy offshore environments could result in higher rates of infrastructure loss or damage, see Section 3.B.i. The parameters that were selected to conduct spatial modeling for AOAs were high level and meant to encompass all types of aquaculture. The spatial planning and analysis conducted for the Atlas identified environments that align with the tolerances in offshore commercial-scale aquaculture farming practices worldwide, which have been observed by contributing authors of the Atlas as well as industry stakeholders of each aquaculture sector. Other areas, e.g., north of Point Conception, were excluded from consideration in the Atlas for the reasons suggested by commenters. Based on the Atlas, NMFS found that the Santa Barbara Channel is suitable and appropriate for offshore aquaculture.Successful development of individual sites for commercial production is anticipated to require appropriate site-specific assessments and evaluations if and when a specific aquaculture project is proposed. These assessments are essential to account for localized factors such as wave climate, currents, and seasonal wind events, particularly during winter storms. It is expected that siting considerations within any AOA option would require additional environmental surveillance to assess oceanographic or local conditions to determine the suitability for specific types of aquaculture and/or cultivation approaches. We appreciate your concern and acknowledge the importance of consideration of dynamic environmental conditions during future planning stages for any commercial operation. Additional language has been added to Chapter 2 to clarify what data was provided in the Atlas for characterization vs. what data were used for the relative site suitability screening. Additional background detail on the oceanographic conditions of

		the Santa Barbara Channel has been added Section 3.B.i to enhance the analysis. Two commenters on this theme specifically mentioned hurricanes/natural disasters and additional clarification on why natural disasters and other "force majeure" events were determined to be out of scope was added to Section 2.B. The level and scope of an analysis is commensurate with the potential impacts of the action.
m66-u1ha-euaj E-20250211-03	Animal welfare concerns relating to potentially-farmed species	The PEIS considers a long-term planning effort that is not a regulatory or permitting action and does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects, and examines a wide-range of potential impacts to the human environment should aquaculture be proposed in the future. The PEIS did not specifically evaluate or approve any particular project and so is unable to prescribe specific mitigation measures associated with animal welfare suggested by commenters (e.g., stocking densities, enrichment, humane slaughter methods, and proactive health management) given future aquaculture applicants could propose a suite of species from shellfish to finfish to macroalgae. Each species has specific growing needs and tolerances that dictate overall species health. Animal care, treatment, and health is under the jurisdiction of the USDA, Animal and Plant Health Inspection Service. The FDA maintains jurisdiction over drugs used for the treatment or prevention of parasites and diseases of fish, the anesthetization of aquatic species and the alteration of sex and regulation of reproductive function in aquatic species. Additional language has been added to Section 3.C.iv to clarify that this issue would be considered in more depth in future project-level analysis if and when aquaculture projects are proposed, if appropriate.
E-20250122-01 E-20250122-02 E-20250122-05 E-20250122-07 M-20250211-01 E-20250123-03 E-20250123-02 E-20250123-04 E-20250130-01 E-20250211-01 E-20250212-01 E-20250220-01 E-20250210-02 m73-khm0-23qz O-20250123-06 m76-mnng-wpbx E-20250220-10	AOA footprint is too big or that large operations in close proximity amplify impacts	NOAA Fisheries considered the impacts associated with the scale and size of potential aquaculture operations throughout the PEIS. AOAs range from 500 to 2,000 acres, which is relatively small (~0.59-2.4 nm2) compared to other authorized ocean activities, such as wind energy areas or oil and gas platforms. This size reflects a planning goal developed through public engagement that meets industry and engineering requirements, is suitable for all types of aquaculture development including the cultivation of finfish, macroalgae, shellfish, or a combination of species, and would support 3-5 farms. NOAA recognizes the importance of responsible aquaculture development. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects.

E-20250220-13		
m6h-d9ln-8uj3 O-20250128-02	Request to include decommissioned oil rigs	The Proposed Action does not include the topic of your comment. Please see Chapter 2 (Proposed Alternatives) of the PEIS for a definition of the scope of the project; aquaculture that includes the co-use of existing offshore infrastructure is not in scope.
m4g-qjro-e74p m6h-d9ln-8uj3 m73-khm0-23qz m75-b1s2-vyup E-20250215-02 m7d-3p9a-os44 E-20250220-02 E-20250220-05 E-20250220-07 E-20250220-10 m7e-40b7-icjr E-20250220-14 E-20250224-01	Commenters provided references not previously cited in DPEIS	All provided references that were available have been reviewed and considered for addition in the development of the FPEIS, if they provided relevant additional information or changed the basis of the analysis or conclusions.
E-20250220-15 E-20250220-11 O-20250123-02 M73-khm0-23qz m75-b1s2-vyup E-20250224-01	Request for more spatial data on specific species and/or more research	NEPA generally does not require Agencies to conduct new research unless it is essential to make a reasoned decision among project alternatives and the overall cost and timeframe of obtaining that new information are not unreasonable (42 U.S.C. 4336(b)(3)(B)); agencies can utilize existing data sources to assess environmental impacts as part of the NEPA process. NOAA has sponsored and supported both internal and independent research and monitoring efforts that have been considered in the environmental baseline and environmental consequences sections of this document. NOAA Fisheries has included the currently best available science and most relevant information in its analysis. The current information is sufficient to inform the decision maker on the impacts of the proposed action and alternatives at this time. The best available science would be considered in future analyses if and when aquaculture projects are proposed.
m7d-g4zs-p9cd m7c-w9e7-lozg m77-1d51-hccj m75-b1s2-vyup	Community Impacts	Commenters on this theme expressed concerns with community impacts, and some specifically identified Tribal communities. Since the publication of the DPEIS, a series of executive orders have been revoked. (E.O. 13985, E.O. 14008, and E.O. 14096 have been revoked by E.O. 14148; E.O. 12898 has been revoked by E.O.14173). The FPEIS modifies where practicable those sections in the DPEIS which were developed in order to comply with the now-revoked executive orders, and references to revoked Executive Orders have been removed. Section 3.D.ix (Environmental Justice Considerations), which was developed to comply with the series of executive orders has been removed. Impacts on socioeconomic resources are

		discussed throughout Section 3.D. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects.
m7d-g4zs-p9cd m7c-w9e7-lozg	Cultural Resources	Commenters on this theme expressed concerns about potential adverse impacts associated with aquaculture operations on cultural resources and the Chumash due to both changes in access/limitation of cultural practices and negative impacts on biological resources. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects.
E-20250220-14 m7e-6cbo-2lpq E-20250220-04 m7d-g4zs-p9cd m7c-w9e7-lozg m7c-cjci-nvgc E-20250215-02 m78-k3ds-f575 E-20250213-03 E-20250211-04 E-20250211-01 E-20250207-01 E-20250123-01 E-20250122-06 E-20250122-04	General impacts	NOAA Fisheries considered potential impacts on the human environment, including the health of coastal communities, fisheries, and ecosystems. We acknowledge that the proposed action may have impacts on the administrative environment, and that offshore aquaculture may have potential impacts on the physical, environmental, socioeconomic, and cultural/historic environments if a project is sited in an AOA. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Future aquaculture operations proposed within an AOA would need to comply with all applicable laws.
E-20250220-15 m7e-40b7-icjr E-20250220-11 E-20250220-05 E-20250220-04 m7d-j6uc-45hh m7c-cjci-nvgc m78-g022-3dvf O-20250128-01 m73-khm0-23qz	Outside the scope of the EIS	The Proposed Action does not include the topic of your comment. Please see Chapter 2 (Proposed Alternatives) of the PEIS for a definition of the scope of the project. The PEIS contains a reasonable range of alternatives that are technically and economically feasible and meet the purpose and need of the proposed action.

E-20250205-01 m6h-d9ln-8uj3 E-20250124-01 E-20250126-01 m4q-hb2t-4zag m4g-qjro-e74p		

Table 6-3. Responses – Socioeconomic Concerns

Submission ID Number	Comment/Theme	Response
m4g-qjro-e74p E-20250122-01 E-20250122-02 E-20250122-05 E-20250122-07 M-20250211-01 E-20250123-03 E-20250122-06 E-20250123-02 E-20250122-03 E-20250123-04 m6f-r8tq-xlet E-20250130-01 m78-k3ds-f575 m7c-w9e7-lozg E-20250220-06 E-20250220-08 E-20250220-10 m7e-6cbo-2lpq	Transportation/navigation	Commenters on this theme expressed concerns about increased vessel traffic, with some characterizing the proposed AOAs as areas of existing high vessel traffic. NOAA Fisheries analyzed vessel traffic in the EIS for the proposed AOAs. Vessel traffic patterns were considered in the marine spatial planning process used to develop the proposed AOA options, which avoid conflicts with established shipping lanes/fairways, traffic separation schemes, routes frequently traveled by other commercial and recreational vessels, and other important sites like harbor pilot boarding areas. As described in Section 3.vi (Transportation and Navigation), the proposed action and siting aquaculture in AOAs are not expected to affect shipping routes. Once AOAs are identified, interested growers will still need to go through the permitting process before aquaculture farms can be built. The USACE regulates construction activities to ensure minimal impacts to navigation. Permission to build any structure requiring personal aids to navigation (buoys, lights, etc.), as well as permission to place them in navigable waters, is required from the USCG, who consults local resources in the permit review process to ensure that a permitted aid is not creating a hazard to mariners using that water way. Generally more detailed and up to date site-specific navigational risk assessments, including vessel traffic analyses, are likely to be part of the permitting process if and when aquaculture projects are proposed. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects.
E-20250220-15 E-20250220-13 m7e-6cbo-2lpq	Socioeconomic concerns	The majority of comments on this theme were related to concerns about potential competition with wild capture fisheries, and risk to biological resources that support commercial and recreational fishing communities, though some commenters

m7e-40b7-icjr E-20250220-10 E-20250220-06 E-20250220-04 m7d-g4zs-p9cd m7d-3p9a-os44 E-20250215-02 m78-g022-3dvf m73-khm0-23qz m6s-aixn-615a E-20250205-01 E-20250122-01 E-20250122-02 E-20250122-05 E-20250122-07 M-20250211-01 E-20250123-03 E-20250122-06 E-20250123-02 m66-u1ha-euaj m5o-n6q5-cgue m4g-qjro-e74p E-20250224-01		expressed concern about adverse socioeconomic impacts on other industries like whale watching tours. Communities in the region are supported by several interconnected resources, including the biological and physical environment, commercial fishing, recreational fishing, markets and regional food systems, ports and working waterfronts, tourism and other recreation, etc. NOAA Fisheries analyzes potential impacts from the proposed action and siting aquaculture in AOAs to socioeconomic resources in Section 3.D. As discussed in the PEIS, potential impacts to socioeconomic resources could occur via impacts on biological and physical resources or via socioeconomic stressors like the creation of economic opportunities, and new or increased interactions with wild-capture seafood products (competition or complimentary), etc. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Quantifying the ways an increase in aquaculture production could change revenue, value, and profitability of seafood products, create new interactions between wild harvest, existing aquaculture, and potentially new aquaculture products, etc., is not feasible at the programmatic level before details like location, production level, or species are known. More in-depth analysis of socioeconomic impacts may be considered during project-specific NEPA planning if and when aquaculture projects are proposed. While this PEIS analyzes the impacts of siting aquaculture facilities in AOAs, it does not propose any avoidance, minimization, mitigation, and monitoring measures, including mitigation of socioeconomic impacts (e.g., compensatory mitigation, which some commenters advocated for and other commenters recommend against), however, possible mitigation that could be considered for aquaculture facility development is discussed in Appendix 1. Unnecessary detail has been removed from Appendix 1 for clarity based on public comment. The BMPs and mitigation and monitoring suggestions in the document are provided with cited literature and could be considered in future project specific evaluations on a case-by-case basis. Additional information has been added to Section 3.D to enhance the analysis, including updated descriptions of the affected environment. Compensatory mitigation is no longer mentioned in Appendix 1 as an example.
m5o-n6q5-cgue E-20250122-01 E-20250122-02 E-20250122-05 E-20250122-07 M-20250211-01	Wants focus on small business and/or against "industrial" aquaculture	The proposed action is needed to meet the directives of E.O. 13921 to address the increasing demand for seafood, facilitate long-term planning for marine aquaculture development, and address interests and concerns regarding offshore marine aquaculture siting.

E-20250123-03 E-20250122-06 E-20250123-02 E-20250123-03 E-20250123-02 E-20250130-01 m73-khm0-23qz E-20250215-02 m7d-3p9a-os44 E-20250220-10 m7e-40b7-icjr E-20250220-13		
m7d-3p9a-os44	[...] “the U.S. is simply too far behind to compete in this particular race. Contributing to only one percent of global aquaculture production, and with its high labor and capital costs, the growing pains needed for the U.S. to be a significant player in the aquaculture market makes it a losing proposition[...]it is difficult to see how opening up the EEZ to outside investors will aid American food security[...]So long as the United States lacks the ability to process its seafood, whether caught or farmed, increasing the amount of seafood produced in the country will not change the imbalanced export-import ratio.”	The proposed action is needed to meet the directives of E.O. 13921 to address the increasing demand for seafood, facilitate long-term planning for marine aquaculture development, and address interests and concerns regarding offshore marine aquaculture siting. The goal of identifying AOAs is to promote American seafood competitiveness, food security, economic growth, and support the facilitation of the development of domestic commercial aquaculture, consistent with sustaining and conserving marine resources and applicable laws, regulations and policies. While the United States is currently only the 20th largest producer of farmed seafood by volume, the demand for seafood in the United States has increased dramatically in recent decades, and that demand will likely continue to rise into the future (Shamshak et al. 2019). This increased demand is expected to drive the market to purchase seafood from overseas if there is no domestic industry available. The United States has one of the most robust regulatory structures in the world, protecting the environment, human health, and labor to levels that ensure that when a consumer buys American, they are purchasing a product that was created sustainably, responsibly and safely (OMB, 2017, 2024). By increasing our dependence on foreign seafood, we are foregoing our regulatory structure to countries that do not offer the same protections as the U.S., potentially causing further harm to the environment, our health, and enabling unsafe labor practices (Engle et al. 2025). The growth of a domestic industry may encourage processors, wholesalers, and distributors to invest in facilities close to the centers of production. This in effect could decrease their costs, reduce logistical risks, and create jobs for local economies. Thus, a positive feedback loop may be created, spurring more growth, furthering production, and increasing investment.

		Additionally, while a domestic product may be more expensive than an imported product, the American consumer has shown a willingness to pay more for a product that they know is produced sustainably, and is safe to consume (Fonner and Sylvia 2015). By supporting the growth of American aquaculture in a sustainable fashion, we could become the global "gold standard" for offshore aquaculture production.
m7d-3p9a-os44	[...] "The DPEIS fails to adequately account for the devastating impact that expanded open seas aquaculture production would have on local communities. Even if a few large American companies have the capital to enter into the market, this is unlikely to benefit the population writ large. The DPEIS discusses the job opportunities that open sea aquaculture could bring, saying that "new opportunities in employment and trade may help to alleviate some of the race and gender gaps in socioeconomic participation in ocean-related industries." However, not all so-called economic opportunities are created equal: low-paid jobs in the middle of the ocean where oversight is necessarily lacking is a situation ripe for abuse. Furthermore, the DPEIS fails to account for the fact that local fisheries would not be able to compete with the powerful aquaculture businesses, and the fact that these businesses would require laborers is not a win for the community, as it would be swapping out fulfilling, family businesses to corporate takeover. As we have seen in land-based agriculture, family farms have been increasingly forced out of business, unable to compete with corporate competitors."	NOAA Fisheries disagrees with this characterization of aquaculture industry jobs. Section 3.D of the PEIS acknowledges that certain groups could potentially experience adverse socioeconomic effects should large-scale business entities undertake offshore aquaculture operations along the Southern California coastline. However, this outcome assumes that such entities would necessarily: (a) proceed with disregard for the well-being of adjacent coastal communities, (b) fail to hire or equitably compensate skilled local residents for services rendered, and (c) operate without effective oversight of offshore operations and at-sea labor practices. Such outcomes are not inevitable. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects.

Table 6-4. Responses – Water Quality

Submission ID Number	Comment/Theme	Response
E-20250220-15 E-20250220-13	Water quality concerns	Comments on this theme expressed concerns that aquaculture operations could adversely impact water quality, and many of the commenters noted how changes in

m7e-6cbo-2lpq m7e-40b7-icjr E-20250220-11 E-20250220-10 E-20250220-08 E-20250220-06 E-20250220-04 m78-g022-3dvf O-20250128-03 O-20250123-06 E-20250213-01 m73-khm0-23qz E-20250212-01 E-20250220-01 E-20250210-02 E-20250211-03 E-20250210-01 m6s-aixn-615a E-20250205-01 E-20250130-01 E-20250124-01 E-20250126-01 E-20250123-04 E-20250123-01 E-20250122-03 E-20250122-01 E-20250122-02 E-20250122-05 E-20250122-07 M-20250211-01 E-20250123-03 E-20250122-06 E-20250123-02 m66-u1ha-euaj		water quality could adversely impact other biological and socioeconomic resources. Some commenters disagreed with the characterization of the affected environment for water quality, citing recurring sewage spills near the Alternative 2 AOA options, while other commenters noted that the Alternative 1 AOA options "can take advantage of the ideal conditions for aquaculture, which include good water quality… This can be a significant benefit to companies seeking to establish an aquaculture operation, particularly shellfish companies that will require growing area certification." NOAA Fisheries analyzes potential impacts from the proposed action and siting aquaculture in AOAs to water quality in Section B.iv, including potential benefits, and the impact of water quality nexus issues to other resources throughout Chapter 3, including public health and safety. Aquaculture operations could potentially impact water quality through effluent discharge and other stressors, and this is primarily a concern for finfish operations. As stated in the PEIS, the best available science indicates that siting facilities in well-flushed water can usually mitigate many of the potential adverse water quality impacts associated with finfish cage culture operations and enrichment to the water column is generally not detectable. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Future aquaculture operations proposed within an AOA would need to comply with all applicable laws, for example the Clean Water Act's National Pollutant Discharge Elimination System (NPDES) regulatory program, if applicable, which has discharge standards for water quality. Additional language has been added to Section 3.B.iv to better characterize the affected environment and potential impacts. Additional language has been added to Section 3.C to clarify how changes in water quality may impact biological resources.
E-20250220-08 E-20250220-11	AOA Alternative 3 options are too close to existing NPDES/CALCOFI stations	The City of Los Angeles Environmental Monitoring Division provided updated locations for NPDES monitoring stations near Alternative 3 that were not included in the Atlas or DPEIS. Figure 8 and discussion in Section 3.B.iv have been updated in the FPEIS to reflect this new information.

		We do not anticipate any interruption of fisheries or oceanographic research cruises or data collection efforts as a result of identifying AOAs. Historical records of research cruises were included in the spatial analysis for identification of AOAs (e.g., California Cooperative Oceanic Fisheries Investigations). The locations of ongoing research and monitoring efforts would be considered in future siting and permitting decisions if and when a project is proposed.
E-20250220-12	[...] “The DPEIS states that "Escaped/dispersed organisms and reproductive material are considered biological material and a pollutant that must be considered in the NPDES permitting process." DPEIS, at 156. While VPD takes no position as to whether or not this is true for finfish projects, the Ninth Circuit has determined that it is not the case for shellfish (and likely seaweed) projects: "We are persuaded that Congress did not intend that living shellfish and the natural chemicals and particulate biological matter emitted from them, or the occasional shells that separate from them, be considered pollutants." Association to Protect Hammersley, Eld & Totten Inlets v. Taylor Resources, Inc., 299 F.3d 1007, 1016 (9th Cir. 2002). VPD respectfully requests that this sentence be deleted to avoid the implication that shellfish and seaweed operations would be required to obtain a NPDES permit.”	This statement has been revised in the FPEIS to clarify that shellfish and macroalgae operations that do not discharge pollutants at any time during operations may not need NPDES permits.
m7e-40b7-icjr O-20250128-03 E-20250205-01 m73-khm0-23qz	DDT-specific concerns	Commenters on this theme expressed concerns about the proximity of proposed AOAs to historical DDT dumping sites in the SCB, generally in the context of public health and safety risks. As noted in the PEIS, there is no historical record of DDT disposal occurring near the proposed AOAs. A history on DDT and deep ocean disposal in Southern California is presented in Almada et al. (2023). In the late 1980s, the EPA designated the Palos Verdes Shelf as a Superfund site due to the historic disposal of DDT and extensive sediment contamination at depths of 48 m (150 ft.) or more. In 2020, further studies uncovered decaying barrels suspected of containing DDT waste in the San Pedro Basin, southwest of the Palos Verdes Shelf, indicating that the extent of waste disposal or dumping was greater than previously understood (Schmidt et al. 2024). All known disposal sites are located south and southwest of the proposed AOAs. The effluent-affected deposit area for the EPA Palos Verdes Shelf Superfund Site is located approximately 18 km south of the southernmost Santa Monica AOA option. The northern boundary for the Palos

		Verdes Shelf Superfund Site is Redondo Canyon. All other disposal or contaminated locations are to the southwest in the San Pedro Basin. Regarding the potential for seafood contamination, Almada (2024) highlights the importance of fish ecological traits—particularly habitat and diet—in influencing the relationship between local sediment contamination and bioaccumulation levels in fish. McGill et al. (2024) expands on this by demonstrating that DDT bioaccumulation in fish is context-dependent, with proximity to and interaction with contaminated sediments increasing the likelihood of accumulation. Most potential species for offshore aquaculture would have no interaction with sediments, as cultivation occurs in the upper water column. Additionally, the proposed AOAs are located far from known DDT sources. Therefore, it is highly unlikely that aquaculture products would contain measurable levels of DDT related to historic ocean disposal. One commenter noted that recent investigations indicated "that while the plumes around the barrels contained DDT, the corroding barrels themselves still currently contain radioactive waste". The best available science would be considered in future analyses if and when aquaculture projects are proposed, including updated and project-specific descriptions of the affected environment and potential environmental consequences of the specific proposed action, as applicable.

Table 6-5. Responses – Fish and Fisheries

Submission ID Number	Comment/Theme	Response
E-20250130-01 E-20250205-01 m6s-aixn-615a m73-khm0-23qz E-20250215-02 E-20250219-01 m7d-3p9a-os44 E-20250220-04 E-20250220-06 E-20250220-10 m7d-w5k1-71cg m7e-40b7-icjr	Negative impacts on fishing and fisheries	Commenters on this theme expressed concerns about adverse impacts from identifying AOAs and siting aquaculture on fishing and fisheries, both through direct market competition or spatial conflict, and through adverse impacts on the environment and wild fish stocks. As discussed in the PEIS, potential impacts to fishing and fisheries could occur via impacts on biological and physical resources, like wild fish stocks or water quality, or through impacts on socioeconomic resources like commercial fishing, markets and regional food systems, etc. NOAA Fisheries analyzes potential impacts from the proposed action and siting aquaculture in AOAs to commercial fishing and fisheries throughout Chapter 3. The proposed AOAs were designed to minimize interactions with other users, such as the fishing industry, based on data considered in the Atlas and input received in the public engagement process. Additional detail has been added to Chapter 2 about fish and fisheries data considered

E-20250220-13 E-20250224-01 E-20250220-15		in the Atlas and public involvement. Additional detail has been added throughout Chapter 3 to enhance the analysis, based on public comment and updated best available science. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Future aquaculture operations proposed within an AOA would need to comply with all applicable laws.
E-20250122-06 E-20250220-10 E-20250224-01	Negative impacts on specifically recreational fishing and fisheries	Commenters on this theme expressed concerns about adverse impacts from identifying AOAs and siting aquaculture on fishing and fisheries that specifically noted recreational fishing and fisheries. As discussed in the PEIS, potential impacts to recreational fishing and fisheries could occur via impacts on biological and physical resources, like wild fish stocks or water quality, or through impacts on socioeconomic resources like recreational fishing, ports and working waterfronts, etc. NOAA Fisheries analyzes potential impacts from the proposed action and siting aquaculture in AOAs to recreational fishing and fisheries in various resource areas throughout Chapter 3. The proposed AOAs were designed to minimize interactions with other users, such as the fishing industry, based on data considered in the Atlas and input received in the public engagement process. Additional detail has been added to Chapter 2 about fish and fisheries data considered in the Atlas and public involvement. Additional detail has been added throughout Chapter 3 to enhance the analysis, based on public comment and updated best available science. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Future aquaculture operations proposed within an AOA would need to comply with all applicable laws.
m66-u1ha-euaj E-20250122-01 E-20250122-02 E-20250122-05 E-20250122-07 M-20250211-01 E-20250123-03 E-20250122-06 E-20250123-02 E-20250124-01	Fish escapes and/or native species and genetic concerns	Many commenters on this theme expressed a particular concern about the potential impacts of cultivation and escape of specifically non-native species. The potentially-farmed species discussed in the PEIS and considered in the described OMEGA model were selected by NOAA Fisheries based on known industry interest, potential for significant industry development, environmental suitability, and environmental/technical feasibility for farming offshore in Federal waters. The referenced species do not represent an exhaustive list of potential species that could be cultivated in Federal waters, nor an explicit endorsement or recommendation by NOAA Fisheries of these species for cultivation. Usage of the terms “candidate” or “suitable” species when discussing potentially-farmed species considered in this PEIS

E-20250126-01 E-20250130-01 m6s-aixn-615a E-20250210-01 E-20250211-03 E-20250212-01 E-20250220-01 E-20250210-02 m73-khm0-23qz E-20250213-01 m78-g022-3dvf m7c-w9e7-lozg m7d-3p9a-os44 E-20250220-04 E-20250220-10 E-20250220-11 m7d-w5k1-71cg m7e-40b7-icjr m7e-6cbo-2lpq E-20250220-13		has been removed throughout the document to reduce confusion. At this time, NOAA Fisheries did not limit the framework or planning approach considered in the PEIS to specific species. The document identifies potential AOAs suitable for all types of aquaculture operations. As discussed in the PEIS, the likelihood of escapes is high. However, the likelihood of escapees contributing significant genetic change to wild populations is species-dependent and variable, but generally not high. The ability for domesticated fishes to survive, and compete with wild fish stocks for food or habitat is low. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. The current NOAA Marine Aquaculture Policy supports the use of only native or naturalized species in Federal waters unless best available science demonstrates use of non-native or other species in Federal waters would not cause undue harm to wild species, habitats, or ecosystems in the event of an escape. Additional information has been added to Section 3.C.ii (Wild Fish Stocks) to enhance the analysis.
E-20250220-15 E-20250220-13 m7e-40b7-icjr m7d-w5k1-71cg E-20250220-10 E-20250220-06 E-20250220-04 E-20250215-02 E-20250215-01 m73-khm0-23qz E-20250211-03 m6s-aixn-615a E-20250130-01 E-20250124-01 E-20250126-01	Disease	Commenters on this theme expressed concerns about potential adverse impacts on wild species due to increased risk of disease associated with aquaculture operations. As discussed in the PEIS, the presence of aquaculture operations may alter disease dynamics in the ocean environment. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. The PEIS did not specifically evaluate or approve any particular project and so we are unable to prescribe any specific mitigation measures associated with pathogens, disease, or parasite transmission at this time. There are a variety of rules and regulations concerning animal health, biosecurity planning and disease control that may require measures to avoid, reduce, or minimize adverse impacts (e.g., FDA Veterinary Feed Directives, USDA APHIS biosecurity plans, biotoxin management plans according to NSSP HACCP guidance, etc.) if and when aquaculture projects are proposed. Based on public comments, additional language has been added to Section 3.C.ii to analyze the potential adverse effects of siting aquaculture on wild fish stocks from the use of antibiotics and other husbandry materials/therapeutics, which is connected to disease processes.

E-20250220-13 E-20250220-04 O-20250123-03 E-20250219-01 E-20250224-01	Concerns with the data used for fisheries in the Atlas	The Southern California AOA Atlas provided the most comprehensive marine spatial analyses ever developed for any U.S. ocean space. With over 200 data layers, new data sets, and novel modeling approaches, the Atlas analyzed vast ocean areas to identify the most suitable AOA options for Southern California relative to the Atlas planning goals. NCCOS worked across all NOAA offices and staff participated in national and regional listening sessions. Data and information were gathered from hundreds of stakeholder meetings, most included fishing communities like those associated with communities along Santa Barbara. Fishing data were predominantly received from cooperating programs across NOAA and the California Department of Fish and Wildlife. Data and maps within the Atlas and PEIS reflect the resolution at which data can be displayed to the public to ensure protection of confidential data components. Fishing data from 23 fisheries were included in suitability analysis, including data on ridgeback shrimp and rock crab. We acknowledge the limitation of coverage of vessels equipped with Vessel Monitoring Systems (VMS) and that with some fisheries, a significant portion of the fleet remains unmonitored at the resolution afforded by VMS. NOAA Fisheries did review the incorporation of fishing data based on comments received at the NOI and confirms that it has included the best available science and most relevant information in its analysis. The current information is sufficient to inform the decision maker on the impacts of the proposed action and alternatives at this time. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Based on public comment, additional language has been added to Section 2 about the development of the Atlas and public involvement.

Table 6-6. Responses – Protected Species

Submission ID Number	Comment/Theme	Response
m3x-as13-f9k1 m4g-qjro-e74p E-20250122-03 E-20250122-06 E-20250123-01 E-20250123-04 m6f-r8tq-xlet	Protected species concerns	Commenters on this theme expressed concerns about potential adverse impacts of aquaculture operations on protected species and their habitats. The probability, occurrence, and distribution of protected species was already considered in the spatial mapping and suitability analysis used to develop the proposed AOA options. NOAA Fisheries analyzes the potential impacts from the proposed action and siting aquaculture in AOAs to protected species in Section 3.C.i. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be

E-20250205-01 E-20250210-01 E-20250212-01 E-20250220-01 E-20250210-02 m73-khm0-23qz O-20250123-06 O-20250128-03 m77-1d51-hccj m78-g022-3dvf m78-k3ds-f575 m7c-w9e7-lozg m7d-g4zs-p9cd E-20250220-06 E-20250220-10 E-20250220-11 m7d-w5k1-71cg m7e-40b7-icjr E-20250220-14		context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Future aquaculture operations proposed within an AOA would need to comply with all applicable laws. Chapter 5 summarizes anticipated federal environmental compliance requirements for site specific aquaculture facilities, and includes some state requirements that facilities may wish to consider. The ESA and MMPA, referenced by certain commenters, are included.
E-20250220-12	[...] “The DPEIS states "Aquaculture projects sited in Alternative 2 may have potential impacts on habitat connectivity for the Southern California Distinct Population Segment (DPS) of steelhead. Critical habitat for the Southern California DPS of steelhead includes the Ventura River, Coyote Creek, and the Santa Clara River. The close proximity of the North Study Areas AOA options to the mouths of those rivers could impact the steelhead's abilities to return to the river to spawn (PFMC 2022a)." DPEIS, at 119. VPD disagrees with this statement. As noted in the DPEIS, the closest proposed AOA in Alternative 2 is 10 km offshore and not in "close proximity" to the mouths of any river. Further, steelhead would be able to easily swim around aquaculture vessels and installed aquaculture gear; therefore, it is unclear how aquaculture projects would impact habitat connectivity for steelhead. VPD respectfully requests that this paragraph be deleted.”	Language has been updated in Section 3.C.ii to clarify that the potential for this kind of impact is unknown and not reasonably foreseeable, and if and when aquaculture projects are proposed, they may be required to undergo additional analyses under ESA/EFH to further assess impacts.

E-20250220-12	[...]“The DPEIS states that "A proxy to assess risk to protected species in the SCB may be considered from reviewing regional reports of entanglements in derelict fisheries gear." DPEIS, at 110. While the paragraph goes on to state that "Perspectives are divided on whether or not fixed gear fisheries bycatch should be used as a proxy to estimate risk of longline aquaculture entanglement" and notes several differences between aquaculture gear and fishing gear, NOAA's own data and analysis does not support that aquaculture entanglements occur at anything close to the same frequency as fishing gear. See Price, C.S., E. Keane, D. Morin, C. Vaccaro, D. Bean, and J.A. Morris, Jr. 2017. Protected Species & Longline Mussel Aquaculture Interactions. NOAA Technical Memorandum NOS NCCOS 211. 85 pp. ("Since some fishery gears, or components of the gear, are similar or analogous to aquaculture gear, it may be appropriate in certain instances to draw similarities between gear types as proxies, when determining relative risks to marine mammals to inform regulatory and management decisions with respect to aquaculture. However, much aquaculture gear is unique to that industry and direct comparisons to fishery gear may not be valid"). "Proxy" in this context is understood to be analogous without access to better information; if entanglements from fishing gear were used as a proxy during permitting or environmental review of offshore aquaculture farms, it will likely significantly overstate the potential risk and may result in denial of projects. VPD respectfully requests that NOAA reconsider this statement.”	Section 7 of the Endangered Species Act (ESA) requires Federal agencies to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitat. The Marine Mammal Protection Act (MMPA) regulates the incidental take of marine mammals, prescribes the permissible methods of taking and other means of effecting the least practicable adverse impact on marine mammal species or stocks and their habitat, and establishes requirements pertaining to the monitoring and reporting of such taking. In addition, commercial shellfish aquaculture operations may require a Rivers and Harbors Act Section 10 permit. These Section 10 permits undergo a public interest review to assess marine mammal impacts and typically must also comply with regional conditions that include measures to mitigate impacts. NOAA Fisheries may conduct more in-depth analyses under the ESA Section 7 consultation process, the MMPA, and other relevant protected species statutes if and when specific aquaculture projects are proposed. Where similarities exist with stationary fishing gear, using this as a proxy to assess impacts on marine mammals may be a starting point, but may not be the only information that may be used to assess potential impacts. NOAA uses a range of information when considering potential impacts from any new activity on protected resources. Nothing in this PEIS is meant to imply an endorsement or requirement for any method of evaluating risk, or mitigation measures. If and when an aquaculture project is proposed, multiple sources of information would be used to evaluate risk to marine mammals. This discussion in Section 3.C.i of the FPEIS has been updated for clarity.

Table 6-7. Responses – Statutory Compliance

Submission ID Number	Comment/Theme	Response

m3x-as13-f9k1 m4g-qjro-e74p m66-u1ha-euaj E-20250123-03 E-20250123-02 E-20250130-01 m6s-aixn-615a E-20250211-04 m77-1d51-hccj E-20250215-02 m7c-w9e7-lozg m7d-3p9a-os44 m7d-g4zs-p9cd E-20250220-04 E-20250220-10 E-20250220-11 m7e-40b7-icjr E-20250220-13 E-20250220-14 E-20250224-01 E-20250320-01	Mitigation	Commenters on this theme expressed concerns about mitigating the impacts of aquaculture operations or reiterated the need for BMPs, mitigation, and/or monitoring. The PEIS is one of the first two programmatic EISs prepared pursuant to Executive Order 13921, so it is both novel and broad in scope, resulting in an extraordinarily complex PEIS. While this PEIS analyzes the impacts of siting aquaculture facilities in AOAs, it does not propose any avoidance, minimization, mitigation, and monitoring measures, however, possible mitigation that could be considered for aquaculture facility development is discussed in Appendix 1. Unnecessary detail has been removed from Appendix 1 for clarity, based on public comment. BMPs and mitigation and monitoring suggestions in the document are provided with cited literature and could be considered in future project specific evaluations on a case-by-case basis.
m7e-40b7-icjr	Statutory compliance	The commenter stated that NOAA must comply with federal environmental statutes in its identification of AOAs, including initiating a consistency determination under the Coastal Zone Management Act, and initiating formal consultation under the Endangered Species Act. Identification of AOAs is a planning effort. It does not result in any authorization or permit. It does not authorize, permit, fund, or otherwise involve any action that would trigger consultation under the Endangered Species Act, essential fish habitat consultation under the Magnuson-Stevens Act, or legal obligations under federal law such as the Marine Mammal Protection Act, Coastal Zone Management Act, Migratory Bird Treaty Act, or National Marine Sanctuaries Act. Regulatory requirements associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. Any future aquaculture operations would need to comply with any applicable laws, which may include, among others, the Clean Water Act, Rivers and Harbors Act, Endangered Species Act, the Magnuson-Stevens Act, Marine Mammal Protection Act, Coastal Zone Management Act, National Historic Preservation Act, and National Marine Sanctuaries Act. Project compliance may include Endangered Species Act consultations, essential fish habitat consultations under the Magnuson-

		Stevens Act, and Marine Mammal Protection Act authorizations, as applicable. Chapter 5 summarizes anticipated federal environmental compliance requirements for site specific aquaculture facilities, and includes some state requirements that facilities may wish to consider. Any potential regulatory changes related to aquaculture are beyond the scope of this PEIS, which is limited to the identification of AOAs.

Table 6-8. Responses – Authority

Submission ID Number	Comment/Theme	Response
m73-khm0-23qz E-20250219-01 E-20250220-10 E-20250220-11 m7e-40b7-icjr E-20250220-13 E-20250220-15	Public Trust Concerns	Commenters on this theme stated that identification of AOAs allocates public trust resources to private corporate interests, or specifically stated that AOAs would exclude or displace other ocean users, generally referring to wild capture fisheries. Identification of AOAs is a planning effort. Identification of AOAs does not result in any authorization, permit, or regulatory impact that privatize a public resource or excludes or displaces other ocean users from any area. Identification of AOAs does not exclude other uses of the areas, such as fishing, tourism, and recreation, and does not set aside any areas for the sole use of any individual users or activities. Any future aquaculture operations would need to comply with any applicable laws, which may include, among others, the Clean Water Act, Rivers and Harbors Act, Endangered Species Act, the Magnuson-Stevens Act, Marine Mammal Protection Act, Coastal Zone Management Act, National Historic Preservation Act, and National Marine Sanctuaries Act. Project compliance would include any applicable requirements regarding potential impacts on the environment, including public trust resources. Applicable laws would include careful consideration of any potential impacts on the environment and other potential resource users.
m66-u1ha-euaj m6s-aixn-615a m73-khm0-23qz O-20250123-06 m7d-3p9a-os44 E-20250220-10 m7e-40b7-icjr E-20250220-14	Lack of regulatory framework for aquaculture operations	Commenters on this theme noted that there is no clear federal framework to effectively regulate aquaculture operations in federal waters and suggested that, absent a clear regulatory framework, NOAA should not identify AOAs and that the Magnuson-Stevens Act does not provide such authority. NOAA is identifying AOAs as directed by Executive Order 13921 (E.O. 13921), "Promoting American Seafood Competitiveness and Economic Growth" (May 7, 2020). Identifying AOAs under E.O. 13921 is also consistent with directives in the National Aquaculture Act of 1980 and the NOAA Marine Aquaculture Policy, for NOAA to promote sustainable aquaculture in the U.S. The proposed action does not

		create any new regulatory framework or change any existing statutory authority related to offshore marine aquaculture. NOAA is not relying on the Magnuson-Stevens Act for authority. Identification of AOAs is a planning effort, and does not result in any authorization or permit. Any future aquaculture operations would need to comply with any applicable laws. Any potential regulatory changes related to aquaculture are beyond the scope of this PEIS, which is limited to the identification of AOAs. No aquaculture operations are authorized or permitted through the AOA identification process. The Guide to Permitting Marine Aquaculture (NMFS 2022a) remains the most current federal guide to aquaculture permitting. In addition, the Guide to Leasing, Permitting, and Authorizing Commercial Aquaculture Operations off the California Coast (2025) includes information pertaining to Federal waters. Chapter 5 summarizes anticipated federal environmental compliance requirements for site-specific aquaculture facilities. Regulatory requirements associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. Any future aquaculture operations would need to comply with any applicable laws, which may include, among others, the Clean Water Act, Rivers and Harbors Act, Endangered Species Act, the Magnuson-Stevens Act, Marine Mammal Protection Act, Coastal Zone Management Act, National Historic Preservation Act, and National Marine Sanctuaries Act. Project compliance may include Endangered Species Act consultations, essential fish habitat consultations under the Magnuson-Stevens Act, and Marine Mammal Protection Act authorizations, as applicable.
E-20250219-01 m7d-3p9a-os44 E-20250220-10 m7e-40b7-icjr	Lack of statutory authority to identify AOAs	Commenters on this theme stated that Congress has not authorized NOAA to identify AOAs or regulate aquaculture, or asked about Congressional authority. NOAA is identifying AOAs as directed by Executive Order 13921 (E.O. 13921), “Promoting American Seafood Competitiveness and Economic Growth” (May 7, 2020). Identifying AOAs under E.O. 13921 is also consistent with directives in the National Aquaculture Act of 1980 and the NOAA Marine Aquaculture Policy, for NOAA to promote sustainable aquaculture in the U.S.

Table 6-9. Responses – Public Involvement Process

Submission ID Number	Comment/Theme	Response

E-20250220-15 E-20250220-14 E-20250220-13 m7e-6cbo-2lpq E-20250220-10 E-20250220-04 E-20250219-01 m7c-cjci-nvgc O-20250123-04 O-20250123-03 O-20250123-01 O-20250123-05 m73-khm0-23qz m66-u1ha-euaj	Concerns with public involvement process	Commenters on this theme expressed general concern about the public involvement process, or specifically identified particular groups whose input they felt should be incorporated more. NEPA requires federal agencies to provide opportunities for meaningful public involvement. An area is not identified as an AOA until the NEPA process is complete, and there are multiple opportunities for public input throughout the planning process that ends with the identification of AOAs. Stakeholder involvement has been and will continue to be pursued throughout the planning and permitting processes. A Request for Information solicited public input to help identify data needs, data sources, and project requirements to develop the planning objectives considered in the Atlas. Comments received during the NEPA scoping period were considered in the development of the Draft PEIS. Comments received on the Draft EIS have been considered in the development of this Final PEIS. NOAA fisheries provided a 90-day review period of the DPEIS, which is 45 days longer than the minimum recommended time, and conducted 2 public meetings. Chapter 1 has been updated with additional information about public involvement for this project. Two commenters who provided oral comments at public meetings expressed discontent and confusion that the sessions had been advertised online as "listening sessions" and therefore had been unclear on the purpose of the meeting and felt unprepared to provide substantive comments at the meeting; however, these commenters were still able to provide submissions via other methods during the on-going public comment period, and one of them did subsequently provide written submissions. While the announcement on the website used the term listening sessions for the meetings on the DEIS, the Dear Recipient letter included with the EIS described these meetings as a method to submit public comment. NOAA Fisheries values the public engagement process, and strives to develop tools and assessments using the best available science to make informed decisions.
m7c-w9e7-lozg m7d-g4zs-p9cd	Lack of tribal consultation	During scoping, NOAA Fisheries reached out to tribal governments in the Southern California region to inform them about the AOA PEIS process and invited them to participate in the AOA planning process. No tribe reached out with request for consultation or provided any comments. See Chapter 1 for an updated discussion of the public engagement process. Identification of AOAs is a planning effort. Identification of AOAs does not result in any authorization, permit, or regulatory impact. Any future aquaculture operations would need to comply with any applicable laws, which may include the National Historic Preservation Act (NHPA). Project compliance would include any applicable requirements regarding potential impacts, including consultation under NHPA.
E-20250220-02	The Pacific Fishery Management Council indicated their intent to submit a detailed comment letter after the closure of the DPEIS comment period and	All comments are part of the official project record. Input from the Pacific Fishery Management Council has been reviewed and incorporated into the FPEIS given the consultation relationship outlined in EO 13921.

	requested for that letter to be included in the administrative record.	

Table 6-10. Responses – Habitat concerns

Submission ID Number	Comment/Theme	Response
m4g-qjro-e74p m66-u1ha-euaj E-20250122-01 E-20250122-02 E-20250122-05 E-20250122-07 M-20250211-01 E-20250123-03 E-20250122-06 E-20250123-02 E-20250123-04 E-20250124-01 E-20250126-01 E-20250130-01 m6s-aixn-615a E-20250211-03 m73-khm0-23qz O-20250123-06 m78-g022-3dvf E-20250215-01 m7c-w9e7-lozg E-20250220-04 E-20250220-05 E-20250220-06 E-20250220-10 E-20250220-11 m7e-40b7-icjr m7e-6cbo-2lpq E-20250220-13 E-20250220-15	Habitat concerns, including noise and light pollution	Many commenters on this theme noted that aquaculture operations should not be located in or near sensitive habitats, like EFH Conservation areas, Habitat Areas of Particular Concern, migration routes, or coral. As discussed in the PEIS, sensitive habitat areas were already considered and avoided in the spatial mapping and suitability analysis used to develop the proposed AOA options. The set-back distances that were used in the spatial planning process are based on the best available science appropriate for the high-level planning goal of identifying potential AOAs suitable for all aquaculture operations, including shellfish, finfish, macroalgae or a combination of species, all of which may have various different types of potential habitat impacts. NOAA Fisheries analyzes potential impacts from the proposed action and siting aquaculture in AOAs to habitats in various resource areas throughout Chapter 3, including impacts on habitat mentioned by commenters like noise and light pollution, deposition, etc. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Future aquaculture operations proposed within an AOA would need to comply with all applicable laws. Chapter 5 summarizes anticipated federal environmental compliance requirements for site specific aquaculture facilities, and includes some state requirements that facilities may wish to consider. Numerous statutes that have habitat elements like MSA EFH, ESA Section 7, MBTA, FWCA, CWA, MMP etc., are included.
E-20250220-10	[...] “The suggestion in the DPEIS that strong ocean currents will sufficiently disperse pollutants	NOAA Fisheries disagrees with the characterization that this discussion of the potential effects of siting aquaculture is speculative. Potential impacts associated

	is speculative. Studies have shown that aquaculture waste can accumulate in sediments and disrupt seafloor ecosystems, particularly in regions with complex bathymetry like the Santa Barbara Channel."	with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Successful development of individual sites for commercial production is anticipated to require appropriate site-specific assessments and evaluations if and when a specific aquaculture project is proposed. These assessments may account for localized factors such as wave climate, currents, and seasonal wind events, particularly during winter storms. It is anticipated that siting considerations within any AOA option will require additional environmental surveillance to assess oceanographic or local conditions to determine suitability for specifics types of aquaculture and/or cultivation approaches. NOAA Fisheries has included the currently best available science and most relevant information in its analysis. The current information is sufficient to inform the decision maker on the impacts of the proposed action and alternatives at this time. Additional information about both deposition and the dispersion of aquaculture effluents has been added to Chapter 3 to enhance the analysis.
E-20250215-01	[...] "The seafloor is a vital part to not only the ocean ecosystem but to the maintaining of earth's climate control as well. The seafloor houses much of earth's carbon dioxide and when the seafloor is disrupted or destroyed by anchors and waste that like fish food and excrement from the farms... there can be a creation of 'dead zones' on the seafloor which adversely affect the environment and subsequently affect humans through the food chain as sea creatures could be displaced."	NOAA Fisheries analyzes potential impacts from the proposed action and siting aquaculture in AOAs to seafloor habitats in various resource areas throughout Chapter 3. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Future aquaculture operations proposed within an AOA would need to comply with all applicable laws. Chapter 5 summarizes anticipated federal environmental compliance requirements for site specific aquaculture facilities, and includes some state requirements that facilities may wish to consider. Numerous statutes that have seafloor habitat elements like MSA EFH, ESA Section 7, FWCA, CWA, MMP etc., are included.
E-20250220-05	[...] "FAD effect is not the correct concept. FADs just aggregated fish making them easy to catch and are often seasonal in nature, artificial reefs are designed to enhance or create habitat and are more permanent. FADs do not increase fish populations while well-functioning artificial reefs do[…] Aquaculture structures are somewhere between these two types of structures having connections between surface and bottom structures and being more permanent than a FAD. There are ample	The term "FAD effect" has been removed from the FPEIS where appropriate, and effects from new areas of wildlife aggregation are presented in the context of habitat for various resources. Quantitative measures of habitat value are not provided because the programmatic approach used in the PEIS does not evaluate individual project-level issues such as precise project impacts or specific design details that are not appropriate for decisions at the planning level. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed

	studies showing that aquaculture farms of all types function as habitat and serve as a source of nutrition for wild stocks. Finfish, shellfish and seaweeds would all have different levels of habitat value depending on if you were evaluating protection, provisioning, reproduction or some other aspect of habitat value[…]A better concept than FAD effect would be habitat value. This would also make the PEIS more useful for project specific EISs if there was an estimate for the various components."	action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects.

Table 6-11. Responses – Scope of the PEIS

Submission ID Number	Comment/Theme	Response
m4g-qjro-e74p m73-khm0-23qz m75-b1s2-vyup m7c-cjci-nvgc E-20250220-05 m7e-40b7-icjr E-20250224-01	Questions about tiering and/or requests for quantitative details that will be considered in future project NEPA/permitting	Commenters on this theme generally reiterated the need for project-specific analyses or requested details associated with the impacts of siting aquaculture that are unavailable at the programmatic level. As discussed throughout the PEIS, site-specific NEPA analyses are expected if and when aquaculture projects are proposed. Some types of quantitative details requested by commenters included details on structures, species and species-specific impacts, mercury absorption rates, amount of expected production, details on vessel activity, details on emissions, broodstock sourcing, etc. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. The need for quantitative data may in part be driven by statutory requirements. One commenter on this theme specifically noted that they expected tiered site-specific NEPA would require site-specific EISs, not EAs, given that open water marine aquaculture is largely untested on the U.S. West Coast. Future proposed aquaculture projects may tier from the PEIS if the lead agency determines the PEIS is appropriate for its needs. Any future aquaculture operation proposed to be located in an AOA would need to comply with all applicable laws, including any project-specific evaluation under NEPA, as applicable. The level and scope of an analysis is

		commensurate with the potential impacts of the action. Additional language has been added to Chapter 1 to clarify the scope of the PEIS.
m73-khm0-23qz m7e-40b7-icjr	Role of AOA identification in project-specific NEPA process	Commenters on this theme noted that NOAA must take a "hard look" at the direct, indirect, and cumulative impacts of identification of AOAs. It is "reasonably foreseeable" that identification of an AOA will result in siting of aquaculture facilities. A commenter stated that NOAA is downplaying the role that identification of AOAs will play in individual NEPA processes moving forward, and must fully address impacts now rather than relying on future NEPA processes. A commenter requested meaningful input and decision-making power from the California Coastal Commission, the California Department of Fish and Wildlife, other state agencies, and local stakeholders in future development. Identification of AOAs is a planning effort. Identification of AOAs does not result in any authorization or permit. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Any future aquaculture operations would need to comply with any applicable laws. Chapter 5 summarizes anticipated federal environmental compliance requirements for site-specific aquaculture facilities, and includes some state requirements that facilities may wish to consider. Regulatory requirements associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. NOAA Fisheries took a hard look at the impacts of the proposed action. It analyzed the specific resource areas as discussed in Chapter 3. It makes use of reliable data and resources.
m6s-aixn-615a E-20250220-10 m73-khm0-23qz	Identification of AOAs effect on California resources	Commenters on this theme noted the lack of a federal regulatory framework for aquaculture operations will negatively impact California resources and stated that identification of AOAs which may include finfish aquaculture disregards California law. Identification of AOAs is a planning effort. Identification of AOAs does not result in any authorization or permit. Any future aquaculture operations would need to comply with any applicable laws. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. Later actions of siting and operating aquaculture facilities may have impacts. Regulatory requirements associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. Any future aquaculture operations would need to comply with any applicable laws, which may include, among others, the Clean Water Act, Rivers and Harbors Act, Endangered Species Act, the Magnuson-Stevens Act, Marine Mammal Protection Act, Coastal Zone Management Act, National Historic Preservation Act, and National Marine Sanctuaries Act. Project compliance may

		include Endangered Species Act consultations, essential fish habitat consultations under the Magnuson-Stevens Act, and Marine Mammal Protection Act authorizations, as applicable. More language has been added to Section 3 and associated tables to identify Federally-managed fisheries and fisheries managed by the state of California. Section 3.C.ii identifies the potential risk of escape from finfish aquaculture operations, and this section has been updated in the FPEIS to enhance the analysis. Any future aquaculture projects would need to comply with any applicable laws, including applicable requirements regarding potential impacts on the environment. Chapter 5 identifies laws which may involve potential state coordination or consideration such as the Coastal Zone Management Act. In addition, certain federal laws such as, for example, the Clean Water Act and Clean Air Act have state involvement. The state would be able to participate in any applicable federal regulatory process to the same extent as it always would.

Table 6-12. Responses – Additional comments from cooperating and participating agencies (PFMC and EPA Region 9)

Submission ID Number	Comment/Theme	Response
E-20250224-01	[...] "In our July 2022 comment letter on the National Oceanic and Atmospheric Administration (NOAA) Notice of Intent to prepare a DPEIS, we provided detailed comments on potential impacts, mitigation measures and the Council's obligations under the MSA. Many of our comments have been incorporated into the DPEIS, and we request that that letter be incorporated by reference here."	Comments in the PFMC's letter on the NOI were considered in the development of the DPEIS, for additional information see the NOI Scoping Report. These comments have either been addressed in the final PEIS, in other comments or may be out of scope of this PEIS. On the latter point, requirements for individual projects would be evaluated on a project-specific basis by the relevant agencies, if applicable.
E-20250224-01	MSA National Standards	The PFMC recommended that the analysis of impacts from offshore aquaculture activities on fishery resources consider relevant Magnuson Stevens Act National Standards. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects
E-20250224-01	[...] "The Council does not support the use of naturalized species. However, if naturalized species are considered, the Council recommends they be	Usage of the terms "candidate" and "suitable" species has been modified throughout the FPEIS to clarify that no particular species are being recommended via this proposed action, and additional language to reiterate the current National

	evaluated on a species-specific basis and only permitted after thorough evaluation determines the species (and their interactions) is low risk to native species, habitats, and the environment…The Council recommends against identifying longfin yellowtail, olive flounder. and striped bass as "suitable" in the DPEIS."	Aquaculture Policy in regards to native species has been added in section 3C.ii. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects
E-20250224-01	[...] "The DPEIS should strongly encourage consultation with local members of fishing fleets, who have site-specific knowledge of seafloor features that may not be evident from existing mapping or survey data."	The parameters that were selected to conduct spatial modeling for AOAs were high level and meant to encompass all types of aquaculture. However, we recognize that the successful development of individual sites for commercial production is anticipated to require appropriate site-specific assessments and evaluations if and when a specific aquaculture project is proposed. These assessments may be essential to account for localized factors such as seafloor features. It is anticipated that siting considerations within any AOA option will require additional environmental surveillance to assess local conditions to determine the suitability for specific types of aquaculture and/or cultivation approaches.
E-20250224-01	[...] "The DPEIS lists channel catfish and rainbow trout (both are freshwater species) in an overview of saltwater species that are grown in the state for food….This should be corrected for the Final PEIS."	Language has been modified to correct this error.
E-20250224-01	Use of the term "offshore" to describe proposed AOAs.	The PFMC recommended using alternate language when characterizing the depth and location of the proposed locations, e.g., "moderately deep, coastal waters outside the State boundary line." In this PEIS, NOAA Fisheries uses the term "offshore aquaculture" in accordance with EO 13921. The statement identified by the commenter was not characterizing the AOA options, but describing where certain types of shellfish aquaculture were more likely.
E-20250224-01	[...] "Natural disasters and other "force majeure" events were deemed outside the scope for this DPEIS. Given the proximity of the Alternatives to earthquake faults, areas known to be subject to major wildfires, and prone to impacts from tsunamis from earthquake across the Pacific Rim, the Council recommends that those be considered in the analysis"	Additional language has been added to Chapter 1 to clarify the scope of PEIS.
E-20250224-01	[...] "The DPEIS references an environmental monitoring study of offshore finfish culture of mutton snapper and cobia in water off Puerto Rico which reported no evidence of anaerobic sediments beneath the fish cages, and inorganic nitrogen levels	Potential impacts associated with future aquaculture operations that may be sited in an AOA, and therefore what details from what references would or would not be relevant, would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit

	near the cages similar to background levels. However, the DPEIS fails to mention the depth of water those operations took place, nor does it mention prevailing currents, weather and oceanic conditions. Thus, it is not clear if that study would be applicable for informing potential finfish operations in any of the proposed AOAs. The other reports referenced in that section relating to a Pacific threadfin operation and an offshore aquaculture demonstration project off New Hampshire also do not describe the depth or prevailing conditions."	any specific aquaculture-related activities or individual aquaculture projects. The current information is sufficient to inform the decision maker on the impacts of the proposed action and alternatives at this time.
E-20250224-01	[...] "The DPEIS states on Page 84 that the Santa Monica AOAs options are within 5 km of inactive oil platforms. This appears to be an error as there are no oil platforms in marine waters within Santa Monica Bay."	The Santa Monica AOAs are within 5 kms of inactive oil and gas wells, not platforms. Language has been updated in section 3.B.iv to correct this error.
E-20250224-01	[...] "Considering recent wildfires in Southern California, fire retardants such as Phos-Chek and other chemicals should be included as potential impacts to water quality. A recent study found wildfire retardant is laden with toxic metals….How these metals may impact aquaculture operations, particularly whether those metals can be easily filtered or if they remain in the flesh of product, should be analyzed."	Additional language has been added to Section 3.D.viii to better characterize the affected environment and potential impacts for public health and safety. Seafood safety and testing is already discussed in the PEIS.
E-20250224-01	[...] "The Council agrees that recent updates to the methods and results for identifying cetacean Biologically Important Areas in marine waters of California published after the spatial modeling for the Atlas should be incorporated and reflected if and/or when NOAA publishes a Final DPEIS and during future site-specific environmental planning activities."	New figures have been added to the FPEIS to show the location of Phase II BIAs in relation to the AOA options.
E-20250224-01	[...] "The DPEIS correctly points out that marine aquaculture operations in the California EEZ are listed as a Category III fishery under the Marine Mammal Protection Act's list of fisheries. It should be noted the current List of Fisheries describes the	Language has been added to section 3.C.i for clarity.

	Hawaiian offshore pen culture as a Category II fishery."	
E-20250224-01	[...] "Fishermen operating in or near the areas identified under the Alternatives are reporting significant increases in the presence of dolphin and porpoise. The DPEIS references a report from the Mediterranean which showed site-fidelity, changed hunting tactics, and exhibited different social structures in dolphin species around finfish facilities. This could have profound impacts on the commercial fishery for market squid which has historic dependence on areas identified under the alternatives. The presence of dolphin and/or porpoise changes the behavior of market squid and makes them much less catchable and also will keep squid fishermen from deploying their nets to avoid potential interactions."	Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The analysis may be used to inform processes for individual projects proposed later in time. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. The PEIS already discusses new areas of wildlife aggregations and states that impacts are likely to be context and species specific. Language has been added to sections 3.C.ii and 3.D.i to note this as an example of that potential impact.
E-20250224-01	Additional information and references	The PFMC provided additional references and information to better characterize the affected environment. Language has been added to section 3.C.i (Federally-Protected Species and Habitats) and section 3.C.ii (Wild Fish Stocks) to reflect this new information provided by the PFMC.
E-20250224-01	[...] "The Council recommends including the market squid purse seine fishery which is active in those areas. The Council reiterates a comment included in our letter on the Notice of Intent that there is no Dungeness crab fishery which operates in the SCB."	Squid fishery data for 2000-2019, including the purse seine squid fishery, were considered in the spatial planning in the Atlas used to identify AOAs. The CA squid purse seine fishery was considered in the DPEIS, see Table 6. NOAA Fisheries confirms that both VMS data and CDFW landings data indicate activity in this area by the Dungeness crab pot/trap fishery over the period considered in the Atlas. NOAA Fisheries will continue to investigate any possible errors in data. As discussed in the PEIS in Section 3.D.i (Commerical Fishing), potential geographic overlap of an AOA with fishing grounds may disrupt or cause other changes to fishing access and fishing practices and more precise, localized data from fishing communities would be needed to ground-truth the high-level predictions in this PEIS if and when projects are proposed.
E-20250224-01	[...] 'The DPEIS states that: "It is likely that projects within an AOA would be sited with some distance between them; so commercial fishing vessels could take advantage of this effect." However, this does not apply to most commercial fishing vessels. Commercial fishing vessels using trawl gear, purse seine gear, or set nets would likely be unable to take advantage of any fish aggregating	Language in Section 3.D.i has been revised as suggested to improve clarity.

	benefits associated with aquaculture operations…A more accurate statement would be: "It is likely that projects within an AOA would be sited with sufficient distance between them; so that some commercial fishing vessels deploying certain gear types could take advantage of this effect."'	
E-20250224-01	[...] "The DPEIS should be updated to reflect the closure of the salmon fishery off California in 2024."	Language has been added to Sections 3.C.ii and 3.D to note the closure of these fisheries over the last several years due to low stock numbers.
E-20250224-01	[...] "The Council recommends the DPEIS analyze potential impacts on availability of live bait that support recreational fishing activities."	This PEIS considers pressure on forage fish, otherwise feed sourcing for potential future aquaculture operations is out of scope. The PEIS contains a reasonable range of alternatives to the proposed action. The current information is sufficient to inform the decision maker on the impacts of the proposed action and alternatives at the programmatic level.
E-20250224-01	[...] "The Council recommends the DPEIS not be finalized until the CEC's Report on suitable sea space is finalized. If there is overlap, that could change the analysis of potential cumulative impacts to fisheries and fishing communities."	NOAA Fisheries is publishing the FPEIS in accordance with the statutory timelines as required by NEPA. This effort has been added to the list of Ongoing Monitoring and Coordination outside of the AOA process for Offshore Energy and Public Services in Appendix 1.
E-20250224-01	Cumulative Impacts	The PFMC provided a list of projects, references, and impacts that it requested be added to the cumulative impacts analysis. Additional information has been added to Chapter 4 where it enhanced the analysis. There are thousands of actions occurring in Federal water off of Southern California on an annual basis. It is not possible, nor appropriate to list them in a NEPA document. NEPA requires consideration of reasonably foreseeable environmental effects of the proposed agency action. The PEIS addresses environmental effects at a programmatic level. The analysis includes the appropriate scope and level of evaluation for the proposed action and alternatives. The proposed action (identifying AOAs) is not anticipated to have individual significant effects on the administrative, physical, biological, socioeconomic, cultural and historic environments. Any effects of the proposed action, when combined with other past actions, present actions, and reasonably foreseeable actions are not expected to be significant.
E-20250320-01	[...] "The EPA recommends that the Final PEIS discuss the prospects and "triggers" for developing additional NEPA documentation, including site-specific Environmental Assessments (EAs) or EISs for individual projects, and when a proposed aquaculture project could rely on the PEIS for a tiered NEPA analysis."	The PEIS supports long-term planning. It provides information to assist regulatory authorities by providing information to support the permitting and environmental review processes for operations located within those locations. While the identification of AOAs does not change existing regulatory authorities or processes related to permitting offshore aquaculture, there may be a potential beneficial impact reflecting efficiencies in permitting and environmental review processes for future

		aquaculture through the information developed in this PEIS. NOAA Fisheries is not prescribing tiering guidance or NEPA triggers in this PEIS because NOAA Fisheries may not be the lead agency for site-specific NEPA analysis. Agencies possess differing regulatory authorities. Programmatic NEPA reviews can facilitate decisions on Agency actions that precede site- or project-specific decisions and actions, such as mitigation alternatives or commitments for subsequent actions, or narrowing of future alternatives. They also provide information and analyses that can be incorporated by reference in future NEPA reviews. Future proposed aquaculture projects may tier from the PEIS if the lead agency determines the PEIS is appropriate for its needs. Agencies relying on the programmatic NEPA review may consider whether its tiered review requires additional analysis that adds to or builds on the programmatic review. Additionally, the tiered review may raise new issues that may need to be addressed through additional agency reviews, authorizations or consultations (e.g., ESA Section 7, NHPA Section 106). Additional language has been added to Chapter 1.
E-20250320-01	[...] "To assist the permitting process for subsequent project proposals, we recommend the Final PEIS establish siting, design, operational, or other relevant implementation criteria that can be implemented by future proposed projects to address potentially significant impacts."	The Federal action is to identify one or more AOAs that may be suitable for multiple future offshore aquaculture projects in Federal waters of the SCB, and to evaluate the impacts of siting aquaculture in those locations. It is not a regulatory or permitting action and does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. The analysis may be used to inform such processes for individual projects proposed later in time. Siting, design, operational, or other implementation criteria pertaining to future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. NOAA Fisheries is not establishing siting, design, operational, or other implementation criteria at this programmatic level because the relevant criteria are dependent on the project and type of operation. This level of effort may be needed for siting and operation of individual projects. Successful development of individual sites for commercial production is anticipated to require appropriate site-specific assessments and evaluations if and when a specific aquaculture project is proposed. These assessments may account for localized factors such as wave climate, currents, and seasonal wind events, particularly during winter storms. It is anticipated that siting considerations within any AOA option will require additional environmental surveillance to assess oceanographic or local conditions to determine the suitability for specific types of aquaculture and/or cultivation approaches.

E-20250320-01	Public involvement	EPA region 9 recommended the FPEIS provide additional information on the public involvement processes, including coordination with Tribes, and how public involvement was incorporated into Agency decision-making. Additional language has been added to Chapter 1 about the public involvement process for this proposed action. The concerns raised by all commenters and actions taken to update the FPEIS are summarized in this appendix.

Table 6-13. Responses – Other individual/standalone responses

Submission ID Number	Comment/Theme	Response
m73-khm0-23qz	[...] "The agency's assessment does not reflect the findings of the October 2024 Science Advances issue on aquaculture, where peer-reviewed North American scientists detailed the many shortcomings of ocean-based finfish farms."	The journal special issue cited by the commenter was not available during the preparation of the DPEIS, which was published shortly after the provided reference. All references provided by all commenters have been reviewed and considered for addition in the development of the FPEIS, if they provided relevant additional information or changed the basis of the analysis or conclusions.
m75-b1s2-vyup	[...] "the cumulative effects of light, noise, and nutrient pollution could create what is generically discussed in the literature as "a vacuum cleaner effect". Such an effect would heavily influence the fitness, diversity, and behavioral patterns of native organisms[...]The idea of predator attraction and general light pollution was well mentioned in the report, but things like the introduction of insect populations in facilities due to artificial light and anthropogenic movement, and changes in zooplankton migration would likely have an effect on all levels of life in the area"	While aquaculture operations can introduce light, noise, and nutrient inputs, effects are typically minimal compared to broader human activities in busy ocean environments (see: Price and Morris 2013, Morris et al. 2024). Modern aquaculture practices are designed to minimize environmental impacts through improved farm siting, efficient feed management, and advanced technologies that reduce excess waste. Possible mitigation that could be considered for aquaculture facility development is discussed in Appendix 1. Mitigation measures already practiced by the industry and environmental monitoring may also reduce cumulative impacts. Any specific operation is anticipated to require appropriate assessments of cumulative impacts and consideration of appropriate mitigation measures if and when a specific aquaculture project is proposed. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects.
m7d-3p9a-os44	[...] "The World Health Organization has identified antimicrobial resistance as one of the top threats to public health worldwide. Similarly to land-based livestock and poultry operations, concentrated fish operations necessitate "the misuse and overuse of antibiotics to compensate	NOAA Fisheries disagrees with the characterization that aquaculture necessitates the misuse or overuse of antibiotics. At present, there are no antibiotics approved by the U.S. Food and Drug Administration (FDA) for use with any marine fish or shellfish species. Any future use of antibiotics in U.S. aquaculture would require rigorous oversight, including FDA approval, veterinary supervision, and regulations to ensure seafood safety. Modern aquaculture practices emphasize preventative health

	for crowded, stressful conditions." Up to 5% of antibiotics used in aquaculture is lost to the surrounding environment, a statistic made all the more troubling when considering that the surrounding environment for facilities in the AOAs would be the open ocean"	strategies such as improved genetics, optimized nutrition, proper stocking densities, and enhanced site management to reduce disease risks without relying on antibiotics. NOAA recognizes the importance of responsible aquaculture development and remains committed to ensuring that environmental protection and public health are key priorities in the planning and management of aquaculture operations. The DPEIS discussed potential impacts from the use of antibiotics and other husbandry materials/therapeutics on potentially-farmed species (Section 3.C.iv) and public health and safety (Section 3.D.viii). Based on public comments, additional language has been added to the FPEIS to clarify that the use of antibiotics and other husbandry materials/therapeutics may also impact wild fish stocks. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects.
E-20250220-01	[...] "Fish farming goes against one of our basic religious principles: Respect for the interdependent web of life of which we are a part."	Thank you for your participation in the National Environmental Policy Act process.
E-20250220-07	One commenter provided additional insights to enhance the PEIS, mainly focused on sections referencing seaweed cultivation	NOAA Fisheries agrees that as the first and only applicants proposing to use an identified AOA, the commenter can provide meaningful input on the PEIS, which may help for future tiering should the lead agency determine the PEIS is appropriate for its needs. All provided references and comments have been reviewed and considered for addition in the development of the FPEIS, if they provided relevant additional information or changed the basis of the analysis or conclusions.
E-20250220-14	[...] "The DPEIS references the maps and figures included in Morris et al. (2021), however, those maps do not appear to include overlays for the proposed AOAs in relation to potential conflicts or resource areas. Recommendations: The Agencies recommend including figures that clearly show the coastal uses and resources in the vicinity of the proposed AOAs, including bathymetry, shipping lanes, commercial/recreational fishing activity, hard bottom habitat, submarine infrastructure, cultural resources, sensitive marine mammal zones, and other potential conflicts."	Some maps and figures in the FPEIS have been updated to better reflect the proposed action and some potential conflicts, however the PEIS is not repeating figures for all coastal uses, resources and potential conflicts offshore across the SCB; these figures are already available in the Atlas.
E-20250220-10	[...] "The carrying capacity of the Santa Barbara Channel needs to be taken into account in order to appropriately delegate size and biomass for offshore aquaculture projects. It is imperative that these variables are fully evaluated in an assessment of offshore aquaculture's feasibility in the Channel so that risk can be minimized."	Ecological, biological, and social carrying capacity would be carefully considered as offshore aquaculture develops. The parameters for identification of AOAs in southern California included an area of 500-2,000 acres for each identified AOA, in order to accommodate three to five commercial-scale farms. Successful development of individual sites for commercial production is anticipated to require appropriate site-specific assessments and evaluations if and when a specific aquaculture project is proposed. The proposed action does not propose to authorize

		or permit any specific aquaculture-related activities or individual aquaculture projects.
E-20250220-11	[...] “I have five major concerns with the proposed AOA DPEIS and siting exercise: 1) ignoring water quality data layers, 2) failure to mitigate for ongoing NOAA fisheries monitoring, 3) not using this opportunity to leverage structures to enhance ocean observations, 4) ignoring endangered and protected species migration patterns (including by your own agency!), and 5) farming of high trophic level and non-native species requiring high feed inputs and not solving American seafood import discrepancies.”	For the siting analysis, NOAA consulted with the FDA and EPA on distance from point sources of pollution such as sewage outfalls. We used a 3-mile setback from all point sources. See Appendix C-10 of the Atlas for a description of the setback for outfall pipes and diffusers. The AOAs are not prescriptive to the type of aquaculture, so the permitting process will review considerations that are specific to the specific type of aquaculture if and when a project is proposed. We used best available science to characterize the AOA options and will further characterize specific locations in respect to water quality and distance to point sources if and when projects are proposed. We do not anticipate any interruption of fisheries or oceanographic research cruises or data collection efforts as a result of identifying AOAs. Historical records of research cruises were included in the spatial analysis for identification of AOAs (e.g., California Cooperative Oceanic Fisheries Investigations). The locations of these ongoing research efforts would be considered in future siting and permitting decisions if and when a project is proposed. In regards to leveraging offshore aquaculture for ocean observation, the Proposed Action does not include the topic of your comment. Please see Chapter 2 (Description of Proposed Action and Alternatives) of the PEIS for a definition of the scope of the project. The probability, occurrence, and distribution of protected species was already considered in the spatial mapping and suitability analysis used to develop the proposed AOA options. To holistically consider protected species in the siting analysis, a novel combined data layer providing the overall score for select protected species was developed through collaboration with NMFS West Coast Region and NMFS Office of Protected Resources (Morris et al. 2021, Appendix B). A scoring table (Morris et al. 2021, Table 2.2) was developed to assign relative suitability scores to protected species data based on species status, population size, and trajectory. Protected species include those listed under the Endangered Species Act (ESA) and/or protected under the Marine Mammal Protection Act (MMPA). This approach was preferred given that this spatial planning process does not consider gear-specific aquaculture or other secondary interactions with protected species, and because a more generalized approach was transferable across regions. This submodel contains only highly vulnerable protected species, so there are a number of protected species, especially marine mammals, which were excluded from this

		analysis. The combined data set considers Biologically Important Areas and Critical Habitat and was developed through collaboration with NMFS West Coast Region and NMFS Office of Protected Resources. Monitoring and reporting to permitting agencies is likely to be a requirement of permits that are granted by USACE, EPA, and other agencies, as appropriate, for projects in Federal waters. Future consultations and permitting would likely include this consideration, if and when projects are proposed. The AOA identification process does not set monitoring requirements for any future aquaculture operation. Potential impacts associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity. The proposed action does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects. The goal of identifying AOAs is to promote American seafood competitiveness, food security, economic growth, and to support the development of domestic commercial aquaculture, consistent with sustaining and conserving marine resources and applicable laws, regulations and policies. The growth of a domestic aquaculture industry will help to satisfy the increasing domestic demand for seafood, which is currently largely supported by an imported product (Shamshak et al. 2019). The U.S. consumer has shown a willingness to pay for a higher quality, safer, and locally-sourced seafood options, which alongside the creation of a strong domestic aquaculture industry, can decrease our reliance on imported seafood thus lowering import discrepancies (Fonner and Sylvia 2015). In respect to feed inputs, as stated in the DPEIS, it is beyond the scope of this PEIS to analyze if feed would be live, fish-based, from a wild or cultivated source, and the location where it would be sourced. Feed type and sourcing is a project-level decision. This PEIS addresses the potential pressure on forage species from fed-aquaculture in Section 3.C.ii, and additional language has been added to the FPEIS to enhance the analysis.
E-20250215-01	One commenter proposed another alternative "that instead of having big aquacultures there could be (1) an amount of more but smaller aquacultures spread out across the sea to try and reduce the size of these possible 'dead zones' on the seafloor. Instead of using anchors they could also use floating piers which have been proven to have less effect on the natural habitat."	NOAA Fisheries considered the impacts associated with the scale and size of potential aquaculture operations. The Agency is proposing AOAs ranging from 500 to 2,000 acres. This size reflects a planning goal developed through public engagement that meets industry and engineering requirements, is suitable for all types of aquaculture development including the cultivation of finfish, macroalgae, shellfish, or a combination of species, and would support 3-5 farms. Details regarding the development of reasonable alternatives are provided in Chapter 2. As discussed in the PEIS in Section 3.B.iii, organic enrichment of the seabed is the most widely encountered environmental effect of culturing fish but siting in deep, well-flushed areas over erosional seafloor limits effects seen in nearshore environments. At this time, NOAA Fisheries did not limit the types of gears that may be proposed in AOAs, in accordance with EO 13921.

m7e-40b7-icjr	[...] “NMFS must also consider pesticide use in industrial shellfish production, which creates its own suite of risks and adverse impacts. Pesticide use to clear away wild species and allow intensive shellfish farming has harmful impacts on biodiversity. For example, in Washington state, shellfish growers have historically used pesticides to kill native burrowing shrimp, recently changing from carcinogenic carbaryl to experiments with the neonicotinoid imidacloprid. Currently, Washington permits shellfish growers to use the herbicide, imazamox, to control Japanese eelgrass. If used at facilities in the AOAs, these pesticides and herbicides would not only kill the target species — they would also harm other invertebrates, fish, and the species that rely on these species as a food source.”	The referenced shellfish aquaculture practices are characteristic of farming practices in the estuaries of the Pacific Northwest, and are not relevant in the offshore environment of the SCB. As such, the pesticide examples referenced do not apply to offshore aquaculture.
O-20250128-01	[…] “in the document, where can I find the information that decided or determined the San Diego region was not a suitable…place for aquaculture”	The PEIS discussed what areas of the SCB were determined to be suitable and carried forward for consideration in NEPA Alternatives in Section 2.B (Alternatives Considered but Not Carried Forward), reflecting the specific planning goal for AOAs. Additional language has been added to this section to clarify that other areas in the SCB may still be suitable for aquaculture, even if they were not considered in the alternatives of this PEIS, and to clarify what areas not carried forward were closest to San Diego.
E-20250220-06	Relation to USACE Nationwide Permit 56	One commenter reiterated concerns that were raised and enumerated in detail in a lawsuit challenging the legality and sufficiency of the US Army Corps Nationwide Permit No. 56 for aquaculture. As the commenter noted, Corps Nationwide Permit No. 56 is the subject of ongoing litigation in Federal court. NOAA is not a party to that litigation. Challenges or concerns raised in the NWP 56 litigation are beyond the scope of this PEIS, which evaluates the potential identification of an AOA or AOAs in the waters of Southern California, and includes potential effects that may result from siting of a project within an AOA. Regulatory requirements associated with future aquaculture operations that may be sited in an AOA would be context and location-specific, and dependent on the proposed activity.

Appendix 7: Public Comments

Full text of public comments

Comment ID Number: m3x-as13-f9k1

Submitted Via: Regulations.gov **Submitter Name/Organization:** Amphibian Refuge

Comment:

According to the Environmental Impact Statement (EIS), numerous Federally-protected species occur in the waters off of Southern California. As discussed on page 110 of the EIS, the National Marine Fisheries Service must conduct a thorough evaluation of the risk and severity of interactions with Federally-protected species for any proposed aquaculture location. Avoidance and mitigations measures must be developed to ensure minimal impact to Federally-protected species.

Comment ID Number: m4q-ekrw-vylo

Submitted Via: Regulations.gov **Submitter Name/Organization:** John Langford III - Colorado

Comment:

We must implement systems that regenerate marine ecosystems and move away from unsustainable practices. We must preserve our beautiful oceans.

Comment ID Number: m4q-hb2t-4zag

Submitted Via: Regulations.gov **Submitter Name/Organization:** Patricia Armfelt - Venice, FL

Comment:

If we don't act now, it will be the end of us! I hate tjus, but I don't even encourage my 3 children to have kids anymore! I want grandchildren, butt we are leaving them a mess

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Comment ID Number: m4r-095c-tuk9

Submitted Via: Regulations.gov **Submitter Name/Organization**: Jane Elmore - Charlottesville, CA

Comment:

I have been interested in the oceans since I was a child and received that magazine/newsletter, Highlights. It contained pictures of whales and explained how each whale tail was unique. The ocean and this planet have so many beautiful forms of life, and without some protections and smarter approaches in harvesting food, we will eliminate the precious life that helps feed us. I hope sustainable and positive methods can be used to ensure that fish will be plentiful in years to come.

Comment ID Number: m5o-n6q5-cgue

Submitted Via: Regulations.gov **Submitter Name/Organization:** Micheal Frances Smith - Ojai, CA

Comment:

The government in FRANCE supports its local and regional farmers, cheese producers, wine makers, etc. by a variety of measures including subsidies and other forms of support.

I encourage you to support small farms as a way to foster competition, innovation, and local community benefits.

It's no longer time to allow large-scale operations to monopolize new industries like this one.

We have an opportunity to align aquaculture with local environmental and economic goals. California should be a leader in how it develops its new industries. I encourage you to be like FRANCE and understand the unique qualities that our environment give us as Californians and protect and encourage our new industries. Especially, don't allow big corporations to come in and dominate what should be a series of small business owners - like the wine producers in the Champagne region of France, for example.

I encourage you to consider looking at France for a model of how new industries should be supported in California.

Micheal Frances Smith, LMFT

Comment ID Number: m6f-r8tq-xlet

Submitted Via: Regulations.gov **Submitter Name/Organization:** Dr. Anthony Knight - Studio City, CA

Comment:

I strongly oppose any expansion of aquaculture in the Santa Barbara Channel and the Santa Monica Bay. I have personally witnessed humpback whales foraging for food near the kelp growing aquaculture area off of Santa Barbara. This is an entanglement hazard. Whales, dolphins, sea lions, and other marine mammals are protected under the Marine Mammal Protection Act and some of them are protected under the Endanged Species Act. ADDITIONALLY, these are a hazard to navigation from extensive boat traffic in the areas.

Comment ID Number: m78-k3ds-f575 AND m78-k5l1-d6bn

Submitted Via: Regulations.gov **Submitter Name/Organization:** Anonymous

Comment:

I OPPOSE the aquaculture projects because of concerns related to whale and marine mammal entanglement, negative impact on the natural ecosystem, and hazard to navigation in busy area

Comment ID Number: m7d-g4zs-p9cd

Submitted Via: Regulations.gov **Submitter Name/Organization:** Sarah Garcia - Camarillo, CA

Comment:

As a lifelong resident of neighboring Ventura County, and an alumna of UC Santa Barbara's environmental studies program, I vehemently oppose this project for several reasons.

(1) The potential for negative impacts on native wildlife, many of which are endangered species, is too great to ignore. Even with the most stringent mitigation techniques, the risk remains.

(2) Losing such wildlife, including many whale species, would also negatively impact the economy as much of Ventura and Santa Barbara county tourism relies on activities like whale-watching, dolphin sightings, etc. With tourism being one of the top economic industries in Santa Barbara, the potential loss of revenue for hotels, tour and aquatic recreation companies, restaurants, etc. would be devastating to the existing economy of the region.

(3) The indigenous peoples of the area in question, the Chumash, also vehemently oppose this project, as it would disrupt and irreparably damage their cultural connection to their ancestral lands through the limitation of their cultural practices and the negative impacts likely to occur to the native animal and plant species in the Santa Barbara channel. The Chumash people have already endured incredible loss over centuries in the name of economic growth, and it must not continue.

I end my comments with the sentiment that protection of wildlife and economic growth are not mutually exclusive. There are many other ways to grow our economy that would not burden or damage the delicate and irreplaceable ecosystem of the Santa Barbara Channel. Those should be considered over any project such as this.

Comment ID Number: m76-mnng-wpbx

Submitted Via: Regulations.gov **Submitter Name/Organization:** Anonymous

Comment:

Out of the proposed alternatives I believe sub-alternative 3b would best protect the hydrodynamic processes and protected habitats while still complying with Executive Order 13921. I agree that the expansion of commercial aquaculture is important because of our nation's growing demands which is why I do not support the no action alternative. However, I retain the belief that the protection of our oceans takes precedence. The identification of aquacultures would release emissions that would cause further ocean acidification therefore harming hard shelled organisms such as the Pacific and Eastern oysters, who's numbers are in decline, and coral reefs that provide habitats for numerous organisms and play an important role in ocean purification and erosion prevention. It is also stated in the EIS that "it is not possible to quantify GHG emissions for potential aquaculture projects in the potential AOAs at this time". Since the extent of the impacts aquaculture projects would cause is unknown I believe it is best to limit the identification of potential AOA sights to a smaller area such as the one proposed on sub-alternative 3b.

Comment ID Number: m66-u1ha-euaj

Submitted Via: Regulations.gov **Submitter Name/Organization:** Giulia Malerbi - Head of Global Policy, Aquatic Life Institute

Comment:

To Whom It May Concern,

Aquatic Life Institute (ALI) appreciates the opportunity to provide feedback on the Draft Programmatic Environmental Impact Statement (DPEIS) for the Identification of Aquaculture Opportunity Areas (AOAs) in Federal Waters off Southern California. As an organization committed to improving aquatic animal welfare and advocating for sustainable aquaculture practices, we commend NOAA Fisheries for its efforts to balance food production, environmental conservation, and economic interests. However, we believe that several critical areas require further attention to ensure that aquaculture development in these waters is responsible, ethical, and sustainable.

Aquatic animal welfare is a central concern that must be addressed within the DPEIS. The document currently lacks sufficient measures to ensure humane treatment of farmed species, including standards for stocking densities, health management, and slaughter practices. High-density farming environments can lead to significant stress and increased susceptibility to disease, while inadequate health monitoring and poor water quality management can result in high mortality rates. Additionally, the absence of humane slaughter requirements is a missed opportunity to align aquaculture practices with growing public and scientific recognition of animal sentience and the ethical imperative to minimize suffering.

Environmental risks associated with aquaculture operations are another pressing issue. The potential for nutrient pollution, habitat degradation, and the escape of farmed species must be mitigated through robust management practices. Without stringent waste management and monitoring systems, aquaculture operations could exacerbate issues like eutrophication and hypoxia in surrounding waters. Furthermore, careful consideration must be given to the siting of facilities to avoid ecologically sensitive areas, including essential fish habitats and marine protected areas. Prioritizing the cultivation of native species is also critical to reducing the risks of invasive species establishment and genetic dilution of wild populations.

The DPEIS should also address the socio-economic implications of aquaculture development more comprehensively. Local communities, indigenous groups, and maritime industries have valuable insights and perspectives that should be integrated into the planning process. Meaningful stakeholder engagement is essential to ensure that the benefits of aquaculture are equitably distributed and do not come at the expense of traditional livelihoods or cultural practices. Additionally, the economic impacts of aquaculture on existing industries, such as fishing and tourism, must be assessed to prevent unintended harm to these sectors.

Finally, a clear regulatory framework is necessary to oversee aquaculture operations effectively. This includes the development of mechanisms for monitoring and enforcing compliance with environmental and animal welfare standards, as well as adaptive management strategies to respond to emerging challenges and new information. Transparency and accountability in decision-making processes will be critical to maintaining public trust and ensuring the long-term success of aquaculture initiatives.

ALI supports the responsible development of aquaculture in Southern California's federal waters but emphasizes that this must not compromise aquatic animal welfare, environmental integrity, or community

Comment ID Number: m66-u1ha-euaj

interests. By addressing the issues outlined above, NOAA Fisheries can establish a model for sustainable aquaculture development that balances ecological, ethical, and economic priorities.

Thank you for considering these comments. We look forward to further engagement on this important initiative.

Sincerely,

Giulia Malerbi

Head of Global Policy

Aquatic Life Institute

Comment ID Number: m77-1d51-hccj

Submitted Via: Regulations.gov **Submitter Name/Organization:** Eliza Hammari – United States

Comment:

Hello! After reading through the NOAA's PEIS on identifying AOAs in Southern CA, I have a few thoughts I'd like to share. Overall, I felt that the document did a good job of considering a plethora of factors and requirements in the spatial analysis process of aquaculture planning and siting. I appreciated how the analyses were rooted in academia and how it takes information from the Atlas published in 2021.

I noticed how in the evaluation of environmental justice impacts on pages 231-237, Alternatives 2, 3, and 4 did not have equal impact distribution on their communities. It was stated that the communities affected in Alternatives 2 would be "less able to adapt to changes brought on by a developing new industry such as offshore aquaculture." All alternatives 2-4 were described as being "especially vulnerable" to potential impacts from aquaculture. This has me concerned, and I hope this difference in EJ's impact to varying communities with their own unique histories of discrimination and gentrification is given weight and strong consideration when decisions are made on where to place the AOAs.

Additionally, in the section regarding federally-protected species and habitats on pages 105-129, I was grateful for the amount of detail included on how each unique species might be affected in the several ways listed. I felt that something missing that could fit into this section is the option for conservation programs as a method to mitigate any potential loss from aquaculture's impact on a species. For example, if there is a protected species' habitat overlap in the selected AOA site, rehabilitation measures could be put in place to make up for whatever harm occurs to the species. This method could open up new areas for siting as long as species were being conserved and taken care of.

All in all, I think this EIS has taken a significant amount of information into consideration and will serve as a valuable guide in protecting our marine systems off the coast of California.

Comment ID Number: m78-g022-3dvf

Submitted Via: Regulations.gov **Submitter Name/Organization:** Becky Winchester - Santa Barbara, CA

Comment:

I object to the creation of 1-8 Aquaculture farms in or near the Santa Barbara Channel, for many reasons:

This area has a high concentration of whales and dolphins. It is a migration route for close to a thousand gray whales traveling up and down this coastline and channel twice a year. These whales are already dropping in numbers, probably due to reduced food due to ice melt in the Arctic.

Blue whales and Humpback whales are 2 more of the 27 different cetaceans that spend time in this area. Both are Endangered and Protected within the MMPA. Vessel strikes and entanglement are the leading causes of death to whales. This population is already threatened with 100 ships a week passing through on the shipping lanes.

Many local, small, ecotourism businesses thrive here, creating good jobs and helping to educate the public on the importance of healthy whales to benefit the health of the ocean and the planet.

The many vessels carrying supplies and materials to construct aqua farms , as well as monitoring, feeding, and harvesting the areas would greatly increase the likelihood of vessel strikes and entanglements for whales dolphin and sharks well as noise and light pollution.

Food for finfish, antibiotics, and concentrations of poop in this area would alter the ecosystem in ways that have not been studied. These farmed species may escape and cause imbalances in the natural biodiversity as well.

Regrading kelp, efforts to rebuild kelp forests on sea floor structures is a less dangerous alternative than suspending a network of lines below the surface that increase risks of entanglements.

The thought of placing more than one aquaculture structure in the channel only increases the risks to these intelligent marine mammals, who have called this area home for thousands of years.

Aquaculture farms that are constructed on land eliminate the risks to the rich diversity of marine life in the Santa Barbara Channel.

Submitted Via: Regulations.gov **Submitter Name/Organization:** Cooper Bond - Utah

Comment:

I'd like to first express my gratitude to NOAA for drafting an extremely comprehensive and detailed EIS that I feel properly conveyed to the public the full range of impacts a fishery location could have on each of these locations. It is my assumption, based on the document that the aim of this EIS was to primarily address the location of where such an operation would be best suited. However, the size, scale, and design of these operations cannot be understated when assessing the impact. I would hope that in the event of issuing permits, an additional EIS is drafted regarding structure, size, transportation channels, and specific species involved to fully address the potential impact.

I feel as though the document properly addressed the possibility of genetic drift in native wildlife in the event of an escape. However, I feel the cumulative effects of light, noise, and nutrient pollution could create what is generically discussed in the literature as "a vacuum cleaner effect". Such an effect would heavily influence the fitness, diversity, and behavioral patterns of native organisms. The idea of predator attraction and general light pollution was well mentioned in the report, but things like the introduction of insect populations in facilities due to artificial light and anthropogenic movement, and changes in zooplankton migration would likely have an effect on all levels of life in the area. Most of the literature on this topic focuses on shorelines of terrestrial ecosystems as they are most frequently in interaction with artificial light, but in such an operation with a variety of factors driving the interest in native life towards these facilities, I feel additional research is in order to fully consider the compounding effects of these operations.

Additionally, I feel the human health consequences of increasing fish consumption sourced in that locality should be considered. The absorption of heavy metals, including mercury was mentioned, but specific mercury absorption rates and the volume of mercury that could potentially be redistributed back into the public and terrestrial environments should be an important consideration. I also did not understand the rationale for the exclusion of natural disasters in the report. I imagine the human and natural impacts would vary depending on location due to common ocean currents and population centers. This also has environmental justice implications as well. Perhaps a clearer statement on why it was deemed out of scope is in order.

Some citations regarding compounding effects of light pollution:

Manfrin, A., Singer, G., Larsen, S., Weiß, N., Van Grunsven, R. H., Weiß, N. S., ... & Hölker, F. (2017). Artificial light at night affects organism flux across ecosystem boundaries and drives community structure in the recipient ecosystem. Frontiers in Environmental Science, 5, 61.

Perkin EK, Hölker F, Tockner K. 2014 The effects of artificial lighting on adult aquatic and terrestrial insects. Freshwat. Biol. 59, 368-377. (doi:10.1111/fwb.12270) Crossref, Web of Science, Google Scholar

Eisenbeis G 2006 Artificial night lighting and insects: attraction of insects to streetlamps in a rural setting in Germany. In Ecological consequences of artificial night lighting (eds Rich C, Longcore T), pp. 281-304. Washington, DC: Island Press.

Dijkstra KDB, Monaghan MT, Pauls SU. 2014 Freshwater biodiversity and aquatic insect diversification. Annu. Rev. Entomol. 59, 143-163. (doi:10.1146/annurev-ento-011613-161958)

Moore MV, Pierce SM, Walsh HM, Kvalvik SK, Lim JD. 2001 Urban light pollution alters the diel vertical migration of Daphnia. Verh. Int. Verein. Limnol. 27, 779-782

Comment ID Number: m4g-qjro-e74p
Submitted Via: Regulations.gov **Submitter Name/Organization:** Sofia Gutierrez - Santa Barbara, CA

December 8th, 2024
Sofía Gutiérrez, MS Environmental Science and Management candidate
Bren School of Environmental Sciences and Management, University of California Santa Barbara
ESM257 Coastal Policy and Management, Comment Letter Assignment

Re: Comments on Potential Aquaculture Locations in Southern California, Santa Barbara Alternative 2

Dear National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service West Coast Region (NMFS) and cooperating agencies U.S. Environmental Protection Agency (EPA), U.S. Army Corps of Engineers (USACE) and U.S. Coast Guard (USCG):

I am submit comments on the *Draft Programmatic Environmental Impact Statement (DPEIS) regarding the identification of Aquaculture Opportunity Areas (AOAs) in United States Federal Waters of Southern California* [1]. This letter provides feedback on proposed Alternative 2 (Chapter 2) and the environmental and Climate Change impacts associated with the proposal of AOAs in Santa Barbara Channel to ensure its sustainable establishment and practices for the support of responsible Blue Economy and Food Security of the United States.

Comments

Comment 1: Impacts from proposed Alternative 2: Santa Barbara Channel on Whale Species are extense. Mitigation actions needs to be extended.

The proposed boundaries shown in Figure 1, p. 55 (Chapter 2) may coincide with whale feeding grounds.Monitoring on behaviour, population stocks assesments, and occurances observations have been extensively studied by various organizations along the coast with the aim of contributing to conservation efforts. However, because resources are limited further away from the coast, information gathered on this species may be underestimated. The draft mentions that the proposed alternatives are placed in areas of high occurances of Gray, Humpback and Blue whales, and does well in

[1] U.S. Department of Commerce, National Oceanic and Atmospheric Administration. (2024). *Draft Programmatic Environmental Impact Statement (DPEIS) for the Identification of Aquaculture Opportunity Areas (AOAs) in Federal Waters of Southern California*. NOAA. [https://www.fisheries.noaa.gov/s3//202411/wcr-aoa-dpeis-13nov24.pdf]

describing the potential impacts from the industry associated with noise, collisions and entanglement as well as proposing mitigation measures on this matter.
Based on the extensive supporting literature, the draf also does very well at describing impacts associated with *Shellfish and Macroalgae* subalteranative cultivation. However, the document fails on quantifying the impacts of this alternative on whales and how it is expected to be impacted by different management scenarios regarding number of individuals, seasonality, behaviour, vessel activity, amount of expected production, impacts on tourism, etc. Since it is known, that the proposed alternative it is an area with high vessel traffic the stablishment of aquaculture in this area would significantly increase the risks of collision, noise impacts even though considering the mitigations actions mentioned on the draft document.

Comment 2: Science based approach must consider dynamism of climate change effects in its proposed actions and and alternatives

Marine heatwaves are of high concern for California fisheries. Climate change is predicted to decrease salinity and dissolved oxygen in many proposed Aquaculture Opportunity Areas (AOAs)." [1] . Due to the need of incrementing food security but also considering climate change implications in aquaculture, it is relevant to better understand climate change implications on the estabishment of aquaculture and in which ways can aquaculture contribute to Green House Gas (GHG) emissions. Climate change can highly impact efficiency of Aquaculture Areas in California and because of this stablishment must be proposed with rigurosity. The imminent threat of climate change in food security makes relevant to ask, are there proposed alternatives for different climate change scenarios? Where climate change scenarios considered in the development of the alternatives and subalternatives for the areas proposed?

<u>Recommendations</u>

Recommendation 1: Impacts from proposed Alternative 2: Santa Barbara Channel on Whale Species are extense. Mitigation actions needs to be extended.

It is recommended to conduct a cost-benefit analysis (CBA) that considers all the costs mentioned in the draft document, based on an extensive literature review. Both environmental and stakeholders quantity and qualitative variables respectively should be included in the draft with the aim of modelling not only impacts on Gray Whales but other important key species associated within the trophic cascade of the area proposed on this alternative. Based on this CBA it would be expected to stablished more detailed regulations on 1) minimising entanglements, 2) decreasing the risk of ship strikes by for example partnering with Blue-Whales Blue Skies program and like this also 3) Contributing to decrease the footprint of aquaculture companies in California by adhering and stablishing compliance from companies to adhering to the program for example by being allowed to receive sustainable accreditation on its produts.

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[1] Rhodes, L. D., Parrish, K. L., & Rub, M. W. (2023). Scientific support for health management and biosecurity for marine aquaculture in the United States.

Very High Resolution (VHR) satelittle imagery to monitor whale species has already started to be explored as an additional tool to inform whale conservation management to help reduce whale ship collisions risk [2][3]

Recommendation 2: Science based approach must consider dynamism of climate change effects in its proposed actions and alternatives.

It is recommended to incoporcorate climate change implications into marine spatial planification, specifically in the proposed alternatives. Enhancing this can improve reduce the risks of economic losses associated with areas where the alternatives have been proposed but that are also areas prone to more temperature changes. It is important as well to mention that analysis where done with Sea Surface Temperature (SST). Recently scientists are proposing to include three dymension structure of the ocean for ocean planning [4], and even though it comes with many challenges it provides and opportunity to better understand the environmental condictions requiered by species and how they will change in with different climate change scenarios and depths of the ocean in order to make the cultivation process more efficient and less economic costly, because of losses associated with predicted heat waves or ocean accidification,

On a different matter, it is highly recommended to investigate the potential of kelp forest cultivation in helping contribute to Sea Level Rise (SLR) mitigation efforts. Sea Level Rise is another climate change effect of high concern for California State. This issue is not mentioned anywhere in the draft document. It is recommended to include the implications and assesment on how for example, infrastructure could be impacted/damaged by SLR.Or seen from a different perspective, how could kelp forest help contribute to mitigate SLR impacts and to which level and extent.

I recognize the high impact of your contributions to the draft document and the complexity of spatial planning regarding urgency on food security and climate change. Thanks for reading.

Sincerely,

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[2] Höschle, C., Cubaynes, H. C., Clarke, P. J., Humphries, G., & Borowicz, A. (2021). The potential of satellite imagery for surveying whales. *Sensors*, *21*(3), 963.

[3] Cubaynes, H. C. (2020). *Whales from space: Assessing the feasibility of using satellite imagery to monitor whales* (Doctoral dissertation, University of Cambridge).

[4] Venegas Li, R., Levin, N., Possingham, H., & Kark, S. (2018). 3D spatial conservation prioritisation: Accounting for depth in marine environments. *Methods in Ecology and Evolution*, *9*(3), 773-784.

Submitted Via: Regulations.gov **Submitter Name/Organization:** Jeff Maassen – Santa Barbara, CA

Comment:

I am a commercial fisherman (Sea Urchin diver) in Santa Barbara, California. Over the past 7 years our Sea Urchin industry has collapsed due to the effects of the warm water blob, an El Nino, loss of predators on Purple Sea Urchins and the demise of Kelp forests. Consequently many vessels in the fleet have been looking for alternative opportunities and fisheries to participate in or just suspending fishing in hopes of a natural cyclic regeneration of the natural nearshore ecosystem. We are eager to examine and consider the possibilities of your AOA campaign around and including the unused platforms even if only temporarily until they are removed.

Could we explore the potential of converting the unused offshore oil platforms in Federal waters to develop wild harvest of bioaccumulation and Aquaculture opportunities? Could we include several "Shut in" oil platforms in an AOA? About half of the 13 Oil Platforms situated in Federal waters in the Santa Barbara channel are "Shut In" or closed down. It appears that there could be a fabulous opportunity to develop aquaculture opportunities and energy technologies which could help to ensure food security and shore up our domestic seafood production in accordance with NOAA goals.

Over the past several years I obtained permits to harvest naturally settling Mussels and was granted permission from a now shut down oil operator on Two platforms in Federal waters. I harvested these Mussels with documented legal landings for bait only in order to have a baseline and proof concept to develop and commence testing to determine the suitability for human consumption. I attempted to enlist collaborative support for the permitting and testing framework to ensure safety for human consumption with several entities to no avail.

I am hoping that NOAA and the State of California will rigorously support offshore aquaculture in the future and support a suite of "rigs to reefs" plans which could be used to produce food, jobs and support emergent alternative energies instead of being removed. Numerous studies have shown that the Oil Platforms have become incredibly productive trophic de facto powerhouse fish reefs which support and nourish life on an unforeseen magnitude. These places are an apparent hedge against an unknown climate change quantity as well as ready and existing habitat resource for facilitating renewable food sources.

I am looking forward to finding out more and examining updates and if possible to enable further understanding of the potential of the "Northern Santa Barbara Channel Area". As a small business person that is a sole proprietor, please understand that I am not equipped with the resources of larger entities but I am eager and hoping that you can see a potential for myself and others like me (perhaps as a group) to secure a position as a true stakeholders in California's future aquaculture opportunity zone development.

It appears that I may be too late for general public comment but nevertheless I would like to respectfully request a placeholder in the process in which we could collaboratively explore this vision.

Thank you, Jeff Maassen

Comment Attachments:

Proposal to Develop an Environmental Plan to Harvest Mussels and Scallops on California's Oil Platforms

Submitted To

Jeff Maassen

unidiversb@gmail.com

805-450-8488

Date

January 17, 2019

Prepared By

Blue Latitudes LLC

P.O. Box 2823

La Jolla, CA 92038

BLUE LATITUDES

Amber Jackson

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INTRODUCTION

Jeff Maassen (Client) is preparing to harvest and distribute mussels and scallops off several of the active oil platforms in California for human consumption (Project). To streamline the line of sight for the Project, Blue Latitudes is pleased to present this proposal to develop an Environmental Plan (the Plan) which will detail the scope, schedule, and resources required to obtain a Harvest License for shellfish in Federal Waters from the United States Food and Drug Administration (FDA) by Q4 2019. This Plan will ensure project compliance with all federal, state, and resource agency regulations and is a critical aspect of the pre-application process.

SCOPE OF WORK: DEVELOP ENVIRONMENTAL PLAN

Blue Latitudes conducted a preliminary review of the FDA's National Shellfish Sanitation Program (NSSP) Guide for the Control of Molluscan Shellfish to better understand the requirements for biotoxin testing as mandated by the FDA and NSSP permitting process. Based on our review, it is our preliminary understanding that in order to obtain a Harvest License, the Client will be required to develop an Operational Plan (OP). Blue Latitudes can support the Client by preparing the OP, which will be the first component of the Plan and will detail the appropriate onboard/dockside sampling protocols. The approved OP will ensure Pre-Harvest Sampling complies with the NSSP guidelines. Ultimately, the results of the Pre-Harvest Sampling will inform any additional environmental documentation that may be required before the final submission of a Harvest License application to the FDA.

Blue Latitudes has prepared this scope to support the Client in obtaining the necessary permitting from the FDA, and any other regulatory agencies, required to harvest mussels and scallops from Federal waters for human consumption. The Plan will be carried out in a series of steps. First, Blue Latitudes will facilitate an informational meeting with the relevant stakeholders at the FDA and other agencies to gather more information regarding the proposed project. Second, Blue Latitudes will prepare and submit an OP that will detail scope, schedule, and budget, including additional certifications and best management practices for harvesting shellfish in Federal Waters off the coast of California. Blue Latitudes will address any comments or questions that arise from the FDA that pertain to the OP. Upon the FDA's approval of the OP, Blue Latitudes will assist the Client in completing the Pre-Harvest Sampling, in accordance with FDA and NSSP requirements, by organizing a field team, developing appropriate sampling protocols, and selecting a laboratory to assist in evaluating the toxicity of the collected shellfish. Last, Blue Latitudes will prepare the required environmental documentation and permits needed to support the Client's Harvest License application to the FDA.

PROPOSED BUDGET

Budget to Complete the Environmental Plan		
	Description	**Cost**
Task 1	Facilitate an information meeting with the relevant stakeholders at the FDA and other agencies.	$400.00
Task 2	Draft Operational Plan.	$4,800.00
Task 3	Manage field work and monitoring efforts for biotoxins.	$3,400.00
Task 4	Prepare Environmental Documents in support of the Client's Harvest License application to the FDA.	TBD
	TOTAL	**$8,600.00**

PROPOSED SCHEDULE

Blue Latitudes will initiate work on the Plan immediately upon receipt of written authorization to proceed. Tasks 1-2 will be completed within 5 weeks (25 business days) and the OP will be submitted to Jeff Maassen for initial review. Mr. Maassen will then have 2 weeks (10 business days) to submit any edits or comments on the report to Blue Latitudes. The final report will subsequently be completed by Blue Latitudes within 2 weeks (10 business days) of receipt of edits or comments from Mr. Maassen. Tasks 3 and 4 are subject to edits and review time of the OP by the FDA.

Comment ID Number: m6s-aixn-615a
Comment ID Number: m6x-aixn-615a

Submitted Via: Regulations.gov **Submitter Name/Organization:** James Kelly - Corvallis, OR

Comment:

Putting the cart before the horse. There are no current Federal regulatory guidelines on how offshore aquaculture operations are to be conducted. How can we set aside areas for unknown types of operations and monitor their impact? This is unacceptable and lacks oversight legislation.

Attached Comment Letter:

To whom it may concern regarding NOAA-NMFS-2022-0051,

I stand in firm opposition to the designation of open-water aquaculture areas in federal waters, particularly under the current regulatory landscape where **no clear federal framework exists to oversee offshore aquaculture operations**. The **Magnuson-Stevens Act (MSA)**, the cornerstone of U.S. fisheries management, does not provide a structured, enforceable framework for aquaculture, leaving a dangerous regulatory void. Without proper oversight, **designating areas for aquaculture without federal safeguards is reckless and shortsighted**.

This lack of federal regulation poses **significant risks to state waters**, as the environmental and economic consequences of unregulated offshore aquaculture—such as **water pollution, habitat degradation, fish escapes, and disease transmission**—do not stay confined to the designated zones. Currents will carry **excess food waste, chemicals, and parasites** directly into coastal ecosystems, impacting wild fisheries and local industries that depend on clean waters. Additionally, state agencies will be left to manage the downstream consequences without the resources or jurisdiction to regulate activities occurring beyond their territorial boundaries.

Designating federal waters for aquaculture when **no comprehensive national monitoring or enforcement plan exists** is akin to granting a blank check to an industry with **immense environmental risks**. There are **no uniform waste management requirements, no national escape prevention standards, and no federal accountability measures** to ensure these operations do not harm marine ecosystems. Without a federal regulatory structure in place, we are inviting **industrial-scale aquaculture with no clear mechanisms for oversight, enforcement, or mitigation of negative impacts**.

For these reasons, I urge strong opposition to any effort to designate open-water aquaculture areas in federal waters **until a comprehensive, enforceable federal framework is established to govern and monitor this industry**. Our marine environments and coastal communities should not be subjected to the risks of **unregulated, profit-driven expansion** at the expense of ecological and economic stability. **Designating Aquaculture Oportunity Areas prior to federal regulatory guidlines is putting the cart before the horse.**

-James Kelly

Submitted Via: Regulations.gov **Submitter Name/Organization:** Michael M. Okoniewski – Secretary, West Coast Pelagic Conservation Group

Ms. Celia Barroso
Regional Aquaculture Coordinator, California
National Marine Fisheries Service (NMFS)
West Coast Region
501 W. Ocean Blvd., Ste. 4200
Long Beach, CA 90802

Docket No. NOAA-NMFS-2022-0051-0048 ***(Submitted Electronically via Regulations.gov)***

RE: Draft Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal Waters of Southern California

Dear Ms. Barroso

The West Coast Pelagic Conservation Group (WCP) appreciates the opportunity to submit the following comments. Our organization is composed of commercial fishermen and processors. Our present focus is on cooperative research with the Southwest Fisheries Science Center (SWFSC). Our members harvest, process, and market all major species of seafood on the west coast and Alaska. Our processors service over one thousand fishermen and our fishermen and processors employ over 3500 people. They sell and distribute fresh and frozen seafood from every major West Coast fishery across the U.S. and Worldwide.

Opening remark: After several years trying to work with the Bureau Ocean Energy Management's (BOEM's) on Offshore Wind Energy (OSW) as promulgated by BOEM we determined that (a) it would destroy commercial fishing and (b) that it was gambling with the health and productivity of the California Current Large Marine Ecosystem (CCLME. BOEM plans had huge data gaps related to OSW impacts to marine meteorology, hydrology, and CCLME ecology, the socioeconomic welfare of our coastal towns and its residents. Any concerns raised by the fishing industry, NGO's, and the coastal populace were written off as impactfully insignificant. There were no plans to study the long term effects of a full-scale industrialized ocean of wind turbines.

After long hours of research on the fishing industry's part we found that our CCLME's' ecosystem, food web, and natural biosphere are more complex, fragile, and dynamic than anything we could imagine. There are huge data gaps that science has not explored about the impacts of OSW. We believe that may also be true of marine open ocean aquaculture.

Draft Programmatic Environmental Impact Study (DPEIS) for the NMFS alternatives for Aquaculture in Southern California Waters. Although we are not experts on aquaculture, we have learned something about Ocean Dynamics & Ecosystem services. The impacts of any disturbance to the ocean are not static. They are three dimensional and spatially spread out by currents, tides and surface forces. A negative effect at the bottom of the food chain to the lowest trophic species impacts the entire biosphere and potentially impacts other environmental services such as oxygen[1] generation and CO2 sequestration.

Proposed CA Aquaculture Alternatives, WCP is not opposed to Aquaculture per se but we do believe that there are still unanswered questions about ecological, hydrological, and biological potential impacts that need answers. Additionally for the wild capture industry we would like to see more government effort to help our fisheries achieve optimum yield while maintaining our safeguards for sustainability.

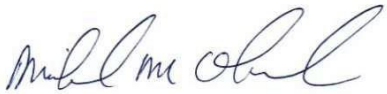
Communication. We have heard from a number of our fishing colleagues that they were not as much a part of the NMFS process as they expected and that more of their input would have been valuable. As we experienced similar treatment by BOEM we bring it up for consideration. WCP has found our experience with NMFS to be satisfactory and productive for the most part so to hear this was a surprise.

References for consideration:
WCP incorporates, and references the comments recently made on February 13, 2025 for 2022-0051 by "*Don't Cage Our Oceans"* and also those made by Oceana on July 22 of 2022 on 2022-0051. WCP believes these comments to be reasonable given the unknown effects that are not yet researched and analyzed.

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[1] | Phytoplankton of the Northwest U.S. Shelf Ecosystem | NOAA Fisheries NOAA Fisheries *"Globally, primary producers (Phytoplankton) generate almost half of Earth's oxygen and are the base of most marine food webs. They are also important components of carbon cycling and sequestration"*

Thank you,
Sincerely



Michael M. Okoniewski: Secretary: West Coast Pelagic Conservation Group
E-Mail: Mokoniewski.consultant@PacificSeafood.com
Ph: 360-619-2019

C.c. Greg Shaughnessy
Vice-President: West Coast Pelagic Conservation Group
COO: Ocean Golds Seafood
E-Mail: Greg Shaughnessy gshaughnessy@oceancos.com
Ph: 360-310-0662

Submitted Via: Regulations.gov **Submitter Name/Organization:** Mati Waiya - Tribal Chair, Coastal Band of the Chumash Nation

February 19, 2025

RE: NOAA-NMFS-2022-0051

To whom it may concern,

It has come to our attention that NOAA has proposed the California coastal bight and the Santa Barbara Channel as a site for an Aquaculture Opportunity Area. The lack of official and meaningful consultation with the Coastal Band of the Chumash Nation on this proposed project has limited our ability to raise our concerns prior to public comment. While we understand the intent behind aquaculture expansion for economic development is meant for good, our priority remains committed to protecting the lands and waters our people have called home since time immemorial. For these reasons, we do not support the Santa Barbara Channel for an Aquaculture Opportunity Area.

The development of up to eight aquaculture sites, or farms, will have a negative impact on our cultural connection to the Santa Barbara Channel. The waters between the Channel Islands and the mainland have been traveled across in our tomols (plank canoes) for as long as our people have existed, other than the brief time our tomols were taken from us by settlers. It has taken a great deal of effort to revitalize our cultural practice of crossing the channel in our tomols that was disrupted due to the colonization of our lands and waters. Any structures placed in the channel impact our ability to travel in the ways our ancestors did.

The sealife and plants that exist in the waters of the channel are also our relatives. Our relationship to the endangered mammals as well as the fish, shellfish, and harvestable ocean plants in our traditional fishing areas that cover the entire channel and beyond[1] rely on reciprocity. We have a responsibility to them as much as we have to ourselves for the ways in which they have sustained us for thousands of years. We know the Santa Barbara Channel is home to several listed endangered and threatened species that are listed as such due to the impacts of human development, primarily within the last century. Installing these types of farms, especially in an ocean channel, will impact migration of certain species, disrupt ocean currents, and potentially introduce non-native species into the water. Among the impacted species, dolphins, sharks, whales, swordfish, sea otters, and abalone all have significant cultural ties to our people. We cannot support a project that threatens our relatives in the ocean and our cultural practices, especially one without monitoring systems. Aquaculture sites as proposed add to existing offshore oil rigs, wind turbines, underwater pipelines, and military testing in our waters. We do not need

[1] Approximately, but not limited to, 50 miles around the Channel Islands and 30 miles off the main shoreline of the coastal bight.

more disturbance in the name of economic growth and security. Our people and our ocean relatives have paid enough.

Coastal Band of the Chumash Nation Tribal Council



Mati Waiya, Tribal Chair

Appendix 1

Our creation stories tie us to the island of Limuw, which you may know of as Santa Cruz Island. Our stories tell us that we emerged from this island to later cross to the mainland on the rainbow bridge. When some of our people fell into the ocean, they became dolphins. The full story is a bit longer, but the point is, our tie to these marine mammals have existed since the beginning of time to us. Endangering the waterways threatens our relatives and our relationship to them.

Appendix 2

ESA listed endangered species in the Santa Barbara Channel:

Blue Whale (Balaenoptera musculus)
Fin Whale (Balaenoptera physalus)
Humpback Whale (Megaptera novaeangliae)
Sperm Whale (Physeter macrocephalus)
Sei Whale (Balaenoptera borealis)
Leatherback Sea Turtle (Dermochelys coriacea)
Green Sea Turtle (Chelonia mydas)
Southern Sea Otter (Enhydra lutris nereis)
California Least Tern (Sternula antillarum browni)
Coastal California Gnatcatcher (Polioptila californica californica)
White Abalone (Haliotis sorenseni)
Black Abalone (Haliotis cracherodii)
Tidewater Goby (Eucyclogobius newberryi)
Western Snowy Plover (Charadrius nivosus nivosus)
Scripps's Murrelet (Synthliboramphus scrippsi)
Guadalupe Murrelet (Synthliboramphus hypoleucus)
Canary Rockfish (Sebastes pinniger)

Submitted Via: Regulations.gov **Submitter Name/Organization:** Miranda Herreid - Portland, OR

February 19, 2025

Celia Barroso

National Marine Fisheries Service

Re: Docket Number: NOAA-NMFS-2022-0051

Dear Ms. Barroso,

Thank you for the opportunity to comment on this Draft Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas (AOAs) in Federal Waters of Southern California. I am Miranda Herreid, a third-year law student at Lewis and Clark Law School. I write to raise my concerns regarding the prospect of open sea aquaculture, specifically finfish aquaculture, in our country's federal waters. The challenges our country has faced as a result of the increasing industrialization, consolidation, and globalization of agriculture on land must serve as an instructive warning against developing a similar system in the ocean. Furthermore, as Congress has not elected to delegate authority to NMFS in this matter, the agency does not have authority under the Magnuson-Stevens Fishery Conservation and Management Act ("MSA") to regulate aquaculture.[1] Moreover, there is inherent tension between commercial finfish aquaculture and the purpose of the MSA: to conserve and responsibly manage our nation's off-coast fishery resources.[2] Not only do the harms wrought by terrestrial concentrated animal feeding operations serve as predictors to how things could go wrong in commercial finfish aquaculture, we have seen how disastrous open sea aquaculture can be on a statewide level in Washington.

On a positive note, unlike the entrenched system of industrialized terrestrial agriculture, here we have a chance to prevent the proliferation of an industry that will harm people and the environment before it is too late. My comments address the following: (1) the insurmountable competitive disadvantage that the U.S. faces as a relatively late entry into the open sea aquaculture market; (2) the disruptive impact that open sea aquaculture market would have on local fisheries and communities in Southern California; (3) the high risks associated with entry to such an economically and environmentally variable venture, as proven by recent events in Washington state; and (4) the public health risks associated with industrial aquaculture. With the great potential for harming our nation's coastal fisheries combined with the lack of statutory authority, NOAA should not continue scoping activities for AOAs.

I. Open Sea Aquaculture in the Federal Waters of Southern California Cannot Promote American Food Security or Competitiveness

The DPEIS admits that the weighty capital investment required to get into this emerging market would provide "large, established businesses (domestic or international) ... [with] an advantage over local or regional stakeholders."[3] Although the goal of the Executive Order that

[1] Gulf Fishermens Ass'n v. Nat'l Marine Fisheries Serv., 968 F.3d 454, 456 (5th Cir. 2020).
[2] *Id.*
[3] *Draft Programmatic Environmental Impact Statementfor the Identification of Aquaculture OpportunityAreas in U.S. Federal Waters off of Southern California*, NOAA 186 (Nov. 15, 2024)

necessitated the DPEIS is to promote the competitiveness of American seafood,[4] in all likelihood, the only companies with the know-how and resources to enter the market at a profitable scale would be foreign companies from Norway, Turkey, and China, whose aquaculture is already heavily vertically integrated and high-tech.[5] Ultimately, the U.S. is simply too far behind to compete in this particular race. Contributing to only one percent of global aquaculture production, and with its high labor and capital costs, the growing pains needed for the U.S. to be a significant player in the aquaculture market makes it a losing proposition.[6]

These high entry barriers aside, it is difficult to see how opening up the EEZ to outside investors will aid American food security. Although the DPEIS cites the disparity between the U.S.'s rank as the world's number one importer of aquaculture products, but ranks at only eighteen in global aquaculture production,[7] there is no guarantee that development of open sea aquaculture in the EEZ will in any way lessen this disparity. Open net pen aquaculture's environmental impact could be devastating for existing wild fisheries currently managed under the MSA, potentially compromising food security. The U.S. domestic caught seafood market serves instructive to this point: currently, the U.S. exports approximately 80 per cent of its domestically caught seafood and imports a comparable amount, owing in part to the international character of the seafood processing industry.[8] As the processing industry is mainly overseas, the fish produced from open sea aquaculture in the EEZ will likely be sent to other countries to be processed, and only then imported back to the US for consumption.

Though the DPEIS does mention the COVID pandemic's detrimental and disruptive impact on the American economy,[9] it draws erroneous conclusions as to what that crisis taught us about the dangers of our industrialized food system. During the pandemic, American consumers suffered from "widespread food shortages" that were all the more detrimental due to the complexities of a global supply chain: "when one company was impacted, the ripple effects were enormous."[10] So long as the United States lacks the ability to process its seafood, whether caught or farmed, increasing the amount of seafood produced in the country will not change the imbalanced export-import ratio.

II. Open Sea Aquaculture in the Federal Waters of Southern California will Disenfranchise Local Communities

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https://www.fisheries.noaa.gov/resource/document/draft-programmatic-environmental-impact-statement-identification-aquaculture (last visited Feb. 9, 2025) [hereinafter DPEIS].

[4] E.O. 13921.

[5] CAL. ENV'T ASSOC., OFFSHORE FINFISH AQUACULTURE: GLOBAL REVIEW AND U.S. PROSPECTS 5 (2018), https://www.ceaconsulting.com/wp-content/uploads/CEA-Offshore-Aquaculture-Report-2018.pdf (last visited Feb. 10, 2025) [hereinafter U.S. PROSPECTS].

[6] *Id.* at 27–28.

[7] DPEIS, *supra* note 3, at 48.

[8] U.S. PROSPECTS, *supra* note 5, at 31.

[9] DPEIS, *supra* note 3, at 187.

[10] Hannah Andrew, *Addressing Consolidation in Agriculture: USDA's Response to President Biden's Directive to Promote Competition in the American Economy*, CTR. FOR AGRIC. & FOOD SYS., 2 (Jul. 2022), https://www.vermontlaw.edu/wp-content/uploads/2024/07/Addressing-Consolidation-in-Agriculture.pdf (last visited Feb. 9, 2025).

The DPEIS fails to adequately account for the devastating impact that expanded open seas aquaculture production would have on local communities. Even if a few large American companies have the capital to enter into the market, this is unlikely to benefit the population writ large. The DPEIS discusses the job opportunities that open sea aquaculture could bring, saying that "new opportunities in employment and trade may help to alleviate some of the race and gender gaps in socioeconomic participation in ocean-related industries."[11] However, not all so-called economic opportunities are created equal: low-paid jobs in the middle of the ocean where oversight is necessarily lacking is a situation ripe for abuse. Furthermore, the DPEIS fails to account for the fact that local fisheries would not be able to compete with the powerful aquaculture businesses, and the fact that these businesses would require laborers is not a win for the community, as it would be swapping out fulfilling, family businesses to corporate takeover. As we have seen in land-based agriculture, family farms have been increasingly forced out of business, unable to compete with corporate competitors.[12]

III. Open Sea Aquaculture in the Federal Waters of Southern California would be Extremely Vulnerable to Disaster

The high risks of open sea aquaculture outweigh the rewards. "A single storm or even one Galapagos shark ripping through the nets…can set profitability back significantly."[13] Experience at a statewide level has demonstrated just how vulnerable open aquaculture systems can be. In Washington, following a disastrous collapse of net pens in an aquaculture facility operated by Cooke Aquaculture, 263,000 Atlantic salmon were released into Puget Sound.[14] The impact of this disaster have been profound and long-lasting: 95% of the escaped Atlantic salmon were infected with a viral variant that had not before been documented in Puget Sound, and because the escape coincided with spawning season, "[i]n several places, Atlantic salmon were caught with small native salmon in their bellies."[15]

One can only imagine the increase in magnitude that a similar breach could have on the open seas. In contrast to the comparatively sheltered Puget Sound, conditions in the open ocean are rougher than those near the shore, increasing the likelihood of fish escapes.[16] To date, the majority of offshore aquaculture operations are located no more than four miles from the shoreline where waves and wind are less intense, and where islands offer buffers from more extreme conditions.[17] Developing facilities past this four mile range increases the risks of

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[11] DPEIS, *supra* note 3, at 43.

[12] Noah Wurtz, *Butz's Law of Economics*, AGRARIAN TRUST (Jan. 23, 2023), https://www.agrariantrust.org/butzs-law-of-economics/ (last visited Feb. 9, 2025).

[13] U.S. PROSPECTS, *supra* note 5, at 27.

[14] Lynda V. Mapes, *Fish Farm Caused Atlantic Salmon Spill Near San Juans, Then Tried to Hide How Bad It Was, State Says*, THE SEATTLE TIMES (Feb. 2, 2018), https://www.seattletimes.com/seattle-news/fish-farm-caused-atlantic-salmon-spill-state-says-then-tried-to-hide-how-bad-it-was/ (last visited Feb. 9, 2025).

[15] Douglas Frantz and Catherine Collins, *How a Salmon Farm Disaster Changed Northwest Aquaculture Forever*, HIGH COUNTRY NEWS (July 1, 2022), https://www.hcn.org/issues/54-7/fish-how-a-salmon-farm-disaster-changed-northwest-aquaculture-forever/ (last visited Feb. 9, 2025).

[16] Marc Gunther, *Can DeepwaterAquaculture Avoid the Pitfalls of Coastal Fish Farms?*, YALE ENV'T 360 (Jan. 25, 2018) https://e360.yale.edu/features/can-deepwater-aquaculture-avoid-the-pitfalls-of-coastal-fish-farms (last visited Feb. 9, 2025).

[17] U.S. PROSPECTS, *supra* note 5, at 12.

disaster. Furthermore, the fish pen collapse in Washington was first sighted by a local family that just happened to be passing by the scene to set crab pots.[18] If this facility was cited in the open ocean, it is unlikely that a passerby would have been around to alert authorities, and the response time would be even slower. The DPEIS itself mentions the difficulty in monitoring offshore facilities,[19] but it does not adequately account for the impact that this could have on the inability to respond in a timely manner to imminent threats such as equipment failure. With such high capital costs and dire consequences in the case of error, as well as increased risk of failure due to natural conditions, open sea aquaculture is too dangerous of a gamble. Washington has set a precedent by learning from its experiences with commercial finfish net pen aquaculture, adopting a rule to prohibit the practice.[20]

IV. Open Sea Aquaculture in the Federal Waters of Southern California Threatens Public Health

The World Health Organization has identified antimicrobial resistance as one of the top threats to public health worldwide.[21] Similarly to land-based livestock and poultry operations, concentrated fish operations necessitate "the misuse and overuse of antibiotics to compensate for crowded, stressful conditions."[22] Up to 75% of antibiotics used in aquaculture is lost to the surrounding environment, a statistic made all the more troubling when considering that the surrounding environment for facilities in the AOAs would be the open ocean.[23]

Thank you for considering these comments.

Sincerely,

Miranda Herreid
Student, Lewis & Clark Law School
lc22-0269@lclark.edu

[18] Frantz and Collins, *supra* note 15.
[19] DPEIS, *supra* note 3, at 41.
[20] *Board of Natural ResourcesEnds Open Sea Net Pen Salmon Farms in Washington Waters*, WASH. STATE DEP'T OF NAT. RES. (Jan. 9, 2025) https://www.dnr.wa.gov/news/board-natural-resources-ends-open-sea-net-pen-salmon-farms-washington-waters (last visited Feb. 19, 2025).
[21] *Antimicrobial Resistance*, WORLD HEALTH ORG. (21 Nov. 2023), https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance (last visited Feb. 9, 2023).
[22] FOOD & WATER WATCH, HOW FACTORY FISH FARMS MISUSE ANTIBIOTICS, 1–2 (Apr. 2016), https://www.foodandwaterwatch.org/wp-content/uploads/2021/03/ib_1604_aquaculture-web_0.pdf (last visited Feb. 9, 2025).
[23] UNITED NATIONS, FRONTIERS 2017: EMERGING ISSUES OF ENV'T CONCERN 15 (2017), https://www.unep.org/resources/frontiers-2017-emerging-issues-environmental-concern (last visited Feb. 9, 2025).

Submitted Via: Regulations.gov **Submitter Name/Organization:** R. Chris Stock - President, Stronger America Through Seafood, Inc.

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February 20, 2025

Ms. Celia Barroso
Regional Aquaculture Coordinator, California
NOAA National Marine Fisheries Service
West Coast Region
501 W. Ocean Blvd., Ste. 4200
Long Beach, CA 90802

Mr. Andrew Strelcheck
Regional Administrator
Southeast Regional Office
NOAA National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, Florida 33701
via *www.regulations.gov*

Re: Draft Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal Waters; Docket: NOAA-NMFS-2022-0051 and Docket: NOAA-NMFS-2024-0135

Dear Ms. Barroso and Mr. Strelcheck:

Stronger America Through Seafood (SATS), a coalition representing companies across the seafood supply chain, supports increased U.S. production of healthful, sustainable, and affordable seafood. In particular, SATS supports the expansion of aquaculture in U.S. federal waters. We applaud the work of NOAA's Office of Aquaculture in advancing the Programmatic Environmental Impact Statements for Aquaculture Opportunity Areas (AOAs) in federal waters. This work to develop the siting and environmental analysis for AOAs is an important step in reducing regulatory barriers for open ocean aquaculture in the U.S.

Aquaculture remains an untapped industry in the U.S. We rank only 18th in global aquaculture production. As a result, we import up to 85% of the seafood we consume – half of which is estimated to come from aquaculture producers in other countries, particularly countries in Asia. Expanding open ocean fish farming into U.S. waters would help increase our supply of American-raised seafood as a sustainable complement to America's wild capture fisheries and would help to ensure a vibrant and competitive American seafood industry.

Expanding aquaculture in federal waters would strengthen our economy, reduce our nation's sizeable trade deficit, ensure a more secure seafood supply chain, and help increase access to affordable, American-grown seafood. Open ocean aquaculture would generate an additional $877 million towards the U.S. economy, create thousands of jobs across the seafood supply chain, revitalize portside infrastructure, and establish new markets for U.S. farmers who supply sustainable fish feed ingredients.

Regulatory barriers in the U.S. have hindered the expansion of aquaculture in U.S. federal waters. Duplicative and costly environmental reviews by multiple federal agencies and lack of a clear or timely permitting process has made it nearly impossible for farmers to secure the necessary permits to farm in U.S. federal waters. Many have attempted to navigate the regulatory process, but not a single commercial-scale farm has made it through to operation. As a result, securing outside capital to develop the necessary environmental information to comply with permitting requirements is extremely difficult.

NOAA's efforts to develop these Aquaculture Opportunity Areas (AOAs) in federal waters is crucial for reducing regulatory hurdles to establishing open ocean aquaculture in the U.S. The development of the PEIS for these AOAs will reduce the time and expense for regulatory compliance by completing the initial analyses for large areas found suitable for open ocean aquaculture. Farmers seeking permits may then develop the site-specific environmental information should they choose to establish a farm in one of the AOAs. SATS supports expanding the science-based AOA process nationwide to reduce regulatory barriers for open ocean aquaculture in the U.S.

SATS supports all of the preferred alternatives identified in the PEIS for **Docket: NOAA-NMFS-2022-0051 and Docket: NOAA-NMFS-2024-0135** and we particularly support the alternatives that will advance finfish aquaculture.

The expansion of U.S. aquaculture will create and sustain American jobs; put safe and healthy food on American tables; improve working waterfronts and contribute to the American economy. SATS stands ready to assist you in working towards a vibrant and expanded U.S. aquaculture industry and a stronger, more resilient seafood sector supported by both well-managed sustainable aquaculture and wild fisheries.

Sincerely,



R. Chris Stock President

Stronger America Through Seafood

Securing a stronger America through increased U.S. production of healthful, sustainable, and affordable seafood.

Submitted Via: Regulations.gov **Submitter Name/Organization:** Sebastian Belle – President, National Aquaculture Association

February 20, 2025

Celia Barroso
Regional Aquaculture Coordinator, California

Andrew Richard
Regional Aquaculture Coordinator Southeast Regional Office

Re: Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal Waters off of Southern California
Docket Number NOAA-NMFS-2022-0051

Draft Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal Waters of the Gulf of America
Docket Number NOAA-NMFS-2024-0135

Dear Ms. Barroso and Mr. Richard:

On behalf of the National Aquaculture Association[1] and the U.S. aquaculture community, please accept and share our appreciation to National Marine Fisheries Service and National Ocean Service staff for the excellent and in-depth work to identify suitable locations in federal waters for marine aquaculture farms.

Analyses to identify aquaculture opportunity areas were initiated by five public listening sessions and two 60-day public comment periods during late 2020. These comments informed two aquaculture area atlases released in late 2021, Gulf of America and Southern California, that benefited from 395 stakeholder meetings (military, natural resources, regional planning bodies, industries, navigation, research, environmental organizations, human health) involving 1,848 individuals and between 204 and 220 data layers encompassing national security, navigation, industries, oceanographic conditions, biological conditions, and federal and state agency authorities.

In May 2022 two notices of intent were published for a 60-day public comments on the risks, benefits, capacity, species and gear types, as well as long-term visions for offshore aquaculture development in the regions to inform draft programmatic environmental impact statements. During November 2024, a 90-day public comment period on the drafts opened that included

[1] The National Aquaculture Association (NAA) is a U.S. producer-based, non-profit trade association founded in 1991 that supports the establishment of governmental programs that further the common interest of our membership, both as individual producers and as members of the aquaculture community. For over 34 years NAA has been the united voice of the domestic aquaculture sector committed to the continued growth of our industry, working with state and federal governments to create a business climate conducive to our success, and fostering cost-effective environmental stewardship and sustainability.

PO Box 12759, Tallahassee, FL 32317
Tel: (850) 443-3456 ♦ Email: naa@nationalaquaculture.org
Home - National Aquaculture Association

three public listening sessions. All of the information and public responses were published to the internet at National Marine Fisheries Service and regulations.gov webpages and freely available to the public.

The simultaneous, complex, thoughtful and thorough efforts to gather and integrate, social, economic, biological, ecological, and regulatory information, was massive in scale and scope and entirely unprecedented by any agency at any time to assess potential ocean use. We also note this effort has resulted in geographic areas identified by the atlases being dropped for consideration within the draft programmatic environmental impact statements.

The May 2020 Executive Order, which initiated this massive effort was very clear, and throughout this effort the National Marine Fisheries Service has clearly stated, the goal is to identify *suitable* farm locations. We believe the goal has been realized. However, suitability is not a certainty to produce fish, shellfish or seaweed that may or may not be competitive in a global marketplace where the United States imports 75 to 80% of the seafood Americans consume and farms must comply with an expensive, time-consuming and fully transparent federal and state regulatory framework that governs aquaculture, whether at-sea or on-land.

There is little doubt that detractors, and often well financed critics, of U.S. offshore marine aquaculture, particularly finfish farming, have significantly contributed to its lackluster growth compared to other countries.

We acknowledge marine aquaculture is not free of potential environmental, economic, social and cultural impacts and challenges remain to achieving sustainable production. The good news is these challenges are well known, and they are the focus of not only the American science and technology enterprises, but by a global network of scientists from many coastal nations focused on expanding seafood production from the ocean. The realities of the current marine aquaculture seascape bode well for a more productive future:

1) There is a clear global imperative to sustainability produce more seafood from capture and culture fisheries to meet constantly growing national and global demand. The U.S. has the marine resources to become a major exporter, if U.S. law can be amended to grant offshore farmers a property right or security of tenure for sites in federal waters.
2) U.S. farmers work within a very complex and effective legal, regulatory, and science-driven environment to anticipate and mitigate potential impacts.
3) Farm level management decisions and federal and state regulatory frameworks are working together to bring about environmentally beneficial siting, operational and production outcomes.
4) Commercial aquaculture advocates in government, universities and the farming community have recognized it is essential to reach out to decision-makers and the public, as well as the critics, with the latest research and empirical results to describe an accurate picture of the risks and rewards to farming the sea.

5) Greater communication and engagement efforts, targeted public research expenditures, and greater offshore, commercial-scale farming experience will enhance the U.S. marine aquaculture track record going forward.
6) Farming offshore is not risk-free. Fortunately, we can and are looking to nations like Canada, Chile, China, Japan, Norway, Panama, Mexico and nations bordering the Mediterranean Sea that are well ahead of the United States in producing farmed seafood to learn from their experiences.
7) The current federal permitting process is thorough, complex, time-consuming and expensive. While it is appropriately thorough and rigorous, we are hopeful it will become more efficient through implementation of the *Strategic Plan to Enhance Regulatory Efficiency in Aquaculture*[2] of the National Aquaculture Development Plan. We, as citizens of the United States, are desirous of protecting and conserving the oceans for the next seven generations.

The comprehensive work done to identify potential development sites and to address potential stakeholder concerns is important. Those efforts will assist in providing investors greater confidence to invest in ventures that inherently have risks associated with them. It is critical that all federal agencies take the next step and actively support the development of several pilot projects that concretely demonstrate feasibility and success in this promising sector. That support should include, but not be limited to, financial tools that help reduce risk and improve the competitiveness of those projects in the face of products produced in other countries that are heavily subsidized by their governments seeking to gain a competitive advantage.

If you should have questions or need additional information, please do not hesitate to contact us.

Sincerely,

Sebastian Belle
President

cc: Danielle Blacklock, Director, NOAA Office of Aquaculture

[2] The Strategic Plan to Enhance Regulatory Efficiency in Aquaculture is a product of the Subcommittee on Aquaculture authorized by the National Aquaculture Act of 1980 and contributes to the Executive Office of the President, National Science and Technology Council, Committee on the Environment.

Submitted Via: Regulations.gov **Submitter Name/Organization:** Elizabeth Purcell - Turtle Island Restoration Network

February 13, 2025

Submitted Electronically

To Whom it May Concern:

In accordance with the National Environmental Policy Act (NEPA), the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) are announcing the availability of the Draft Programmatic Environmental Impact Statement (DPEIS) for identifying Aquaculture Opportunity Areas (AOAs) in federal waters off Southern California. The DPEIS evaluates potential sites for future offshore aquaculture projects and their environmental impacts. This is a planning initiative and does not propose any specific facilities or permits. The DPEIS supports Section 7 of the Executive Order on Promoting American Seafood Competitiveness and Economic Growth (E.O. 13921), with cooperating agencies including the US Army Corps of Engineers, US Coast Guard, and EPA Region 9.

Turtle Island Restoration Network (TIRN) urges the National Oceanic and Atmospheric Administration to not support aquaculture growth in Southern California by adopting a no action alternative.

Aquaculture in the federal waters of Southern California raises several significant concerns that could have detrimental impacts on both the environment and native species. While the idea of expanding aquaculture in this region may seem appealing for its potential to boost seafood production, it can be considered a false solution.

Increase in Anthropogenic Threats

One of the key concerns with aquaculture operations in the federal waters off of Southern California is the potential for marine life to be exposed to additional anthropogenic pressures, including entanglement in aquaculture infrastructure and vessel strike injuries. Different marine species, including sea turtles, marine mammals, and sharks, can accidentally become entangled in aquaculture infrastructure, leading to injury or death. The DPEIS referenced the risk of entanglement to endangered species in the federal waters of Southern California, specifically

indicating that entanglement risk is a major threat to the existence of sea turtle and marine mammal species.[1]

Disease Spread

Aquaculture facilities, especially those in coastal and offshore regions, can become hotspots for diseases and parasites due to the dense concentration of farmed fish in confined spaces. This environment fosters the rapid transmission of pathogens like bacterial infections, viruses, and parasites. These pathogens can then be released into surrounding waters through water flow, escaped fish, or waste, potentially infecting wild fish populations.

The spread of disease can lead to significant declines in wild fish stocks, particularly because wild species may lack resistance to these pathogens. This can disrupt local ecosystems and fisheries, with long-term consequences for biodiversity. Infected wild stocks may also suffer from increased mortality rates, weakening the entire food chain and destabilizing the broader marine environment.

Weather Vulnerability

The Southern California federal waters are vulnerable to severe weather phenomena, such as hurricanes and high storm surges, which are occurring more often and unpredictably due to the progressing climate crisis. The storms feature intense winds, heavy precipitation, and abrupt changes in water level, all of which can greatly impact aquaculture facilities. The operations within this region are especially vulnerable due to their exposure to the open water and coast.

Hurricanes pose a great risk to the physical integrity of aquaculture facilities. Strong winds and storm surges have the potential to uproot or knock over equipment, tanks, and cages, leading to massive economic losses. In extreme cases, whole operations may be rendered unmanageable or destroyed irreparably.

One of the significant challenges following storm damage is the release of farmed fish into the wild. This unintended release could allow non-native species to interact with the local environment, where they could compete with, prey on, or interbreed with native populations. These associations would destabilize the balance of the marine ecosystem, threatening biodiversity and threatening native species with extinction. Farm-raised fish could also spread disease or parasites among the wild population, further disturbing local ecosystems.

[1] Draft Programmatic Environmental Impact Statement (DPEIS) for the Identification of Aquaculture Opportunity Areas (AOAs) in Federal Waters of Southern California. 2024.

The risks associated with the implementation of aquaculture facilities in the federal waters off of Southern California are significant. These include environmental concerns, the spread of disease to wild fish populations, and the vulnerability of aquaculture infrastructure to storms. Without addressing these issues, aquaculture could do more harm than good in this fragile and ecologically sensitive region.

Thank you for your consideration,



Elizabeth Purcell
Environmental Policy Coordinator

Submitted Via: Regulations.gov AND email **Submitter Name/Organization:** Nate Irwin - Santa Barbara Channelkeeper

February 20, 2025

Celia Barroso
Regional Aquaculture Coordinator, California
National Marine Fisheries Service West Coast Region
501 W. Ocean Blvd., Ste. 4200
Long Beach, CA 90802
562-432-1850
Socalaoa.wcr@noaa.gov

Submitted Electronically via Regulations.gov

Re: Comments on the Draft Programmatic Environmental Impact Statement for Aquaculture Opportunity Areas (AOAs) in Southern California

Dear NOAA Fisheries,

Santa Barbara Channelkeeper (SBCK) appreciates the opportunity to provide comments on the Draft Programmatic Environmental Impact Statement (DPEIS) for Aquaculture Opportunity Areas (AOAs) in Southern California. SBCK is a 501(c)(3) non-profit organization dedicated to protecting and restoring the Santa Barbara Channel and its watersheds through science-based advocacy, education, fieldwork, and enforcement. We are deeply committed to ensuring that any proposed developments in our marine environments are sustainable, well-regulated, and ecologically sound.

The Santa Barbara Channel is a highly dynamic marine environment, shaped by strong flushing currents, nutrient-rich waters, and productive upwelling. These characteristics contribute to its ecological productivity, biological significance, and make it a seemingly attractive location for offshore aquaculture. However, as the DPEIS details, the risks associated with large-scale offshore aquaculture operations in such a sensitive and high-energy system are substantial. Alternative 2 of the DPEIS, which proposes the designation of up to eight AOAs in the Santa Barbara Channel, raises serious concerns about regulatory oversight, environmental risks, and immediate and long-term ecological sustainability and economic impacts. The National Oceanic and Atmospheric Administration (NOAA) does not adequately address many critical issues in

the DPEIS, including the lack of statutory authority to regulate offshore aquaculture; the direct, indirect, and cumulative impacts of large-scale operations; water quality degradation from nutrient pollution and antibiotic use; risks to Endangered Species Act (ESA) listed species and marine mammals; increased marine debris; infrastructure failures in a high-energy ocean environment; and conflicts with existing fisheries.

Our position is for NOAA to choose the **No Action Alternative**. If, however, NOAA chooses to move forward with any of the alternatives in this DPEIS, it must develop and strengthen regulations to ensure clear oversight and enforceable environmental protections, conduct robust oceanographic modeling, prohibit offshore finfish aquaculture, fully address the threats to species and habitats in the channel, improve the cumulative impact analysis, and reduce the size of AOAs. These are a few of our top concerns at this point, representing fundamental shortcomings that could inflict immediate and lasting harm on the Santa Barbara Channel's marine ecosystems and undermine broader efforts toward sustainable ocean management.

NOAA's Lack of Legal Authority Over Aquaculture Opportunity Areas

NOAA currently lacks the legal authority to regulate offshore aquaculture. In *Gulf Fishermens Ass'n v. NMFS* (2020), the U.S. Fifth Circuit Court of Appeals ruled that the National Marine Fisheries Service (NMFS) does not have authority under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) to regulate offshore fish farming.[1] The court found that the MSA "unambiguously precludes the agency from creating an aquaculture regime" because the statutory definition of "fishing" does not extend to aquaculture.[2] The push to establish AOAs with the assumption that NOAA can oversee the permitting and operation of aquaculture facilities in federal waters directly contradict this ruling. The MSA was designed to manage wild fisheries, not to serve as a framework for industrial aquaculture, and Congress has not granted NOAA explicit authority to create an offshore aquaculture permitting system.[3] NOAA's reliance on Executive Order 13921, which promotes American seafood production, does not constitute Congressional authorization to move forward with AOAs. The U.S. Supreme Court has consistently affirmed that an agency's authority "must stem either from an act of Congress or from the Constitution itself".[4] NOAA cannot rely on an Executive Order to establish a permitting regime for offshore aquaculture without express authorization from Congress.

In the absence of explicit Congressional authorization, NOAA has pointed to the National Aquaculture Act of 1980 and its own 2011 Aquaculture Policy as justification for its role in

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[1] *Gulf Fishermens Ass'n v. NMFS*, 968 F.3d 454, 2020
[2] Id. at 465
[3] *Magnuson-Stevens Act*, 16 U.S.C. §§ 1801–1891d
[4] *Youngstown Sheet & Tube Co. v. Sawyer*, 343 U.S. 579, 1952

regulating offshore aquaculture. However, neither provides a legal foundation for NOAA to oversee aquaculture permitting or operations in federal waters.

The National Aquaculture Act of 1980 was not intended to serve as a permitting framework for large-scale offshore aquaculture. Congress approved the Act to promote aquaculture development, assigning the Department of Agriculture as the lead agency in assessing industry constraints, maintaining an aquaculture information center, and developing a National Aquaculture Development Plan.[5] The Act does not authorize NOAA or NMFS to designate areas of the ocean for industrial aquaculture or create a permitting regime. The lack of explicit delegation of responsibility is particularly significant given that Congress has previously assigned aquaculture-related regulatory authority to other agencies under laws such as the Clean Water Act.[6] NOAA's 2011 Marine Aquaculture Policy assumes that NMFS has authority under the MSA to regulate aquaculture in the Exclusive Economic Zone (EEZ).[7] As previously mentioned, the Fifth Circuit rejected this interpretation, finding that the MSA does not include aquaculture within its definition of fishing.[8]

The absence of clear statutory authority raises concerns about the establishment and enforceability of environmental safeguards, regulatory consistency, and conflict resolution among ocean users. Without Congressional authorization, NOAA's designation of AOAs risks creating a fragmented regulatory environment with no clear oversight.

Given NOAA's lack of legal jurisdiction, it remains unclear who would be responsible for ensuring the environmental protection of the Santa Barbara Channel and other areas affected by AOAs. If NOAA intends to advance the AOA process, it must first seek explicit Congressional authorization to establish a comprehensive regulatory framework that clearly defines agency roles, enforcement mechanisms, and accountability measures. The DPEIS does not designate a clear regulatory lead among federal agencies, leaving uncertainty about which entity: NOAA, the Environmental Protection Agency (EPA), the Army Corps of Engineers (USACE), or another agency, will be responsible for enforcing compliance, monitoring environmental impacts, and resolving conflicts with other ocean users.[9]

In addition, any offshore aquaculture development affecting state waters, fisheries, and marine protected areas must include meaningful input and decision-making power from the California Coastal Commission, the California Department of Fish and Wildlife, other state agencies, and local stakeholders.[10] Without a structured role for state agencies, federal aquaculture projects risk undermining California's established marine conservation policies.

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[5] *National Aquaculture Act*, 16 U.S.C. §§ 2801-2810
[6] *Clean Water Act*, 33 U.S.C. §§ 1251–1388
[7] *NOAA Marine Aquaculture Policy*, 2011
[8] *Gulf Fishermens Ass'n v. NMFS*, 968 F.3d at 465
[9] *Id.*

If offshore aquaculture in the Santa Barbara Channel moves forward as proposed in the DPEIS it would operate within a regulatory void, where no single agency has clear enforcement responsibility, and no robust oversight framework exists to prevent environmental harm.

High-Energy Ocean Conditions and Infrastructure Risks

The Santa Barbara Channel is a high-energy environment, subject to powerful storms, strong currents, and dynamic wave conditions. However, the DPEIS significantly underestimates these risks for the Channel by broadly characterizing the Southern California Bight as having "relatively calm seas."[11] Applying this broad definition to the Santa Barbara Channel, while noting that, "wave heights vary from 0.6 to 1m within alternative 2"[12], fails to capture the full intensity of the ocean in this region. The reality of the conditions in the Santa Barbara Channel are well documented. Channel Islands National Park advises boaters that only well-equipped, seaworthy vessels capable of withstanding severe weather should attempt a cross-Channel passage.[13] Similarly, NOAA's *U.S. Coast Pilot* gives an overview of the dangers posed by the Channel in stating:

> The prevailing winds are west and northwest and blow nearly every day, especially in the afternoon. Strong southeast winds occur in the winter, and at times the sea is too rough for several days to permit the passage of small vessels.[14]

These warnings underscore the need for a thorough evaluation of oceanographic conditions when considering offshore aquaculture in the proposed AOAs.

Infrastructure failures in high-energy environments are a known challenge for aquaculture operations worldwide.[15] Given the Santa Barbara Channel's history of extreme weather events, there are serious concerns about the structural integrity of offshore aquaculture facilities, including net pens, cages, and anchoring systems. Hydrodynamic modeling that accounts for real world ocean conditions is essential to determine whether such infrastructure can endure prolonged exposure to storms and high energy waves.

Beyond structural concerns, the loss of aquaculture gear, such as: ropes, lines, buoys, and anchors, poses additional environmental risks. In 2020 and 2021 alone, over 90,000 pounds of lost or abandoned fishing gear were recovered along the coasts of Santa Barbara, Ventura, Los

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[11] NOAA, DPEIS, 2024, p. 66
[12] NOAA, DPEIS, 2024, p. 69
[13] *Boating - Channel Islands National Park (U.S. National Park Service)*. (n.d.).
[14] *U.S. Coast Pilot 7, Chapter 5*. (2025). https://nauticalcharts.noaa.gov/publications/coast-pilot/files/cp7/CPB7_C05_WEB.pdf. Pg. 242

Angeles, Orange County, and San Diego, as well as around the Channel Islands.[16] Large scale, offshore aquaculture operations in the Channel could exacerbate this problem, increasing marine debris from broken or lost equipment. The DPEIS does not adequately assess the likelihood of gear loss or the immediate or long-term ecological consequences of adding more marine debris to an already impacted ecosystem.

A comprehensive, site-specific analysis of the Santa Barbara Channel's ocean conditions is essential to accurately assess the feasibility and risks of offshore aquaculture in this dynamic and high-energy environment.

Water Quality Degradation from Nutrient Loading and Antibiotic Use

Offshore finfish aquaculture poses a major threat to water quality in the Santa Barbara Channel, a region already experiencing significant environmental stress from nutrient pollution, harmful algal blooms (HABs), and climate-driven ocean changes. Offshore finfish farms discharge large quantities of uneaten feed, fecal waste, and metabolic byproducts directly into the water column, leading to localized eutrophication, oxygen depletion, and the proliferation of HABs.[17] The Santa Barbara Channel is already prone to HABs, and offshore aquaculture could intensify these events by introducing additional nutrient inputs into an ecosystem that is contending with existing pollution and climate stressors.

Southern California has emerged as a hotspot for harmful algal blooms, particularly those producing domoic acid, a neurotoxin that bioaccumulates in marine food webs and poses serious risks to wildlife and human health.[18] Domoic acid poisoning has led to significant marine mammal strandings, closures of commercial fisheries, and economic losses in recent years. A specific example occurred in 2015, when a toxic bloom of Pseudo-nitzschia along the U.S. West Coast forced the closure of Dungeness crab and razor clam fisheries in California, Oregon, and Washington, contributing to $97.5 million in lost commercial Dungeness crab landings and an estimated $40 million decline in tourism revenue for Washington's coastal communities.[19] Given that HAB frequency and severity are increasing due to warming ocean temperatures and acidification, the introduction of offshore aquaculture without stringent nutrient controls and clear regulatory oversight could exacerbate these harmful conditions.[20]

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[16] *Tons of lost fishing gearrecovered off southern California coast*. (2022, July 14). Wildlife HealthCenter / School of Veterinary Medicine. https://whc.vetmed.ucdavis.edu/blog/tons-lost-fishing-gear-recovered-southern-california-coast

[17] Buschmann, A. H., et al. (2006). Aquaculture and environmental interactions: The Chilean salmon farming experience. *Ocean & Coastal Management, 49*(3), 225-244.

[18] Polakovic, G. (2018). Southern CaliforniaCoast Emerges as a Toxic Algae Hot Spot. *USC News.*

[19] Ritzman, J., et. al. (2018). Economic and sociocultural impacts of fisheries closures in two fishing-dependent communities following the massive 2015 U.S. West Coast harmful algal bloom. *Harmful algae, 80*, 35–45.

[20] Crable, M. (2020). Climate change could make toxic algal blooms in our oceans more deadly. *Phys.org.*

The impacts of HAB's are becoming increasingly evident in Southern California, with recent domoic acid contamination highlighting the risks posed to marine ecosystems and human health. In October 2023, state agencies delayed the opening of spiny lobster fisheries in portions of Los Angeles and Orange counties due to unsafe levels of domoic acid, underscoring the economic and ecological consequences of HAB events.[21] The continued recurrence of toxic blooms, which already disrupt commercial and recreational fisheries, could be worsened by additional nutrient inputs from offshore aquaculture operations, intensifying economic losses for local fisheries and increasing risks to human health.

Oxygen depletion, or hypoxia, is a growing problem in coastal and offshore waters worldwide, and nutrient pollution from aquaculture can contribute to hypoxic dead zones.[22] Increased nutrient loading from offshore aquaculture could trigger more frequent and severe hypoxic conditions, which can devastate fish populations, invertebrates, and benthic ecosystems. The suggestion in the DPEIS that strong ocean currents will sufficiently disperse pollutants is speculative. Studies have shown that aquaculture waste can accumulate in sediments and disrupt seafloor ecosystems, particularly in regions with complex bathymetry like the Santa Barbara Channel.[23]

The widespread use of antibiotics and other pharmaceuticals in industrial aquaculture presents a significant risk to marine life and public health. Studies indicate that up to 75% of antibiotics used in fish farming are excreted into the surrounding environment, where they persist in the water column and sediments.[24] This contamination not only threatens native fish and shellfish populations but also fosters the development of antibiotic-resistant bacteria, a growing global health crisis. Concerns over seafood contamination including the accumulation of heavy metals, antibiotic residues, and microplastics present serious concerns in the long-term viability and safety of offshore aquaculture in the Santa Barbara Channel.

The Santa Barbara Channel supports important commercial and recreational fisheries, and contamination from aquaculture operations could introduce antibiotic residues and drug-resistant pathogens into seafood consumed by humans. The DPEIS needs to address the long-term

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[21] *CDFW news: Spiny lobster recreational and commercial fisheries set to open with delays in portions of Los Angeles and Orange Counties due to public health hazard*. CDFW. (2023, September 22). https://wildlife.ca.gov/News/Archive/spiny-lobster-recreational-and-commercial-fisheries-set-to-open-with-delays-in-portions-of-los-angeles-and-orange-counties-due-to-public-health-hazard

[22] Boesch, D. et al. (2001). *Marine Pollution in the United States.* PewOceans Commission.

[23] Holmer, M. (2010). Environmental issues of fish farming in offshore waters: Perspectives, concerns, and research needs. *Aquaculture Environment Interactions, 1*, 57–70.

[24] Cabello, F. C. (2006). Heavy use of prophylactic antibiotics in aquaculture: A growing problem for human and animal health and for the environment. *Environmental Microbiology, 8*(7), 1137-1144.

consequences of antibiotic use in aquaculture operations and formulate adequate monitoring or mitigation strategies to prevent these risks.

Biodiversity Threats and Risks to ESA-Listed Species

The Santa Barbara Channel is home to a diverse array of marine life, including ESA-listed species such as blue whales, humpback whales, gray whales, sea otters, and leatherback sea turtles. Offshore aquaculture gear and infrastructure, including longlines, net pens, and mooring systems, present a serious entanglement risk to these species, yet the DPEIS does not provide a thorough analysis of these risks or propose meaningful mitigation measures. Entanglements in aquaculture gear can result in injury, starvation, or death for marine mammals and sea turtles, which could further threaten already vulnerable populations.

Beyond direct entanglement risks, the establishment of offshore aquaculture facilities can disrupt the migratory patterns of whales and other large marine species. Increased vessel traffic associated with aquaculture operations could lead to increased vessel strikes.[25] The industrialization of ocean space introduces increased underwater noise, which can interfere with marine mammal communication and navigation.[26] The DPEIS does not adequately assess how increased vessel traffic and underwater noise pollution from aquaculture operations will impact marine mammals.

While aquaculture is often promoted as a sustainable solution to food security, industrial-scale finfish operations frequently rely on fishmeal and fish oil derived from wild-caught forage fish, such as anchovies and sardines.[27] The depletion of these critical prey species can disrupt entire marine food webs, further stressing the already impacted ecosystems of the Santa Barbara Channel.

Given the significant environmental concerns posed by offshore aquaculture in the Santa Barbara Channel, it is imperative that NOAA ensures full compliance with key environmental statutes. These laws, including the ESA, Marine Mammal Protection Act (MMPA), MSA, Coastal Zone Management Act (CZMA), Migratory Bird Treaty Act (MBTA), and National Marine Sanctuaries Act (NMSA), must be strictly followed. Upholding these protections is essential to maintaining the long-term sustainability of marine ecosystems and coastal communities while mitigating the potential ecological and socioeconomic impacts of offshore aquaculture.

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[25] Eliza Oldach, et. al. (2022). *Managed and unmanaged whalemortality in the California Current Ecosystem,* Marine Policy, Volume 140.

[26] *Id.*

[27] Naylor, R. L., et al. (2000). Effect of aquaculture on world fish supplies. *Nature, 405*(6790), 1017–1024.

Direct, Indirect, and Cumulative Impacts

The DPEIS needs to go further in its analysis of the direct, indirect, and cumulative impacts of multiple AOAs operating in the Santa Barbara Channel. The proposed AOA sites in the Santa Barbara Channel could cover up to 15,000 acres. Large scale industrial aquaculture could have significant environmental and economic consequences on the Santa Barbara Channel and coastal communities. Under the the National Environmental Policy Act (NEPA), NOAA is required to take a "hard look" at the direct, indirect, and cumulative impacts of AOA designations.[28] Without a comprehensive cumulative impact assessment that analyzes site specific impacts of the DPEIS, NOAA cannot accurately predict the long-term consequences of establishing multiple AOAs.

The designation of multiple AOAs will cumulatively impact local fisheries, water quality, marine mammal populations, and coastal economies. Many of the proposed AOA sites overlap with traditional fishing grounds, potentially displacing commercial and recreational fishermen and leading to economic losses for local communities. The risk of market saturation from aquaculture-produced seafood could further harm existing fisheries by driving down prices and increasing competition. The DPEIS must fully analyze these economic impacts and consider mitigation strategies to prevent undue burdens on the fishing industry.

Additionally, NOAA has inadequately addressed how offshore aquaculture may contribute to declining water quality, including increased nutrient pollution, harmful algal blooms, and oxygen depletion. The DPEIS must critically evaluate these risks and the potential for worsening eutrophication in the Southern California Bight.

Marine species interactions must also be thoroughly assessed. As previously mentioned, the Santa Barbara Channel is home to several endangered whale species, sea turtles, and other protected marine life. The expansion of offshore aquaculture poses a risk of entanglement from net pens, ropes, and mooring lines, as well as increased vessel traffic, which raises the likelihood of ship strikes. Industrial aquaculture operations can also act as fish aggregating devices (FADs), attracting predators and altering local ecosystems in ways that may disrupt species migration patterns and increase predation pressures on native populations.[29] The DPEIS must consider these cumulative impacts across multiple AOAs, rather than deferring such analysis to individual project evaluations.

Finally, NOAA must take a hard look at the long-term ecological risks associated with escaped fish, disease transmission, and antibiotic resistance. A thorough cumulative impact assessment

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[28] Blue Mountains Biodiversity Project v. Blackwood, 161 F.3d 1208, 1211 (9th Cir. 1998).
[29] Barrett, L. T., et al. (2018). *Impacts of marine and freshwater aquaculture on wildlife: a global meta-analysis*. Reviews in Aquaculture.

must evaluate the likelihood and consequences of escaped fish across multiple AOAs in Southern California.

Without addressing these cumulative impacts in a meaningful way, NOAA cannot fulfill its obligations under NEPA. The establishment of multiple AOAs in the Santa Barbara Channel could have lasting environmental and economic consequences, requiring a more detailed analysis before moving forward. NOAA must ensure that the DPEIS fully evaluates these risks and does not improperly minimize cumulative impacts in its assessment.

Economic Impacts to Coastal Communities in the Southern California Bight

As Superintendent Ethan McKinley of Channel Islands National Park noted, "The connection between our beautiful gateway communities and the 'Galapagos of North America' is a critical economic driver for local businesses."[30] The Santa Barbara Channel supports tourism, commercial and recreational fishing, and marine transportation. Channel Islands National Park and surrounding coastal attractions generate over $31.9 million in annual visitor spending.[31] Whale watching and marine-based tourism contribute significantly to the regional economy, benefiting from the healthy marine ecosystems of the Santa Barbara Channel.

The Santa Barbara Channel supports productive fisheries, including lobster, sea urchin, and white seabass, which generate tens of millions of dollars annually and provide livelihoods for local fishermen. Offshore aquaculture could result in habitat degradation, water pollution, and fishery displacement, jeopardizing these long-standing industries. Channel Islands Harbor alone contributes $159 million in total economic impact, with business activity directly tied to fishing, recreation, and marine transport.[32]

Industrial-scale offshore aquaculture threatens these existing ocean industries by degrading water quality, creating conflicts over marine space, and displacing traditional fisheries.

Lessons from International Offshore Aquaculture Failures

The environmental and economic risks of industrial aquaculture operations are not hypothetical, as they have been well documented in other regions that have pursued large-scale fish farming.

Chile's salmon aquaculture industry has experienced devastating environmental failures, including harmful algal blooms, mass fish kills, and antibiotic overuse. In 2016, a toxic algal bloom caused by nutrient pollution from salmon farms killed 23 million farmed fish, resulting in

[30] National Park Service, 2023
[31] National Park Service, 2018
[32] Channel Islands Harbor Economic Report, 2016

an $800 million economic loss and the collapse of local fisheries.[33] The expansion of industrial aquaculture in Chilean fjords has led to long-term ecosystem degradation, fish disease outbreaks, and increased antibiotic resistance in marine food webs.[34]

Similarly, China's rapid aquaculture expansion has resulted in severe coastal pollution, including nutrient overloading, dead zones, and loss of native marine biodiversity.[35] The discharge of uneaten feed, fish waste, and antibiotics from aquaculture operations has degraded coastal water quality, leading to harmful algal blooms and hypoxia in key fishery areas. In response, China has implemented stricter aquaculture regulations, including limits on expansion and mandatory environmental impact assessments, recognizing the unsustainable trajectory of unregulated offshore aquaculture.[36]

A recent study on the environmental impacts of Chilean salmon farming provides guidance pertaining to similar knowledge gaps present within the Santa Barbara Channel. This study concludes by stating that:

> Possibly, the most important of all of the knowledge gaps is to define an approach to address carrying capacity (both ecological and productive considering biosecurity) for relevant water bodies (fjords, channels etc.), since this could lead to establish maximum biomass to be produced per unit area, even if only proxies are used initially. This information would lead to policy making that ensures a more sustainable salmon farming and could guarantee minimizing risks.[37]

The carrying capacity of the Santa Barbara Channel needs to be taken into account in order to appropriately delegate size and biomass for offshore aquaculture projects. It is imperative that these variables are fully evaluated in an assessment of offshore aquaculture's feasibility in the Channel so that risk can be minimized.

The DPEIS must do more to ensure that any aquaculture development in the Santa Barbara Channel does not compromise the marine ecosystems, ecological integrity, interests of other ocean users, and coastal communities of the Santa Barbara Channel. Because of the unprecedented scale and potential ecological and socioeconomic impacts, we urge NOAA to adopt the No Action Alternative. A comprehensive regulatory framework should be established,

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[33] Reporter, G. S. (2021, August 25). Chile's salmon farms lose $800m as algal bloom kills millions of fish. *The Guardian*.

[34] Quiñones, R.A., Fuentes, M., Montes, R.M., Soto, D. and León-Muñoz, J. (2019), Environmental issues in Chilean salmon farming: a review. Rev Aquacult, 11: 375-402. https://doi.org/10.1111/raq.12337

[35] Huang, L. (2023, November 9). China's offshore fish farming grows amid environmental concerns. *Dialogue Earth*. https://dialogue.earth/en/ocean/chinas-offshore-fish-farming-grows-amid-environmental-concerns/

[36] *Id.*

[37] Quiñones, R.A., (2019).

and the environmental analysis should be expanded to fully account for the immediate and long-term implications of offshore aquaculture in the Santa Barbara Channel before offshore aquaculture is considered for the area.

SBCK's Position and Recommendations:

SBCK strongly advocates for the No Action Alternative because:

- **Lack of Clear Regulatory Authority** – There is no single agency with sufficient oversight to manage offshore aquaculture responsibly, leading to potential gaps in enforcement, accountability, and environmental protections.
- **Unacceptable Environmental Risks** – Offshore aquaculture poses significant threats, including water pollution, disease transmission, fish escapes, and habitat degradation. These risks are well-documented and could have lasting negative impacts on the Santa Barbara Channel's ecosystem.
- **Excessive Scale and Public Trust Concerns** – The proposed AOAs allocate vast areas of public ocean space to private, industrial-scale operators, prioritizing corporate interests over ecological sustainability and public trust resources.
- **Inadequate Analysis and Risk Assessment** – NOAA's draft environmental analysis lacks site-specific, science-driven evaluations of infrastructure resilience, storm event risks, and the long-term effects of climate change.

If NOAA proceeds with designating AOAs despite the risks, SBCK urges the following critical changes:

- **Prohibit Offshore Finfish Aquaculture** – Given the high environmental risks and unresolved regulatory gaps, offshore finfish aquaculture should not be permitted in the Santa Barbara Channel.
- **Reduce the Size of AOAs** – The current AOA designations are excessively large and inappropriate for an area as ecologically and economically significant as the Santa Barbara Channel. NOAA must scale down these zones to limit industrial aquaculture expansion and protect public resources.
- **Strengthen Federal Regulations** – NOAA must obtain Congressional authorization for its oversight of offshore aquaculture, ensuring the establishment of clear, enforceable regulations that prioritize environmental protection, public access, and long-term ocean health of ocean ecosystems before advancing any offshore aquaculture projects.
- **Conduct Robust Oceanographic Modeling** – Before advancing AOA designations, site-specific hydrodynamic modeling and risk assessment must be conducted to evaluate infrastructure resilience, storm vulnerability, and long-term climate impacts.

- **Improve Cumulative Impact Analysis** – NOAA must conduct a comprehensive review of the combined ecological, economic, and social impacts of multiple AOAs within the Santa Barbara Channel, considering their effects on fisheries, marine wildlife, coastal communities, and other factors.

We appreciate the opportunity to provide input and look forward to continued engagement on this important issue,

Nate Irwin
Policy Associate
Santa Barbara Channelkeeper

Submitted Via: Regulations.gov AND email **Submitter Name/Organization:** Merrick Burden – Executive Director, Marc Gorelnik – Chairman, Pacific Fishery Management Council

Pacific Fishery Management Council
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20 February 2025

Celia Barroso
Regional Aquaculture Coordinator, California
National Marine Fisheries Service
West Coast Region
501 W. Ocean Blvd., Ste. 4200
Long Beach, CA 90802

Re: National Oceanic and Atmospheric Administration (NOAA) Aquaculture Opportunity Areas (Docket NOAA-NMFS-2022-0051) – Intent to Submit Comments

Dear Ms. Barroso:

The Pacific Fishery Management Council (Council) appreciates the opportunity to provide comments on the National Oceanic and Atmospheric Administration (NOAA) Draft Programmatic Environmental Impact Statement (DPEIS) on Aquaculture Opportunity Areas (AOAs). We intend to submit a detailed comment letter as soon as possible. However, it may be after the comment period has closed. I ask for that letter to be included in the administrative record.

The Council manages U.S. West Coast fisheries, several of which operate in or near the areas proposed as potential AOAs. In addition to developing harvest management regulations, the Council has statutory responsibilities to protect and conserve the habitats necessary to maintain a sustainable fishery and the managed species' contribution to a healthy ecosystem (50 CFR § 600.815). Section 305(b)(3)(A) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) states that the Council "may comment on and make recommendations to the Secretary and any Federal or State agency concerning any activity authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken, by any Federal or State agency that, in the view of the Council, may affect the habitat, including essential fish habitat, of a fishery resource under its authority."

The MSA includes 10 National Standards (NS) that are principles to be followed in any Fishery Management Plan (FMP), to ensure sustainable and responsible fishery management (50 CFR Part 600 Subpart D). Two of these are particularly relevant in this context. NS8 states that FMPs, in developing conservation measures, must consider the impacts to fishing communities and minimize adverse economic impacts on such communities. NS10 states that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.

The Council commented on the NOAA AOAs in the past, including a July 2022 letter on the Notice of Intent to prepare a Programmatic Environmental Impact Statement. That letter contained numerous recommendations related to concerns about raising non-native species, impacts to sensitive benthic habitats, impacts to commercial and recreational fishing activities, and concerns about disease and escapement. We appreciate that many of our recommendations from 2022 were referenced in the DPEIS. That letter is attached here and I request that it be included in the record for this comment opportunity.

We appreciate your consideration of our prior and our pending comments, and the inclusion of those comments in the administrative record. Please contact me with any questions or concerns at 503-820-2418 or merrick.burden@pcouncil.org.

Sincerely,



Merrick J. Burden
Executive Director

Enclosure:

Pacific Fishery Management Council comment letter on NOAA Aquaculture Opportunity Areas, July 2022.

Pacific Fishery Management Council
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22 July 2022

Dr. Scott M. Rumsey
Acting Regional Administrator
NOAA Fisheries West Coast
Region 1201 NE Lloyd Blvd
#1100
Portland, OR 97232

RE: Notice of Intent to Prepare a Programmatic Environmental Impact Statement for Identification of One or More Aquaculture Opportunity Area(s) in Southern California

Dear Dr. Rumsey,

The Pacific Fishery Management Council (Council) submits the following comments in response to the National Oceanic and Atmospheric Administration (NOAA) Notice of Intent (NOI) to prepare a Programmatic Environmental Impact Statement (PEIS) on the Southern California Aquaculture Opportunity Areas (AOAs).

The Council is one of eight Regional Fishery Management Councils established by the Magnuson- Stevens Fishery Conservation and Management Act of 1976 (MSA). The Council is charged with sustainably managing West Coast fisheries and the habitats upon which they depend and develops fisheries management actions for Federal fisheries of Washington, Oregon, California, and Idaho. The Council is required to achieve optimum yield for public trust marine fishery resources, which requires sustainably managing these resources, their habitats, and the fishing communities that rely on their harvest.

The Council very much appreciates the approach NOAA is taking in this planning initiative and supports the programmatic approach to environmental impact analysis. We understand the resulting Draft PEIS will address an initial programmatic decision and analysis and establishes a tiering process for subsequent decisions to be made that are supported, in part, by the analysis detailed in the PEIS. Seeking stakeholder engagement before siting decisions are made will allow the public to have confidence that their voice is heard as the process unfolds, which will support an informed decision-making process, consider a reasonable range of alternatives, and review the environmental impacts of the Proposed Action.

Council Authorities and Responsibilities

Essential Fish Habitat

The Council is particularly focused on actions that may adversely affect the essential fish habitat (EFH) of Council-managed species. The MSA requires the identification, conservation, and enhancement of EFH for species managed under the Council's fishery management plans (FMPs). The MSA authorizes the Council to comment on actions that may affect the habitat, including

EFH, of a fishery resource under its authority (Section 305(b)(3)(A)) and requires the Council to comment on actions that are likely to substantially affect the habitat of an anadromous fishery resource under its authority (Section 305(b)(3)(B)).

Consistent with 50 CFR 600.10, the Council describes EFH conservation measures in its FMPs. The Pacific Coast Groundfish FMP describes Essential Fish Habitat Conservation Areas, which are spatially discrete areas of particularly sensitive or productive benthic habitats where fishing with some or all types of bottom-contact fishing gear is prohibited. The MSA also authorizes the Council to designate habitat areas of particular concern (HAPC), a subset of EFH, and therefore subject to consultation, based on one or more of the following considerations:

(i) The importance of the ecological function provided by the habitat.
(ii) The extent to which the habitat is sensitive to human-induced environmental degradation.
(iii) Whether, and to what extent, development activities are, or will be stressing the habitat type.
(iv) The rarity of the habitat.

HAPC designations for Pacific Coast Groundfish include rocky seafloor, canopy kelp, seagrass, estuaries, and unique areas such as seamounts and canyons. HAPC designations for Pacific salmon include kelp, estuaries, spawning habitat, submerged aquatic vegetation, complex flood channels and thermal refugia. Many other important habitat features are included in the overall description of EFH, including methane seeps, sand, mud, and coral/sponge habitats.

MSA National Standards
The MSA includes ten National Standards (NS) that are principles to be followed in any FMP to ensure sustainable and responsible fishery management. NMFS has developed regulatory guidance for the ten National Standards (50 CFR Part 600 Subpart D). With those standards in mind, the Council **recommends** that the analysis of the effects of offshore aquaculture activities on fishery resources consider:

- The effects of the proposed action on the ability of fisheries to continue to achieve optimum yield from managed wild fish stocks (NS1 – 50 CFR § 600.310).
- The effects of the proposed action on the sustained availability of fishery resources to fishing communities near any proposed or designated AOA, and on the sustained participation of those fishing communities in fisheries (NS8 – 50 CFR § 600.345).
- The effects of the proposed action on fishing vessel safety of navigation and safety of human life at sea (NS10 – 50 CFR § 600.355).

Scope of Council Comments
The NOI describes the proposed action identification of geographically discrete areas within Federal waters off the coast of Southern California that would be suitable to site future aquaculture development. It further outlines four preliminary alternatives, one of which is the No Action Alternative.

NOAA seeks comments "*concerning the scope of the proposed action, its potential impacts to the natural and human environment, means for avoiding, minimizing, or mitigating potential impacts, the range of preliminary alternatives proposed in this notification, and any additional reasonable alternatives that should be considered within the Southern California Bight*." Additionally, NOAA

is requesting public comments on 16 specific items. The Council provides the following comments on several items that are particularly relevant to Council mandates and authorities.

(1) The scope of the National Environmental Policy Act (NEPA) analysis, including the range of reasonable alternatives described above

Again, the Council appreciates NOAA's thoughtful approach with this effort. The Council fully supports the preparation of a PEIS and considers the preliminary alternatives to appropriately represent the range of potential alternatives. As we understand the scope of the PEIS, it would not include designating areas outside the boundaries of the North or Central North Study Area Selected Site Options (SSOs), although alternative areas within those Study Areas could be proposed. We offer our comments with that understanding. The Council **recommends** that the scope of the NEPA analysis be comprehensive in nature and include the following social, economic, ecological, and environmental effects for seaweed, finfish or shellfish mariculture. These effects are further discussed in the relevant sections of this letter:

- Physical effects on seafloor habitats and benthic organisms through disturbance from anchoring systems, shading, smothering, scouring, etc.;
- Physiological effects on benthic organisms and to benthic community composition from increases in organic nutrient loads and eutrophication from excess feed, excrement, etc.;
- Changes in hydrodynamics caused by facility infrastructure (e.g., reduced current velocity, altered circulation patterns);
- The cumulative and synergistic effects of aquaculture when coupled with climate-induced ocean changes;
- Chemical contamination from therapeutants, antimicrobials, antifoulants, algaecides, pesticides, etc.;
- Changes in water chemistry from feed and metabolic waste (e.g., phosphorus, nitrogen, turbidity, dissolved oxygen);
- Spread of antimicrobials, etc. to wild stocks;
- Transmission of disease to wild stocks and/or other native species in the ecosystem;
- Effects of cultivation and introduction of non-indigenous species on wild, native species and habitats;
- Escape of cultured (native and non-native) seaweed/kelp gametes, colonizing and affecting wild seaweeds/kelps. Recent catastrophic collapse of kelp forests coastwide indicate wild kelp populations are a vulnerable resource that could be further compromised by genetic mixing and competition from cultured species operations;
- Escape of cultured (native and non-native) finfish, progeny, and gametes; predation on or colonizing wild fish stocks, including interbreeding with wild fish, decrease in genetic diversity and resilience; and competition for habitat and food;
- Escape of cultured (native and non-native) shellfish, progeny, and gametes;
- Escape of genetically modified fish, shellfish, or macroalgae. California prohibits transgenic species without a restricted species permit (T14 671(c)(11)). Further, these permits are only issued for transgenic species held in CLOSED systems (T14 671.1(a)(8)(A));
- Attracting and concentrating predators of wild fish stocks and other species (sharks, marine mammals, seabirds);

- Attracting wild fish to the site, possibly reducing fishing access to those fish. Conversely, attraction and crowding can affect reproduction, movement, and migration, resulting in increased capture rate;
- Entanglement of marine mammals, seabirds and turtles in floating and hanging lines and other gear associated with any installations, and increased risk of vessel strikes, and how impacts to these fisheries-constraining species could affect Council and non-Council managed fisheries;
- Effects of marine debris (nets, lines, cages, etc.) on fish and shellfish species, habitats, fishing gear, and navigational safety;
- Anchored mooring systems are at risk for breakage during frequent and severe regional storms, potentially damaging rocky reefs and creating navigation hazards;
- Social and economic losses to current users, including commercial and recreational fisheries, and other recreational users, including passenger excursions.

(2) Suitable species and gear for aquaculture

The Council has serious concerns about the potential introduction of non-native species (fish, shellfish and macroalgae) into waters of the California Current Large Marine Ecosystem, and the potential effects on native species. Top among our concerns is the risk these species pose, including disease transmission, competition for resources, and interbreeding. Additional concerns are noted above under scoping. Many harvesters and stakeholders are not in favor of non-native species being propagated in the Southern California Bight. For these reasons, the Council is very concerned about the cultivation of any non-native species (finfish, shellfish, or macroalgae), or inclusion of these species in the PEIS. The PEIS should include detailed analysis of effects associated with the presence and propagation of non-native species.

To avoid and minimize potential impacts, gear should have as small a surface footprint as possible. Safety should be of paramount importance and all necessary steps must be taken to ensure mariner and public safety. For example, grow lines for shellfish operations should be weighted and incapable of floating to the surface should they break free from any mooring systems. Buoys should be marked and lit in compliance with United States Coast Guard requirements for navigational safety buoys, and the locations should be made readily available to the maritime community via the Local Notice to Mariners and communicated to coastal and fishing communities in the Southern California Bight.

All potential gear types should be analyzed for potential impacts to habitat, fish/shellfish species, protected species, the California Current Ecosystem, safety, and navigation. Best practices regarding gear configurations, deployment and maintenance should be followed to avoid impacts, including those identified above. If finfish aquaculture is proposed for individual projects covered by this PEIS, net pens should undergo greater scrutiny than shellfish or macroalgae projects due to the risk of damage and escapement. They should be rigorously tested for their ability to withstand severe ocean conditions or other circumstances that could damage the integrity of the net pens and risk escapement of cultured fish, such as the catastrophic escapement of net-pen farmed Atlantic salmon in Puget Sound in 2017. Additionally, NOAA should consider requiring double walls and/or other requirements to minimize the possibility of escapement. Current finfish technology utilizes underwater cages that appear to be less prone to failure.

The Council is also concerned that offshore aquaculture operations could result in an increased presence of marine debris from lost equipment, which can pollute and impact the surrounding marine environment, including nearby coral and sponge habitat, fish nursery grounds, or other important or sensitive habitat features. The Council **recommends** the PEIS adequately analyze the risks of marine debris and include a requirement for a Marine Debris Management and Monitoring Plan to minimize the risk of aquatic pollution. Such a plan should also include unique marking or branding of all aquaculture gear with contact information. If consistent discoveries of certain gear types are found, the project should evaluate and implement use of alternative gear types or practices that would reduce these consistent sources of debris.

NOAA should also consider insurance, bonding requirements, or other financial guarantees to ensure a project operator will have funds available for any necessary gear cleanup and/or any damages resulting from escape. The PEIS should evaluate the appropriate amount of insurance, bonding, or financial guarantee.

(3) Suitable reporting requirements for owners and operators of aquaculture facilities
Project applicants should be required to regularly and publicly report on all aspects of the operations, functions, impacts, and problems associated with site surveys and characterization, facility construction and maintenance, as well as decommissioning activities. In addition to regularly scheduled monitoring and reporting, project applicants should be required to immediately report any interactions or accidents such as interactions with non-project vessels and/or gear deployed by those vessels, marine wildlife, any loss of aquaculture gear or other infrastructure associated with the facility, high mortality or escapement of species being propagated, efforts to recover escaped species (see comments under Item 2 above), accidental release of contaminants, excess feed or waste material, etc.

Aquaculture facilities should also be required to report the details of aquaculture project production, including species, weight, product form (frozen, fresh, filleted, round, etc.), and to the extent possible, the destination markets of aquacultured product. This information will help to understand the potential effects on wild-caught fisheries and markets.

Project applicants should be required to regularly monitor the facility and operations. This monitoring, at a minimum, should include visual inspections of all ropes, cables, and equipment to help determine if any entanglement of marine wildlife has occurred, to document the as-built condition of the facility, and to ensure that: (a) no part of the facility has been broken, lost or unintentionally removed; (b) all longlines, anchor lines, buoy lines, grow lines, or any other lines utilized by the facility remain taut and in good working condition; and (c) any derelict fishing gear or marine debris that collects on the facility is removed and disposed of at an appropriate onshore facility.

The Council **recommends** that the PEIS analyze the feasibility and the need of requiring a comprehensive long-term Operations and Monitoring plan for identifying operational issues that could cause adverse effects to water quality, wild marine species, and benthic habitat. This monitoring plan should be developed in conjunction with the appropriate Federal and State permitting agencies. Monitoring measures should be described with sufficient detail in the PEIS to support the evaluation of monitoring plans proposed by project applicants. The Council

recommends adding that owners/operators study new technologies and propose alternatives that reduce or prevent discharge of uneaten feed or metabolic waste.

To assess whether aquaculture facilities are causing an effect on environmental conditions will first require obtaining substantial baseline information on water quality, ocean dynamics, species composition and age class, and habitat characterization at the AOAs. The Council **recommends** an Environmental/Species Baseline Assessment Plan be required in addition to a Monitoring Plan with spatial coverage beyond the proposed lease area to account for drift effects. The Council also **recommends** that baseline information be gathered seasonally and for a minimum of two years to account for natural variability. Similarly, post-project monitoring should also account for seasonal and annual variability for species and oceanographic conditions. The monitoring plan should also be used to assess whether the proposed setbacks from EFH HAPCs, deep sea coral and sponges, and hard bottom habitat are sufficient to avoid impacts to those sensitive habitats. Additionally, the Council **recommends** the PEIS include a detailed mitigation and adaptive management plan that can be immediately implemented if impacts to water quality, marine species, or benthic habitat are observed during monitoring.

(4) Types of aquaculture (e.g., finfish, shellfish, seaweed, integrated multi trophic aquaculture) that could be supported and/or analyzed

Integrated multi-trophic aquaculture contemplates propagation of multiple aquatic species from different trophic levels are farmed in an integrated fashion to improve efficiency, reduce waste, and provide ecosystem services, such as bioremediation. While this may be appealing in a controlled environment, we remain concerned about prevailing currents and sea states in the SSOs which may not lend themselves to such an approach. The benefits of finfish multi-trophic aquaculture systems, primarily characterized as reducing the net discharge of organic wastes leading to subsequent oxygen drawdown via water column respiration, and efficient trophic transfer directly among culture species, are entirely dependent on details of the aquaculture systems, species, growth conditions, and site hydrography that are far from standardized in the nascent field of multi-trophic aquaculture. Most implementations of these approaches are still experimental and unproven at commercial scales. The effects of multi-trophic mariculture are likely to include disease transmission, attraction of wild species, biofouling, mechanical or chemical control, and other impacts associated with more common ocean aquaculture operations. The Council **recommends** that before finfish multi-trophic aquaculture is considered, the project proponent(s) be required to show proof of concept. The proposed PEIS may not be appropriate for experimental industries such as finfish multi-trophic aquaculture, where outcomes and impacts are not well-established, and have not been tested on the U.S. West Coast.

(5) Potential impacts to biological, physical, social, cultural, and economic resources

This section describes some (but not all) of the potential biological and physical impacts we identified under Item #1 (Scope). While these comments and recommendations are focused on the operations of aquaculture facilities, they are also applicable to pre-construction surveys, site characterization, and decommissioning activities.

Impacts to Water Quality, Benthic Habitat, and Ocean Conditions

The Atlas identified biologically important and sensitive habitats that were deemed unsuitable for AOA development. To minimize potential impacts, the Atlas considers setbacks from certain

habitats or management areas: rocky reef EFH HAPCs with a 500-ft setback, deep sea coral and sponge observations with a 500-m setback, hard bottom habitat with a 500-ft setback, fish havens with a 500-ft setback, and National Marine Sanctuaries. However, the Council is concerned that the proposed setbacks may be insufficient to protect these sensitive habitats. Nutrient enrichment from fish and shellfish excrement and excess feed can result in benthic algal growth, harmful algal blooms, oxygen depletion of the water column and underlying sediments, smothering of benthic invertebrates, and other detrimental impacts to benthic communities and habitat (Holmer 2010; Wilding 2012; Price and Morris 2013). Nutrient enrichment from aquaculture projects can further intensify existing threats to marine ecosystems, including increasing acidic and hypoxic ocean conditions (Cai et al. 2011, Kessouri et al. 2021). Of particular concern among climate scientists is the potential for cumulative and synergistic effects of hypoxia and ocean acidification. Organic nutrient load is an important driver in ocean acidification and hypoxia processes, and finfish mariculture projects should be scrutinized as they can introduce substantial amounts of organic material depending on production volume, both individually and cumulatively. In fact, the Environmental Protection Agency now prohibits discharges of offshore seafood processing waste in nearly 3,770 square miles on the continental shelf off Oregon and Washington after concluding that seafood processing waste has the potential to exacerbate hypoxia in the region (EPA NPDES Permit No. WAG520000). The Council **recommends** adding the water quality requirement recently imposed by Washington Department of Ecology that owners/operators study new technologies and propose alternatives that reduce or prevent discharge of uneaten feed and metabolic waste.

The Council is also concerned with impacts on water quality and sensitive habitats from the use of pharmaceuticals, such as antimicrobials and antifungals, and other pollutants and/or chemicals such as antifoulants, algaecides and pesticides. Some materials used in aquaculture gear, such as those designed to prevent or control biofouling, can leach into the surrounding water and be harmful to marine resources or the surrounding ecosystem. Additionally, impacts to water quality and benthic habitat could occur during transportation and mooring of aquaculture support vessels, from spills of oil and other hazardous material, or from scouring of benthic habitat from vessel anchors.

The Council **recommends** the PEIS analyze all potential impacts to water quality, species, benthic habitat, and the surrounding ecosystem associated with different aquaculture proposals (e.g., gear types, species) and at various spatial configurations and scales to determine the type, spacing, and scale of projects that will be the least impactful and most compatible with marine resources. The analysis should address impacts noted above throughout these comments. The PEIS should examine whether a 500-foot buffer around sensitive habitats (e.g., rocky reef HAPC, coral/sponge habitat, kelp beds, etc.) is sufficient to prevent impacts to these resources. The Council **recommends** the PEIS describe siting decisions, gear types, and best management practices that future aquaculture operations will use to avoid and minimize the effects noted above; as well as analyzing.

Offshore aquaculture can also cause changes in ocean conditions by reducing current velocity and altering circulating patterns (Stevens et al. 2008; Lin et al. 2016). There remains a need to better understand the effects of finfish, shellfish, and macroalgae offshore aquaculture facilities on ocean hydrodynamics. Given the large size of each discrete AOA (between 500-2,000 acres), and the

potential for AOAs to be sited in a single, continuous geographic space, aquaculture infrastructure will likely alter circulation patterns and current speeds. Changes in local hydrodynamics caused by aquaculture infrastructure could exacerbate stressors that are already impacting offshore and coastal habitats, such as hypoxia, ocean acidification, marine heat wave events, and ocean warming. Impacts to currents and circulation patterns can also lead to changes in sedimentation and larval transport and dispersal. The Council **recommends** the PEIS analyze potential impacts of aquaculture infrastructure and gear on the surrounding ocean conditions and how that is predicted to be exacerbated by climate change.

Monitoring of Water Quality, Habitat and Ocean Conditions
As discussed under Item #3 (Reporting), the Council **recommends** that the PEIS require a comprehensive long-term Environmental Monitoring Plan to identify operational issues that could cause adverse effects to water quality, wild marine species, and benthic habitats.

Fish Escapes, Naturally Occurring Toxins, and Introduction of Non-native Species, Pathogens, and Parasites
Of significant concern is the escape of cultured species into the wild, and the potential for unintended introduction of a non-native fish, shellfish, and macroalgae species, which could cause significant impacts to native species and habitats. Escaped cultured fish may interbreed with wild fish and thereby decrease the genetic diversity of wild populations, compete with wild fish for important habitat and food resources, consume native species as prey, and increase the risk of disease transmission to wildlife (Holmer 2010). If fish are grown to maturity, escaped eggs and larvae can also disperse into the environment (Jørstad et al. 2008, Uglem et al. 2012, Holmer 2010). Pathogens associated with cultured fish may be transmitted to wild populations, an impact that could persist within native populations even if escaped cultured fish are unsuccessful at establishing reproductively viable populations (Mordecai et al. 2021; Morton et al. 2017). In 2018 net pen aquaculture of non-native fish was banned in the state of Washington after a massive escapement of Atlantic salmon. Similar legislation is proposed in British Columbia, largely due to the risks of non-native fish escapes and transmission of diseases. Suspended culture sites may also facilitate introduction or spread of invasive species. This has been demonstrated extensively in suspended bivalve aquaculture (McKindsey et al. 2011). There is also risk of escapement of cultured species and pathogens during transportation of live and processed products to and from the AOAs.

Depending on the time of year and ocean conditions, there can be algal blooms resulting in saxitoxin (Paralytic Shellfish Poisoning). Also, in California domoic acid is monitored due to Amnesic Shellfish Poisoning concerns. Both toxins are monitored by the California Department of Public Health, Environmental Management Branch Marine Biotoxin, and Phytoplankton Monitoring Programs[1]. These are just a couple of the naturally occurring toxins which can cause consumer illness[2]. Harvests could be shut down due to red tides and Paralytic Shellfish Poisoning, or the presence of high levels of domoic acid in seafood, which is shown to disproportionally

[1] See - Shellfish Program(ca.gov)
[2] A more complete list can be found here - Fish and Fishery Products Hazards and Controls Guidance Fourth Edition – August 2019 Chapter 6: Natural Toxins (fda.gov)

impact small-scale fishers[3]. The Council **recommends** the PEIS consider the potential impacts of naturally occurring harmful algal blooms on farmed species and on human consumers.

The Council **recommends** that the PEIS evaluate how AOA operations will avoid, minimize, and respond to fish escapement at the facility and during transport of live and processed products to and from the AOAs. The PEIS should analyze the potential impacts from accidental introduction of non-native species (fish, shellfish, and macroalgae) into the marine environment and the impacts from potential introduction of new pathogens or parasites that these species may carry.

Impacts to social and economic resources

The PEIS should analyze social and economic impacts to current users, including commercial and recreational fisheries, and other recreation activities such as sailing, whale watching and other passenger excursions, and other maritime operations not covered above. The Council recognizes that some economic impacts may not be readily calculable, for example opportunity costs and recreational values. Increased fuel consumption by vessels having to avoid the AOAs will increase the carbon footprint (climate cost) in addition to higher expenditures on fuel. The PEIS should also analyze changes in both supply and demand for current seafood products, with particular attention to consumer preferences in the geographic areas in and around the AOAs. Any loss of locally sourced, wild-capture seafood may have a negative impact on the local seafood economies in those areas. Additionally, the potential loss of market value of wild-capture finfish due to new competition from cheaper farmed finfish should be analyzed as well.

Cumulative Effects

The Council **recommends** the PEIS evaluate the potential cumulative effects from multiple aquaculture projects within the AOAs as well as with other ongoing and foreseeable activities in the project area. Other proposed aquaculture projects offshore of southern California include Pacific Ocean Aquafarms, Ocean Rainforest, and Avalon Ocean Farm. Other activities that should be included in the cumulative effects analysis include, but are not limited to, navigational channel maintenance dredging, future renewable energy projects, and subsea cable installation. Additionally, the cumulative effects analysis should consider the potential environmental impacts to sensitive habitats and species from concentrating fishing effort that has been displaced outside of AOAs.

(8) Information related to diversity, equity, and inclusion in aquaculture and the seafood sector

The Council very much appreciates NOAA's commitment to diversity, equity, and inclusion, and supports the need to ensure that the aquaculture and seafood sectors are part of those discussions. The fishing, processing, and related industry sectors depend on a diverse workforce, and the Council supports recognition of the entire seafood industry and the impacts to the businesses and employees, in considerations of AOAs. Other proposed offshore activities that could or would impact these sectors often neglect to include the fishing, processing, and related sectors in planning processes.

[3] Jardine, Sunny L., et al. "Inequality in the economic impacts from climate shocks in fisheries: the case of harmful algal blooms." *Ecological Economics* 176 (2020): 106691.

Specifically related to diversity, equity, and inclusion in aquaculture and the seafood sector are concerns surrounding the marketing of the catch. As NOAA considers the economic feasibility of offshore aquaculture, NOAA should be communicating with the California Department of Public Health, Environmental Management Branch and the Food and Drug Administration's Division of Seafood Safety[4]. These agencies can advise on processes in place that are implemented when toxins reach certain action levels, warnings and quarantines are issued to protect the recreational fishing public and shellfish consumers.

(10) Potential interactions with protected species, essential fish habitat, and other sensitive habitats

The Atlas provides information on areas important to humpback whales in Table 2.3. Table 2.4 identifies ESA-listed species providing their status and population trend. Table 2.5 identifies marine mammals protected under the Marine Mammal Protection Act. The North Study Areas SSOs lie within the Santa Barbara Basin Important Bird Area.

The Atlas specifically mentions critical habitat for black abalone, seagrasses, and humpback whale. The Council **recommends** analysis of other potentially applicable critical habitats for the species identified in Table 2.4 and inclusion of potential impacts to the Southern California Distinct Population Segment (DPS) of steelhead. Critical habitat for the Southern California DPS of steelhead includes the Ventura River, Coyote Creek, and the Santa Clara River. The close proximity of the North Study Areas SSOs to the mouths of those rivers could impact the steelhead's abilities to return to the river to spawn. As noted in Table 2.4, white abalone is listed as endangered under the Endangered Species Act (ESA), but no critical habitat has been designated[5]. White abalone live on rocky substrates alongside sand channels, which tend to accumulate the algae they eat. They are usually found at depths of 50 to 180 feet, making them the deepest living abalone species. Historically, white abalone were found in the Pacific Ocean from Point Conception, California, to Punta Abreojos, Baja California, in Mexico[6]. Blue whales are also listed as endangered under the ESA, and there is currently no critical habitat designation for the blue whale. This does not violate the ESA, as it is not required to identify critical habitat for species listed prior to 1978. The Atlas acknowledges that blue whales are known to occur in the Southern California Bight. Stakeholders have noted that blue whales frequent areas near the North Study Areas Selected Site Options.

When discussing NMFS Protected Resources, the Atlas appears to have limited its analysis to highly vulnerable protected species (Atlas, page 23) "so there are a number of protected species, especially marine mammals, that were excluded. Those species will need to be considered during the PEIS stage to determine overall suitability of potential AOA options." Of the species listed on Table 2.5, the following are known to frequent both SSOs: harbor seal, California sea lion, eastern North Pacific gray whale DPS, and all of the dolphin species listed except the coastal bottlenose dolphin. The Draft U.S. Pacific Marine Mammal Stock Assessments: 2021[7] removes all references

[4] https://www.fda.gov/media/85073/download

[5] NOAA Fisheries has determined that it is not prudent to designate critical habitat because identification of such habitat is expected to increase the threat of poaching for white abalone. See 66 FR 29046 (2001)

[6] See - White Abalone | NOAA Fisheries

[7] See - Draft 2021 Pacific SARS.pdf (noaa.gov)

to coastal bottlenose dolphin. We suggest clarifying or explaining the status of the coastal bottlenose dolphin.

Interactions of aquaculture structures and support vessels with protected species can be detrimental to their existence. As these species also tend to constrain fisheries, impacts to protected species can further constrain fishing. These impacts include changes in migratory patterns which make co-occurrence with fishing gear more likely than in the absence of aquaculture structures. The PEIS should attempt to quantify the potential for interactions with, and impacts to, protected species and consider this in their final selection of AOAs.

(11) Potential interactions with commercial and recreational fishing industries, tourism and recreation, and other offshore ocean users

There will necessarily be interactions and impacts to the commercial and recreational fishing industries. These may range from the significant, such as the loss of access to important fishing grounds, to the insignificant, such as having to alter course slightly to get to your intended destination. The impacts will differ depending on the fishery and the sector. For example, tuna or swordfish harvesters based in the area will not likely be displaced from fishing grounds, but the North Study Areas SSOs are located on grounds important to highly migratory species fishermen targeting thresher sharks as well as non-highly migratory species fishermen targeting ridgeback prawn, sea cucumber, California halibut, coastal pelagic species, and other fisheries. Before the decline of the salmon fishery, those areas were important to salmon trollers. The impacts will be felt by the commercial and recreational fishermen and women as well as by members of the fishing and coastal communities which are dependent upon their activities. We note, as was highlighted in the Atlas, commercial fishing is not allowed in the Central North Study Area, with limited exceptions.

Data Improvement

We appreciate the thoroughness of the Atlas and the amount of work that went in to preparing the document. We do, however, have some recommendations for how the data utilized in the Atlas can be improved upon:

- Vessel traffic was a consideration in identifying the AOAs. The Atlas correctly states that Automated Identification Systems (AIS) are required on fishing industry vessels. However, the Atlas misstates those requirements when it says, "fishing industry vessels of various size and tonnage are required to carry AIS transponders to support commercial fishing and fish processing." Coast Guard regulations require AIS on commercial fishing vessels 65 feet or more in length[8]. This requirement went into effect on March 1, 2016[9]. Based on input from fishermen in the area, the vast majority of commercial and recreational vessels which utilize the area in and around the AOAs are less than 65 feet in length, and thus not required to have on board an operational AIS. Reliance on AIS data likely underestimates the amount of fishing industry vessel traffic in the Study Areas. The Council **recommends** NOAA engage with local commercial and recreational fishery participants in an effort to gain a better understanding regarding the use of the Study Areas by commercial and recreational fishing vessels.

[8] 33 CFR §164.46

[9] 33 CFR §164.46(j)

- The Atlas states that fishing vessel transits in 2019 in the North Study Area are focused from the harbors of Ventura, Santa Barbara, and Channel Islands (Atlas p 60). This fails to capture the importance of Port Hueneme to the commercial fishing industry. 2010 – 2019 landings and ex-vessel revenues coming into Port Hueneme are provided in the table below[10]:

Year	Pounds	Ex-vessels revenues
2019	3,294,274	$2,514,511
2018	13,908,010	$8,264,201
2017	35,936,403	$18,481,438
2016	17,224,213	$9,300,002
2015	17,886,149	$5,849,371
2014	34,677,838	$11,507,240
2013	36,324,835	$11,923,632
2012	36,791,416	$10,707,442
2011	58,916,159	$14,768,970
2010	60,385,096	$17,985,224

The vast majority of offloads into Port Hueneme consists of market squid and other coastal pelagic species.

- Throughout the Atlas, vessel monitoring system (VMS) datasets are used to identify where certain types of commercial fishing activity occurs. The VMS data provided only covers 2010 – 2017. The Council **recommends** including more recent datasets for VMS and other fishery datasets incorporated into the model[11]. We are also concerned that VMS data is provided for two fisheries which are not prosecuted in the Southern California Bight – the Pink Shrimp Trawl fishery and the Dungeness Crab Trap or Pot Gear fishery; and references VMS data for fisheries for which VMS is not required - for example, sheephead trap or pot gear and Dungeness crab trap or pot gear. Table 3.5 references VMS dataset 269 – "A gear that is not listed above." Examples of gear types that would fall under this category would be helpful.

- In the North Study Areas there would be conflicts with commercial passenger fishing gear and private boat fishing operations, especially in waters deeper than 100 meters. These areas have become more accessible to anglers lately because of changes in regulations, in addition to improvements in fish finder and fishing gear technology.

- The Council is generally aware of ecotourism which takes place in and around the North Study Areas, particularly whale watch excursions. It does not appear that the Atlas captures those operations or associated vessel traffic.

[10] Values from CDFW Final California Commercial Landings, Table 19 PUB - Poundage And Value Of Landings By Port, SANTA BARBARA Area for each year, 2010 – 19. See - Final California Commercial Landings

[11] A number of datasets incorporate data up to and including 2019. These should be expanded to cover 2021 (or 2022 for those fisheries for which that data is available. For example – commercial passenger fishing vessels, CRFS, Observer data, microblocks for market squid and lobster.

- This above results in less confidence in the analysis provided in terms of potential impacts to fisheries and fishing communities. As such, the Council **recommends** NOAA engage with the local commercial and recreational fishing industries in an effort to validate and correct the datasets provided in the Atlas and used in the area identification process.

Safety concerns
The safety of vessels and their crews near aquaculture facilities within AOAs is extremely important and should be addressed. Providing for safety other than blanket spatial exclusions or restrictions from accustomed commercial and recreational fishing methods is insufficient. Aquaculture facilities should bear some of the burden of and tolerance for the occasional fishing gear entanglement as part of their lease requirements. Previously permitted aquaculture operations in Federal waters off the Southern California coast were required to implement a Lost/Damaged Fishing Gear Compensation Plan as a condition for their Consistency Certification[12]. Conversely, commercial and recreational fishermen should be aware of the additional risk of gear entanglements, should they choose to fish in proximity to aquaculture facilities. Regarding recreational fishing near aquaculture facilities, we note that recreational anglers historically have not been excluded from fishing near structures such as oil rigs, except under specific Homeland Security measures. Even then, rig operators use discretion to enforce the rules, such as when rig maintenance or crane work is performed that may endanger recreational vessels and fishermen. Similar rules should apply to aquaculture facilities, recognizing the occasional loss of recreational gear. That is, anglers should not be excluded from fishing around aquaculture facilities, provided they can do so safely, without losing recreational gear or entangling the aquaculture facility.

As NOAA further conducts the analysis required to refine the marine spatial planning outlined in the Atlas, we suggest undertaking an effort to forecast which areas will be important to different or new fisheries under changing ocean conditions. Fishermen remain concerned about how regulations may affect current (or near-future) fishing and the effects it will have on those future fisheries. That is, sport and commercial fishing regulations and/or other forms of limiting access may change such that fishermen will have to look to other areas for harvest; some of those areas may have aquaculture operations in effect by then. We must also be mindful of fisheries which are currently closed due to the status of the stock, but which will likely be re-opened when appropriate – for example, the directed fishery for Pacific sardine which has been closed since 2015.

(12) Information on other current or planned activities in, or in the vicinity of, the areas described in this NOI and their possible impacts on aquaculture development, or the impact of aquaculture developments on those activities

There are a number of current, planned, or proposed activities in the vicinity, or likely to be serviced by vessels in the vicinity. Generally, they fall into three categories: current maritime uses, offshore renewable energy development, and other aquaculture projects.
Current Maritime Uses:

[12] See Condition 7 of the California Coastal Commission's Staff Report for Consistency Certification CC-035-12, KZO Sea Farms – (California Coastal Commission Staff Report and Recommendation Regarding consistency Certification No. CC-035-12 (KZO SeaFarms, Los Angeles County)) and Special Condition 8 of the California Coastal Commission's Staff Report for Consistency Certification CC-0003-21, Ocean Rainforest, Inc. – (F12a-10-2021-report.pdf (ca.gov))

- As was more fully developed under Item 11 above, recreational and commercial fishing activities are currently utilizing all of the Selected Site Options for fishing or navigational purposes. Vessels of all types and uses transit through the areas. We suspect that vessels servicing the oil platforms off the Ventura coast may also transit through these areas.

Offshore Renewable Energy:

- The Bureau of Ocean Energy Management has recently published a Proposed Sale Notice for the Morro Bay Wind Energy Area. Winning bidders will be allowed to conduct site assessment and site characterization activities in and around the Monterey Bay Wind Energy Area.
- There are two proposed offshore wind pilot projects in State waters (within 3 nautical miles of the coast) near Point Arguello.

It is unlikely that site assessment and/or site characterization activities will impact the aquaculture development, but questions remain as to whether wind development proposals may affect the suitability of any areas for aquaculture. These two efforts don't seem very coordinated and could have overlaps that affect the suitability of locations for either. However, if vessels performing site assessment or site characterization activities, or vessels aiding in the construction or deployment of those activities, or vessels servicing those areas are based in Ventura Harbor, Channel Islands Harbor, or Port Hueneme, there is a possibility that aquaculture development could be impacted. Depending on the prevailing weather conditions and the size and type of those vessels, there may be navigation challenges. Some of the areas in the North Study Areas SSOs lie in a direct course line between those harbors and Point Conception and/or Point Arguello. Some of these vessels may have significantly deeper drafts than the vast majority of other vessels which typically use, or transit through, those areas.

Other Aquaculture Projects

- Pacific Ocean Aquafarms. It is our understanding that NOAA is undertaking an Environmental Impact Statement for the proposed Pacific Ocean Aquafarms development of a commercial-scale finfish aquaculture facility. This project is proposed to be located approximately four nautical miles off the coast of San Diego, with an alternate site off Huntington Beach. The project proposes construction, operation, and maintenance of an offshore marine finfish aquaculture facility composed of submersible net pens.

- Ocean Rainforest. In 2021, the California Coastal Commission issued a conditional concurrence on a consistency certification request to temporarily install and operate a demonstration seaweed aquaculture facility on an 86-acre site in Federal waters approximately 4.4 nautical miles offshore of Santa Barbara[13]. The facility would be comprised of a variety of ropes, lines, buoys, and cultivation equipment that would be anchored to the seafloor and held submerged at a depth of between 33 and 49 ft below the ocean surface. The depth at the proposed site is between 246 and 262 ft. The facility itself would occupy 16 acres and would be used to grow native giant kelp on an array of 32 cultivation lines. The project is intended to last for two years, at which point the project

[13] See - F12a-10-2021-report.pdf (ca.gov)

applicants would fully remove the aquaculture facility and all associated anchors, buoys, cultivation lines, and kelp.

- Avalon Ocean Farm. In early 2020, Avalon Aquafarms submitted an Application for Permit[14] to the U.S. Army Corps of Engineers, Los Angeles District, for an aquaculture facility – Avalon Ocean Farm. In the summer of 2021, the Applicant submitted an updated Application with a revised location and project description[15]. It is proposed to be located in the Pacific Ocean offshore of Long Beach. A map of the proposed location can be found in the application included in footnote 5. The proposed activity is to install a 1,860-acre shellfish and macroalgae aquaculture facility in Federal waters offshore from Long Beach and/or Huntington Beach. The facility would consist of three commercial scale subsurface aquaculture plots consisting of multiple submerged longlines on which shellfish and kelp would be grown.

Scientific Surveys

The Council is concerned about the potential for spatial conflicts with fisheries surveys and other marine scientific surveys, including long-term ocean monitoring that may occur in these areas. The loss of data from these scientific surveys due to spatial conflicts from aquaculture installations would likely increase uncertainty in certain stock assessments. Increased uncertainty may translate into reduced opportunity (e.g., lower catch limits) under the precautionary principle and economic impact to fishing communities. The Council **recommends** that the PEIS analyze whether any of the AOAs will conflict with NOAA, the California Cooperative Fisheries Research Investigations, or other scientific surveys[16], and avoid such impacts to the extent possible.

(14) Input related to the risks and/or benefits of whether an AOA should be a single, continuous geographic space, or a collection of discrete areas separated from one another.

The Council **recommends** analysis of the impacts of a larger continuous AOA space versus a collection of smaller discrete areas. The Council is concerned about navigation and transit as it pertains to fishing activities, search and rescue operations, scientific surveys, and other important navigation activities.

(15) Input related to how an AOA could simultaneously support aquaculture development along with environmental, economic, and social sustainability—including ways to incorporate mitigation and cost-benefit analyses.

When developing the PEIS, NOAA should consider whether impacts or changes that justify mitigation be more specifically defined. This could proactively contemplate changes/impacts that are likely to being blamed on other factors (e.g., offshore wind energy development). This is particularly concerning for species with large natural fluctuations since significant changes may be caused by outside factors (i.e., aquaculture) but just attributed to natural variation.

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[14] See - `ramswp51p~«CORPS_LOGO2»PUBLIC NOTICE (army.mil)

[15] See - `ramswp51p~«CORPS_LOGO2»PUBLIC NOTICE (army.mil)

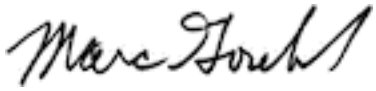
[16] For example, the California Wetfish Producers Association has been conducting various research studies inside the Southern California Bight. Including one in cooperationwith the Southwest Fisheries Science Center where a smaller purse seine vessel is performing a nearshore acoustic survey for Coastal Pelagic Species in waters inaccessible to the larger NOAA vessels. See - 2021 California Current Ecosystem Survey | NOAA Fisheries.

(16) Other information relevant to the Proposed Action and its impacts on the human environment.

The Atlas also mentions naturally occurring oil seeps[17] which are prevalent in the North Study Areas SSOs. In areas off Ventura, fishermen have noted the potential incompatibility of aquaculture in those areas with the prevalence of natural oil seeps, and the prevailing winds and currents which could cause contamination.

The Council appreciates the opportunity to provide comments on NOAA AOAs. We look forward to the draft PEIS and intend to provide further comments when it is released. If you have any questions, please contact Kerry Griffin on Council staff (Kerry.griffin@noaa.gov; 503-820-2409).

Sincerely,



Marc Gorelnik,
Chairman

KFG:kma\ael

Cc: Council Members
Susan Chambers
Mike Conroy
Correigh Greene
Scott Heppell
Diane Windham

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Submitted Via: Regulations.gov **Submitter Name/Organization:** Hans Cole – VP Environmental Activism, Patagonia, Inc.



February 20, 2025 Celia Barroso
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Re: Draft Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in
U.S. Federal Waters off of Southern California.

Dear Ms. Barroso,
I am writing on behalf of Patagonia, a U.S.-based outdoor apparel brand that, for more than 50 years, has advocated for protecting wild fish, aquatic ecosystems, and the communities that depend on them, to express concerns about the proposed Aquaculture Opportunity Areas (AOAs) in the Santa Barbara Channel. The scale, location and potential negative impacts of the proposed AOAs threaten our environment, local fisheries, and coastal communities.
The Santa Barbara Channel's strong currents, storms, and winds make it a vulnerable site, unsuitable for large-scale industrial aquaculture infrastructure. Pollution, habitat destruction, and entanglement risks posed by aquaculture in the Santa Barbara Channel can harm sensitive marine ecosystems and their inhabitants. Increased vessel traffic and escaped fish have the potential to impact native fish populations, and these impacts can also disrupt the livelihoods of local fishermen who rely on healthy, productive waters.

Open net pen aquaculture is a disastrous practice. Over the last decade, we have educated ourselves and our community about the significant impact that industrial net pen fish farming has on the environment, wild species and communities. Open water net pen farms pollute the ecosystems in which they are placed, and the daily pollution includes fecal waste, feed and pharmaceuticals – all of which harm otherwise healthy habitats. Additionally, farmed fish spread parasites and disease and often escape. Interbreeding between farmed and wild fish can also damage thousands of years of genetic evolution, weakening entire species. Countries all over the world are now realizing the dangers these farms pose to healthy ecosystems and many are working to safeguard their waters. The state of Washington recently banned open water net pens in their state waters due to the negative impacts of these activities.

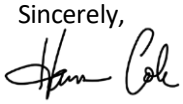
Regardless of the scale of operations, it is critical that NOAA avoid sensitive habitat and impacts on native species, prohibit offshore finfish farming, and consider only regenerative aquaculture practices with the strongest environmental safeguards.

Comment ID Number: m7e-6cbo-2lpq

There must be a more robust process to consider all of the potential impacts – and, thus, NMFS should halt its AOA designations at this time. Community input and greater opportunities for public comment will also continue to be critical.

Thank you for prioritizing the health of the Santa Barbara Channel.

Sincerely,



Hans Cole
VP – Environmental Activism Patagonia

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Patagonia, Inc. is a member of 1% For The Planet

Submitted Via: Regulations.gov **Submitter Name/Organization:** Center for Food Safety

February 20, 2025

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Submitted Electronically via Regulations.gov

Re: Draft Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal Waters off of Southern California

Thank you for the opportunity to comment on the National Marine Fisheries Service's (NMFS's) Draft Programmatic Environmental Impact Statement for Aquaculture Opportunity Areas off of Southern California.[1] On behalf of themselves and their members, the organizations in the signature submit the following comments to identify key deficiencies and issues in NMFS's DPEIS for Southern California Aquaculture Opportunity Areas. These comments also incorporate by reference comments submitted by Don't Cage Our Oceans.

INTRODUCTION

The Center for Food Safety (CFS) is a nonprofit, public interest organization with a mission to protect public health and the environment by curbing the proliferation of harmful food production technologies, such as industrial aquaculture practices, and by promoting sustainable forms of food production. CFS represents over one million members who reside in every state across the country, who support safe, sustainable food production, including members in southern California. CFS has long had a specific aquaculture program, dedicated to addressing the adverse environmental and public health impacts of industrial aquaculture, including numerous policy, scientific, and legal staff. In its program, CFS strives to ensure and improve aquaculture oversight; further policy and cultural dialogue with regulatory agencies, consumers, chefs, landowners, and legislators on the critical need to protect public health and the environment from industrial

[1] NMFS, *Draft Programmatic Environmental Impact Statement (DPEIS) for the Identification of Aquaculture Opportunity Areas (AOAs) in Federal Waters of Southern California* (Nov 12, 2024) (DPEIS).

aquaculture; promote and protect more sustainable alternatives; and push for transparent seafood labeling.

SUMMARY OF COMMENTS

The National Marine Fisheries Service (NMFS) has identified four potential actions regarding Aquaculture Opportunity Areas (AOAs) in southern California.

1. **No Action**
2. **Santa Barbara Channel:** 8 potential options located between 10.02 and 19.72 km offshore, with a total combined acreage of 15,000 acres. Sub alternatives of
    a) macroalgae and shellfish only; or
    b) all types of commercial aquaculture
3. **Santa Monica Channel**: 2 options located between 8.06 and 8.82 km offshore with a total combined acreage of 1,500 acres. Sub alternatives of
    a) macroalgae and shellfish only; or
    b) all types of commercial aquaculture
4. **Combination of Geographic Areas**: total of 10 potential areas, some combination based on public comments. Sub alternatives of
    a) macroalgae and shellfish only; or all types of commercial aquaculture[2]

These designations will identify suitable areas for future offshore finfish, shellfish, macroalgae, or multi-species aquaculture in federal waters in Southern California. NMFS designation of AOAs intends to, and will, streamline approvals of industrial aquaculture operations in the marine space within the Exclusive Economic Zone along the coastline between Point Conception and the U.S./Mexico border known as the Southern California Bight, as well as the Channel Islands, to the detriment of the regional economy and the environment.[3] NMFS's proposed designation would also designate areas for commercial offshore aquaculture in the federal waters of the United States, without proper legal authority and without complying with the relevant federal statutes.

Contrary to NMFS's assertion of authority under Executive Order 13921, the Fifth Circuit has already determined that NMFS does not have statutory authority to develop a system of commercial offshore aquaculture in federal waters absent new, aquaculture-specific Congressional delegation.[4] On this lack of authority alone, NMFS must halt the consideration of these Southern California Aquaculture Opportunity Areas.

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[2] *Id.* at 16-17.
[3] *Id.*
[4] *Gulf Fishermens Ass'n v. Nat'l Marine Fisheries Serv.*, 968 F. 3d 454 (5th Cir. 2020).

If, however, NMFS does proceed with the AOA designations, NMFS is required to thoroughly assess the myriad impacts of offshore aquaculture on the marine ecosystem, human health, and the economy. NMFS must address the lack of federal authority to regulate aquaculture in federal waters and take a "hard look" at the proposed AOA designations, the alternatives, all reasonably foreseeable direct, indirect, and cumulative impacts of each proposed alternative (including intertwined socioeconomic impacts), and the feasibility and enforceability of any mitigation measures proposed, as required by the National Environmental Policy Act (NEPA). NMFS must also ensure compliance with other federal statutes, including the Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), Magnuson-Stevens Act (MSA), Coastal Zone Management Act (CZMA), Migratory Bird Treaty Act (MBTA), and National Marine Sanctuaries Act (NMSA). Failure to do so violates federal environmental law.

STATUTORY BACKGROUND

A. Magnuson-Stevens Conservation and Management Act

The Magnuson-Stevens Act (MSA) is the nation's longstanding program aimed at the management and conservation of ocean fish and fishing resources.[5] In 1976, Congress passed the MSA in order to address threats to wild fisheries and the coastal communities that rely on them, as well as to "prevent overfishing, to rebuild overfished stocks, to insure conservation, to facilitate long-term protection of essential fish habitats, and to realize the full potential of the Nation's fishery resources."[6] The MSA aims to conserve and protect these resources through a system for setting catch levels for the nation's wild fisheries.

The MSA created regional fishery management councils charged[7] with preparing fishery management plans and implementing regulations that are necessary and appropriate to manage and conserve the fisheries under its authority.[8] The Western Pacific Fishery Management Council is one such council, charged with managing fisheries in federal waters off the coast of California.

The MSA defines "fishing" as "(A) the catching, taking, or harvesting of fish; (B) the attempted catching, taking, or harvesting of fish; (C) any other activity which can reasonably be expected to result in the catching, taking, or harvesting of fish; or (D) any operations at sea in support of, or in preparation for, any activity described [above]."[9] Under this authority, NMFS may grant fishing permits solely to fishing "vessels," operators of such vessels, and processors.[10]

The MSA requires that Plans contain conservation measures, minimize impacts to essential fish habitat, use the best scientific information, and be consistent with the Act's national

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[5] 16 U.S.C. § 1801(a); *id.* § 1801(b)(1).
[6] *Id.* § 1801(a)(6); *id.* § 1801(a)(1)-(3).
[7] *Id.* §§ 1851; 1801.
[8] *Id.* § 1852(h).
[9] *Id.* § 1802(16).
[10] *Id.* § 1853(b)(1).

standards, which include preventing overfishing, achieving optimum yield, reasonably allocating fishing privileges among fishermen, and minimizing impacts to fishing communities and bycatch.[11]

The MSA's key regulatory unit is a "fishery," defined as "(A) one or more stocks of fish which can be treated as a unit for purposes of conservation and management and which are identified on the basis of geographical, scientific, technical, recreational, and economic characteristics; and (B) any fishing for such stocks."[12] A key MSA purpose is to prevent "overfishing," defined as "a rate or level of fishing mortality that jeopardizes the capacity of a fishery to produce the maximum sustainable yield."[13]

The MSA tasks NMFS with the narrow role of reviewing a finalized FMP to ensure that "it is consistent with the national standards, the other provisions of this Act, and any other applicable law."[14] NMFS also has the authority to promulgate regulations to implement an approved FMP within the timeframes set forth in the MSA.[15] The MSA requires that NMFS, in promulgating relevant rules and regulations under the Act, ensure that "irreversible or long-term effects on fishery resources and the marine environment are avoided"[16] and that "a multiplicity of options available with respect to future uses of [fishery] resources."[17] NMFS must ensure that "national fishery conservation and management programs utilize[], and [are] based upon, the best scientific information available."[18]

B. The National Environmental Policy Act

NEPA establishes the federal government's policy "to use all practicable means and measures to foster and promote the general welfare, create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans." [19] Its purpose is to require federal agencies to consider relevant environmental information and to provide the public with that information and an opportunity to comment.[20] NEPA is a procedural statute, enacted to ensure that federal agencies engage in a public process in taking actions, and that they take a "hard look" at the environmental consequences of their decisions.[21]

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[11] *Id.* §§ 1801; 1851; 1853; 1854.
[12] *Id.* § 1802(13)(A)-(B).
[13] *Id.* § 1802(34).
[14] *Id.* § 1854(a)(1)(A).
[15] *Id.* § 1854.
[16] *Id.* § 1802(5)(ii).
[17] *Id.* § 1802(5)(iii).
[18] *Id.* § 1801(a)(6).
[19] 40 C.F.R. § 1500.1(a); 42 U.S.C. §§ 4331-4370h.
[20] 40 C.F.R. § 1500.1(a).
[21] *Citizens Against Burlington, Inc. v. Busey*, 938 F.2d 190, 193-94 (D.C. Cir. 1991); *Baltimore Gas & Elec. Co. v. Nat. Res. Def. Council*, 462 U.S. 87, 100 (1983).

NEPA and its implementing regulations require federal agencies like NMFS to prepare an Environmental Impact Statement (EIS) regarding all major federal actions "significantly affecting the quality of the human environment."[22] The EIS must be prepared before the agency commits "resources prejudicing selection of alternatives."[23] "Action" broadly includes "[a]doption of official policy, such as rules, regulations, and interpretations."[24] "Major federal action[s]" under NEPA include "activit[ies] or decision[s] subject to Federal control and responsibility."[25] "If any 'significant' environmental impacts might result then an EIS must be prepared before the action is taken."[26]

NEPA prohibits an agency from avoiding significance, and thus from performing an environmental assessment, by dividing a proposed project into component parts.[27] A federal agency should prepare a programmatic EIS for the adoption of new agency programs.[28] A programmatic EIS ensures that an agency's NEPA review is "relevant to the program decision and timed to coincide with meaningful points in agency planning and decision making" and "should be available before the program has reached a stage of investment or commitment to implementation likely to determine subsequent development or restrict later alternatives."[29]

An EIS, including a programmatic EIS, must disclose all the consequences of the proposed action, including the direct, indirect, and cumulative effects.[30] In addition to direct and indirect, a cumulative effect results from the incremental impact of the proposed action "when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency …undertakes such other actions." [31]

NEPA's implementing regulations define cumulative impact as "effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions regardless of what agency (Federal or non–Federal) or person undertakes such other actions" and can result from "individually minor but collectively significant actions taking place over a period of time."[32] In considering cumulative impacts, "an agency must provide some quantified or detailed information; . . . general statements about

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[22] 42 U.S.C. § 4332(2)(C).
[23] 40 C.F.R. § 1502.2(f).
[24] *Id.* § 1508.1(q)(3)(i).
[25] *Id.* § 1508.1(q).
[26] *Sierra Club v. Peterson*, 717 F.2d 1409, 1415 (D.C. Cir. 1983).
[27] 40 C.F.R. § § 1502.4(a).
[28] *Id.* § 1502.4(b); *id.* § 1508.1(q)(3)(iii). (definition of major federal action includes "adoption of programs, such as a group of concerted actions to implement a specific policy or plan; systematic and connected agency decisions allocating agency resources to implement a specific statutory program or executive directive.")
[29] *Id.* § 1502.4.
[30] *Id.* § 1508.1(g).
[31] *Id.* § 1508.1(g)(3).
[32] *Or. Natural Res. Council v. U.S. BLM*, 470F.3d 818 (9th Cir. 2006); 40 C.F.R. § 1508.1(g)(3).

possible effects and some risk do not constitute a hard look absent a justification regarding why more definite information could not be provided."[33]

C. The Endangered Species Act

The ESA is the most comprehensive legislation for the preservation of endangered species ever enacted by any nation.[34] Congress's "plain intent . . . in enacting [the ESA] was to halt and reverse the trend towards species extinction, whatever the cost."[35] The ESA's "language, history, and structure" make clear that "Congress intended endangered species to be afforded the highest of priorities."[36]

To fulfill the purposes of the ESA, "each Federal agency shall, in consultation with and with the assistance of the [FWS], insure that any action authorized, funded, or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [the critical] habitat of such species."[37] The scope of agency actions subject to consultation is broad, and includes "all activities *or programs* of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies."[38] The ESA's definition of "effect" is also broad, and includes "all consequences to listed species and critical habitats that are caused by the proposed actions, including the consequences of other activities that are caused by the proposed action," including those that "may occur later in time."[39]

The ESA prohibits federal agencies from making "any irreversible or irretrievable commitment of resources" that would "forclos[e] the formulation or implementation of any reasonable and prudent alternative measures" through the consultation process.[40] An agency is required to review its actions "at the earliest possible time."[41]

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[33] *Ocean Advocates v. U.S. Army Corps of Eng'rs*, 402F.3d 846, 868 (9th Cir. 2004) (quoting *Kern v. U.S.*, 284 F.3d 1062, 1075 (9th Cir. 2002); *Muckleshoot Indian Tribe v. U.S. Forest Serv.*, 177 F.3d 800, 810 (9th Cir. 1999); *Ctr. For Env't Law & Policy v. U.S. Bureau of Reclamation*, 655 F.3d 1000, 1007 (9th Cir. 2011).

[34] *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 180 (1978).

[35] *Id.* at 184

[36] *Id.* at 174; *see also* 16 U.S.C. § 1536(a); 1531(c)(1) ("[A]ll Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authority in furtherance of the purposes of this [Act].").

[37] 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.14(a).

[38] 50 C.F.R. § 402.02 (emphasis added).

[39] *Id.*

[40] 16 U.S.C. § 1536(d).

[41] 50 C.F.R. § 402.14(a).

D. Migratory Bird Treaty Act

Congress passed the Migratory Bird Treaty Act (MBTA)[42] to implement the respective conventions between the United States and Great Britain, Japan, Mexico, and Russia. The MBTA prohibits the "take" of migratory birds, defining "take" as "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any covered migratory bird . . . or any part, nest, or egg of any such bird."[43] The Secretary of the Interior may authorize the otherwise prohibited take of migratory birds through regulations; however, current regulations do not expressly address the incidental take of migratory birds.

E. Marine Mammal Protection Act

All marine mammals are protected under the Marine Mammal Protection Act (MMPA). The MMPA prohibits, with certain exceptions, the "take" of marine mammals.[44] "Take" is defined under the MMPA as "harass, hunt, capture, kill or collect, or attempt to harass, hunt, capture, kill or collect."[45] Pursuant to this law, NMFS is charged with protecting whales, dolphins, porpoises, seals, and sea lions, and the U.S. Fish and Wildlife Service (FWS) is charged with protecting walrus, manatees, otters, and polar bears. NMFS and FWS have promulgated joint implementing regulations.

F. Coastal Zone Management Act

The purpose of the Coastal Zone Management Act (CZMA) is to "preserve, protect, develop, and where possible, to restore or enhance, the resources of the Nation's coastal zone for this and succeeding generations."[46] To accomplish these ends, the CZMA encourages the states to draw up "management plans" for their coastal zones and requires that "[e]ach Federal agency activity within or outside the coastal zone that affects any land or water use or natural resource of the coastal zone shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved State management programs."[47] A federal agency ensures consistency of its proposed actions with state management programs by submitting a "consistency determination to the relevant State agency."[48] Federal agencies must provide State agencies with a consistency determination "at the earliest practicable time in the planning … of the

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[42] *Id.* §§ 703 *et seq.*
[43] *Id.* § 703(a).
[44] *Id.* §§ 1361 et seq.
[45] *Id.* § 1362(13).
[46] 16 U.S.C. § 1452(1).
[47] *Id.* § 1456(c)(1)(A).
[48] *Id.* § 1456(c)(1)(C); *see also* 15 C.F.R. § 930.36.

activity."[49] After receipt of the consistency determination, the "State agency shall inform the Federal agency of its concurrence with or objection to the Federal agency's consistency determination."[50]

G. National Marine Sanctuaries Act

The National Marine Sanctuaries Act (NMSA) prohibits the destruction, loss of, or injury to any sanctuary resource managed under the law or by permit, and requires Federal agencies to consult with NOAA on actions that are likely to destroy, injure, or cause the loss of any sanctuary resource.[51] If an applicant plans to conduct activities prohibited under the NMSA but authorized under a valid Federal or state lease, permit, license, approval, or authorization, the applicant must obtain a permit from NOAA for the activities and comply with terms and conditions to protect marine sanctuaries.[52]

COMMENTS

I. NMFS lacks legal authority to designate Aquaculture Opportunity Areas in federal waters.

As NMFS is aware, in 2018, CFS along with other conservation and fishing groups, successfully challenged NMFS's authority to regulate aquaculture in federal waters under the MSA.[53] In August 2020, the Fifth Circuit Court of Appeals affirmed the lower court's decision to vacate the nation's first commercial aquaculture permitting scheme in the Gulf of Mexico and concluded that the MSA "unambiguously precludes the agency from creating an aquaculture regime."[54] This is because "nothing in the [MSA's] definition [of 'fishing'] plausibly suggests the agency has been given authority to regulate aquaculture."[55] Accordingly, NMFS currently lacks the authority to designate AOAs in federal waters, and NMFS's position as the lead agency of the DPEIS process is improper.[56]

NMFS attempts to circumvent this decision in its Atlas by pointing to authority in the National Aquaculture Act of 1980, the NOAA Marine Aquaculture Policy, and Executive Order 13921, "Promoting American Seafood Competitiveness and Economic Growth" (May 7, 2020). But none of these sources provide authority.

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[49] 15 C.F.R § 930.36 (b)(1).
[50] 15 C.F.R. § 930.41.
[51] 16 U.S.C. §§ 1431-1445; 15 C.F.R. pt. 922.
[52] 15 C.F.R. §§ 922.48-49.
[53] *See Gulf Fishermens Ass'n v. NMFS*, 341 F. Supp. 3d 632 (E.D. La. 2018).
[54] *Gulf Fishermens Ass'n v. NMFS*, 968 F.3d 454 (5th Cir. Aug. 2020).
[55] *Id.* at 465.

First, the policy document from 2011 assumes authority from the Magnuson-Stevens Act in direct contradiction to the Fifth Circuit's decision.[57] It states incorrectly that NMFS may regulate aquaculture in the Exclusive Economic Zone through Fishery Management Plans under the MSA.[58] As noted above, the Fifth Circuit definitively determined it may *not*.

Second, it is black letter law that executive orders cannot confer authority on agencies because the president's powers are executive, not legislative, in nature.[59] Rather, the President's authority to act "must stem either from an act of Congress or from the Constitution itself." *Id*. at 585. As a result, Executive Order 13921 cannot allow NMFS to establish a novel offshore aquaculture industry without requisite statutory authority from Congress.

Executive Order 13921 was also recently the subject of CFS and its partners successful challenge to Army Corps of Engineers (the Corps) authority to issue a nationwide permit for industrial finfish aquaculture.[60] The U.S. District Court for the Western District of Washington found that the the Corps violated a number of environmental statutes in its effort to expedite and facilitate its issuance of Nationwide Permit 56. Much like here where NOAA is attempting to get around its statutorily mandated duties by claiming it is not regulating anything, the Corps also (unsuccessfully) alleged that its actions had no bearing on aquaculture development.

And third, nothing in the National Aquaculture Act grants authority for NMFS, or to any agency, to designate massive swaths of federal ocean waters for industrial aquaculture. Rather, Congress passed the National Aquaculture Act more than forty years ago only to demonstrate support for the aquaculture industry.[61] Specifically, the Act assigned the Department of Agriculture to serve as lead agency in 1) establishing a National Aquaculture Information Center,[62] 2) serving as a central source to monitor and assess the industry,[63] and 3) establishing a National Aquaculture Development Plan.[64] The Act's only provision with potential to even *affect* regulatory oversight was its mandate to the Department of Agriculture to simply *identify* "regulatory constraints" to the industry and produce a report due forty years ago.[65] Indeed, when Congress passed the National Aquaculture Act, it knew how to delegate authority to regulate aquaculture because it had done so under the Water Pollution Control Act, yet it refused to delegate that same authority under the National Aquaculture Act.

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[57] NOAA Marine Aquaculture Policy, at 3 (2011), https://media.fisheries.noaa.gov/2021-01/2011-noaa-marine-aquaculture-policy.pdf?VersionId=null.
[58] *Id.*
[59] *Doe #1 v. Trump*, 957 F.3d 1050, 1062 (9th Cir. 2020) (citing *Youngstown Sheet & Tube Co. v. Sawyer*, 343 U.S. 579, 587 (1952) ("[T]he President's power to see that the laws are faithfully executed refutes the idea that he is to be a lawmaker.").
[60] *Don't Cage Our Oceans v. United States Army Corps of Eng'rs*, No. C22-1627-KKE, 2024 WL 4349548 (W.D. Wash. Sept. 30, 2024).
[61] 16 U.S.C. §§ 2801-2810.
[62] *Id*. § 2801(b)(3).
[63] *Id*. § 2804.
[64] *Id*. § 2803(a)(2).

The Act barely assigns responsibilities to the Department of Commerce, let alone authority to designate AOAs. The Act requires only consultation with the Department of Commerce for a biennial report on the status of aquaculture,[66] and several studies due 35 years ago.[67] None of these submissions required NMFS to determine locations suitable for industrial aquaculture. [68]

Without *any* plain text in support, NMFS cannot establish its authority to designate AOAs in the Southern California Bight. The courts have already held NMFS lacks this authority and must return to Congress if it is to proceed. NMFS attempt here to spearhead an entire brand-new industry without pointing to statutory text cannot proceed.[69] This lack of text is significant and does not grant permission to regulate a novel industry with unprecedented impacts on ocean waters. NMFS cannot disregard the lack of authority by calling the DPEIS a "long term planning effort" that has no legal significance. If NMFS issues a final PEIS, that is a final agency action subject to judicial review. The fact that the action is at the programmatic level does not change finality. *See Env't Def. Ctr. v. Bureau of Ocean Energy Mgmt.*, 36 F.4th 850, 868 (9th Cir. 2022).[70]

II. NMFS must not ignore the numerous impacts of offshore aquaculture.

Even if NMFS had authority to regulate offshore aquaculture, which it does not, NMFS must fully assess industrial aquaculture's wide breadth of environmental problems in the DPEIS. NMFS cannot rely on future, individual permitting to conduct the required environmental assessments because massive designation of large swaths of the Southern California Bight for aquaculture, covering 16,500 acres, will undoubtedly have harmful environmental and economic impacts that any future permit conditions cannot mitigate nor avoid. NEPA plainly mandates that NMFS fully assess these problems, or the proposed AOA designation will remain vulnerable to

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[66] *Id.* § 2804(d).

[67] *Id.* § 2804(c)(1)(C), (D) (requiring the Department of Commerce to submit studies by December 31, 1987).

[68] Just last year, in the landmark decision *Loper Bright Enterprises v. Raimondo*, 603 U.S. 369 (2024), the U.S. Supreme Court overturned *Chevron* doctrine, and further cemented the idea that federal agencies cannot legislate where there is ambiguity. Given that the aforementioned cases—*Gulf Fishermen's Association* and *Don't Cage Our Oceans*—were litigated in a *Chevron* world, the bar is even higher for NOAA to convince any court that it has found ambiguity in any statute and should be granted deference when it comes to aquaculture in federal waters.

[69] *See FDA v. Brown & Williamson Tobacco Corp.*, 529 U.S. 120, 159-160 (2000); *Nat'l Fed'n of Indep. Bus. v. Dep't of Lab., Occupational Safety & Health Admin.*, 142 S. Ct. 661, 666, 211 L. Ed. 2d 448 (2022).

[70] Additionally, NMFS's purpose and need statement is written in such a fashion that it improperly determines a narrow range of alternatives to be considered. *Alaska Survival v. Surface Transp. Bd.*, 705 F.3d 1073, 1084 (9th Cir. 2013) ("A purpose and need statement will fail if it unreasonably narrows the agency's consideration of alternatives so that the outcome is preordained"). The PEIS must consider a reasonable range of alternatives. *W. Watersheds Project v. Abbey*, 719 F.3d 1035, 1053 (9th Cir. 2013). As currently drafted, the range of alternatives considered is unreasonably narrow. For example, NMFS should consider a land-based alternative to open ocean aquaculture.

legal challenge. Thus, NMFS cannot suspend its assessment obligations by relying on future project-specific, permit-specific environmental reviews and must fully address the impacts of industrial aquaculture in this *programmatic* environmental impact statement.

A. Under NEPA, NMFS must take a hard look at the direct, indirect, and cumulative impacts of the AOA designations in this DPEIS.

NMFS must take a hard look at the direct, indirect, and cumulative impacts of the AOA designations in the DPEIS.[71] NMFS cannot satisfy this requirement with "conclusory assertions that an activity will have only an insignificant impact on the environment."[72] Rather, NMFS must "consider[ ] all foreseeable direct and indirect impacts" and analyze adverse impacts in a manner that "does not improperly minimize negative side effects."[73] In doing so, NMFS must apply "reliable existing data" and ensure the scientific integrity of its analyses.[74]

Here, there is no question that it is "reasonably foreseeable" that NMFS's AOA designations will result in industrial aquaculture facilities in those locations. The Executive Order plainly states its purpose to remove regulatory burdens for offshore aquaculture.[75] The DPEIS alludes to this directive by stating the "goal of identifying AOAs is to promote American seafood competitiveness, food security, economic growth, and to support the development of domestic commercial aquaculture."[76] NMFS cannot rely on this DPEIS as "a long-term planning effort" that "is not a regulatory or permitting action and does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects."[77] Allowing AOA designations will undoubtedly result in siting of industrial aquaculture operations within the Southern California bight.

Furthermore, much of NMFS's DPEIS must assess the cumulative impacts designation of multiple AOAs will have on Southern California. NEPA defines cumulative impacts as "effects on the environment that result from the incremental effects of the action when added to the effects of other past, present, and reasonably foreseeable actions."[78] Here, multiple AOAs will cumulatively impact species, water quality, public health, and local fishing communities. NMFS must therefore consider cumulative impacts of multiple AOA designations, as well as other activities affecting species and water quality in Southern California.

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[71] *Blue Mountains Biodiversity Project v. Blackwood*, 161 F.3d 1208, 1211 (9th Cir. 1998); 40 C.F.R. § 1508.1(g).
[72] *Ocean Advocates v. U.S. Army Corps of Eng'rs*, 402 F.3d 846, 864 (9th Cir. 2004).
[73] *League of Wilderness Defenders-Blue Mountains Biodiversity Project v. U.S. Forest Serv.*, 689 F.3d 1060, 1075 (9th Cir. 2012).
[74] 40 C.F.R. § 1502.23.
[75] Exec. Order No. 13,921, 85 Fed. Reg. 28,471 (May 12, 2020).
[76] DPEIS, *supra* note 1 at 49.
[77] *Id.*
[78] 40 C.F.R. § 1508.1(g)(3).

1. NMFS inadequately addressedhow offshore aquaculture may contribute to oxygen depletion and harmful algal blooms, exacerbating hypoxia in the Southern California Bight.

NMFS must fully assess impacts to water quality from the fish feed, dead fish, and fish feces industrial aquaculture facilities will directly discharge into the Southern California Bight. Nutrient pollution decreases oxygen levels in our waters, killing off aquatic life and creating low-oxygen "dead zones" and harmful algal blooms.[79] Climate change further exacerbates these risks of harmful algal blooms, as warmer, more acidic ocean waters (due to higher carbon dioxide levels) increase both the frequency and toxicity of these events.[80] Harmful algal blooms produce toxic chemicals that can kill fish and other vertebrates by affecting their central nervous systems and can cause serious illness in humans with severe or chronic respiratory conditions.[81]

Southern California is already experiencing an increase in harmful algal blooms in recent years and harbors some of the world's highest concentrations of domoic acid, an algal toxin dangerous to wildlife and people who eat local seafood.[82]

In this DPEIS, NMFS claims that "[d]espite the concerns associated with aquaculture effluent and primary production, there is currently no link between aquaculture discharge and HABs; nutrient input is a key factor, but the formation of HABs is associated with different elements."[83] NMFS relies on the "general[ization that] eutrophication (nutrient pollution) or hypoxia (low oxygen concentration) are expected to be less of a concern [in] offshore compared to the nearshore environment given the dynamic oceanographic conditions."[84] Such general, conclusory statements contravene NEPA's "hard look" requirement.

2. NMFS must properly assess aquaculture's pathogen and parasite discharges.

NMFS must assess impacts from industrial aquaculture facilities' pathogen and parasite discharges. As NMFS explains "[n]on-infectious diseases, infectious diseases, and parasites are all risks to organisms being grown in an aquaculture facility,"[85] which agriculture and aquaculture sectors respond to with a pharmacopeia of chemicals. Recent research indicates that active aquaculture sites have 2.72 times the probability of detecting pathogen environmental DNA versus

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[79] Donald Boesch *et al.*, Pew Oceans Comm'n, *Marine Pollution in the United States* 20-22 (2001).
[80] Margaret Crable, *Climate change could make toxic algal blooms in our oceans more deadly* (July 17, 2020), https://phys.org/news/2020-07-climate-toxic-algal-blooms-oceans.html#:~:text=Harmful%20algal%20blooms%20will%20likely,and%20toxicity%20of%20these%20events.
[81] NOAA, *Harmful Algal Blooms*, https://oceanservice.noaa.gov/hazards/hab/.
[82] Gary Polakovic, *Southern California Coast Emerges as a Toxic Algae Hot Spot*, (Aug. 21, 2018), https://news.usc.edu/147515/southern-californias-coast-emerges-as-a-toxic-algae-hot-spot/.
[83] DPEIS, *supra* note 1 at 86.
[84] *Id.*
[85] *Id.* at 162.

inactive salmon farm sites.[86] In 2012, off the coast of Bainbridge Island, a massive viral outbreak in Atlantic salmon net pens led to the deaths of over one million pounds of farmed Atlantic salmon.[87] NMFS must assess these potential discharges since these pathogens, parasites, and the chemicals used to treat them can easily spread to wild fish.

Despite acknowledging that "[t]he spread of disease is an ecological impact that could decrease individual fitness and populations," NMFS claims that "if projects comply with existing Federal and State regulatory mechanisms…and other management measures, seed stock should not contain invasive species, parasites or pathogens of concern and this impact would not be significant."[88] Relying on future regulation and compliance does not meet NMFS's duty to address impacts from the AOA designations themselves.

Climate change only exacerbates this possibility of disease spreading. Fish are vulnerable to changes in their aquatic habitat, especially, in the case of net pens, where they cannot swim away.[89] Not only does climate change increase the risk of escapes, but it also impacts the production environment including pathogen prevalence and/or virulence and host susceptibility (immunosuppression) and transmission.[90]

3. NMFS did not take a "hard look" at aquaculture's contributions to antibiotic resistance.

NMFS must assess the potential threat to human health and the environment caused by antibiotic use at the proposed AOA designations. The crowded nature of industrial aquaculture operations will inevitably breed pests and diseases for which operators will likely use antibiotics. This use will not only leave residues in seafood, but it will also leach into the ocean, contaminating nearby water and marine life. For example, the salmon aquaculture industry widely uses Emamectin benzoate to treat sea lice, which could result in drug resistance.[91] In Nova Scotia, the use of this antibiotic resulted in "widespread damage to wildlife," including "substantial, wide-scale

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[86] L.N. Frazer, et al., Environmental DNA (eDNA) from multiple pathogens is elevated near active Atlantic salmon farms, Proceedings of the Royal Society (2020), http://dx.doi.org/10.1098/rspb.2020.2010.

[87] Our Sound, Our Salmon, *New Federal Analysis Finds Puget Sound Commercial Net Pens Are Harming Salmon, Steelhead, And Other Protected Fish*, (June 30, 2022), https://www.oursound-oursalmon.org/news/2022/5/18/new-federal-analysis-finds-puget-sound-commercial-net-pens-are-harming-salmon-steelhead-and-other-protected-fish.

[88] DPEIS, *supra* note 1 at 121

[89] Food and Agriculture Organization of the United Nations, *Impacts of Climate Change on Fisheries and Aquaculture*, at 526 (2018), http://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1152846/.

[90] *Id.*

[91] Chun Ting Lam, et. al, *Sea lice exposure to non-lethal levels of emamectinbenzoate after treatments: a potential risk factor for drug resistance* (Jan. 22, 2020), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6976678/.

reductions" in crabs, lobsters and other crustaceans close to marine finfish facilities.[92] In fact, up to 75% of antibiotics the industrial aquaculture industry uses directly absorb into the surrounding environment.[93]

Though NMFS acknowledges that "[a]ntibiotic residuals have been shown to occur around marine aquaculture, which can induce changes to water quality and have the potential to be toxic to marine life," it disregards such concerns by claiming "[i]n the U.S., the use of antibiotics in aquaculture production is highly regulated and there are currently no antibiotics approved for use in the open ocean environment for warm water marine species."[94] Neither relying on the fact that antibiotics are highly regulated *nor* claiming "risks are similar in farmed and wild seafood, with most samples in the U.S. being below FDA approved levels,"[95] are equivalent to evaluating the consequences of antibiotic resistance. NMFS must include such analysis in the DPEIS.

4. NMFS inadequately assessed impacts from escaped fish.

NMFS must take a hard look at the inevitable[96] fish escapes that will result from industrial aquaculture in Southern California. Around the world, industrial finfish aquaculture has repeatedly resulted in fish escapes, which impact wild fish and other species. For example, in January 2020, 73,600 salmon escaped from a net pen in Mowi, Scotland, marking the third major escape in the area since October 2019.[97] Similarly, approximately four million fish escaped fish in a single year in Norway.[98] In Washington just five years ago, an industrial net pen operation maintained by Cooke Aquaculture Pacific, LLC allowed for approximately 160,000 farmed Atlantic salmon to escape into Puget Sound and the Pacific.[99]

Notably, in countries where most marine finfish farms operate, escapes are not isolated or rare occurrence, for in a given year, a single company or facility will likely experience multiple escapes. AquaChile, for example, reported the escape of 787,929 fish in 2013 due to bad weather

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[92] Rob Edwards, The Sunday Herald, *Scottish government accused of colluding with drug giant over pesticides scandal* (June 2, 2017), http://www.heraldscotland.com/news/15326945.Scottish_government_accused_of_colluding_with_drug_giant_over_pesticides_scandal/.

[93] United Nations, Fron*tiers 2017: Emerging Issues of Environmental Concern*, at 15 (2017), https://www.unenvironment.org/resources/frontiers.

[94] DPEIS, *supra* note 1 at 83.

[95] *Id.* at 228.

[96] FAO, *State of World Aquaculture* (2006), http://www.fao.org/docrep/009/a0874e/a0874e00.htm (FAO describing escapes on fish farms as "inevitable").

[97] *Escape calls high energy salmon sites into question*, The Fish Site (Jan. 20, 2020), https://thefishsite.com/articles/mowi-reports-mass-salmon-escape-from-colonsay.

[98] Nat'l Marine Fisheries Serv. Pac. Islands Reg'l Off., Draft Programmatic Env't Impact Statement (DPEIS), at 171 (2021).

[99] E. Tammy Kim, *Washington State's Great Salmon Spill and the Environmental Perils of Fish Farming*, The New Yorker (Sept. 13, 2017), https://www.newyorker.com/tech/elements/washington-states-great-salmon-spill-and-the-environmentalperils-of-fish-farming.

damaging cages.[100] Five years later, in 2018, 680,000 fish escaped from Marine Harvest Chile,[101] 109,515 from Bakkafrost Faroe Islands, 258,000 from Scottish Sea Farm in Scotland in 2000, and 120,000 from Huon Aquaculture in Tasmania in 2018.[102] Recognizing the regularity of fish escapes from ocean-based net pens, the U.S. Council on Environmental Quality has stated that it "must be *assumed* that escapes will occur" from net pens.[103]

These escapes impact local stocks in a variety of ways, such as predation; competition for food, habitat, and spawning areas; and interbreeding with wild populations of the same species. For example, Atlantic salmon that have escaped from aquaculture operations in Washington State and British Columbia compete with wild Pacific stocks, and increasing numbers of Atlantic salmon have been observed returning to rivers on the West Coast.[104] In the Atlantic region, the U.S. Fish and Wildlife Service has determined that "Atlantic salmon that escape from farms and hatcheries pose a threat to native Atlantic salmon populations."[105] They also predict that "escapement and resultant interactions with native stocks are expected to increase given the continued operation of farms and growth of the industry under current practices."[106]

While NMFS acknowledges the inevitability of fish escapes and resulting harms to wild stocks and native marine life, it punts this responsibility to a different agency, stating that "[e]scaped/dispersed organisms and reproductive material are considered biological material and a pollutant that must be considered in the NPDES permitting process."[107] NMFS must analyze the environmental consequences of these fish escapes in this DPEIS.

Furthermore, reliance on the sterility of farmed fish[108] to prevent interbreeding is never 100% guaranteed; therefore, the "long-term consequences of continued farmed [fish] escapes and

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[100] Lola Novarro, *Here are the largest recorded farmed Atlantic salmon escapes in history*, IntraFish (Feb. 1, 2019), https://www.intrafish.com/aquaculture/here-are-the-largest-recorded-farmed-atlantic-salmon-escapes-in-history/2-1-388082.

[101] *Id.*

[102] *Id.*

[103] Council for Environment Quality & Office of Science and Technology Policy, Case Study No. 1: Growth-Enhanced Salmon, at 23 (2001), https://clintonwhitehouse5.archives.gov/media/pdf/salmon.pdf..

[104] Goldburg, et al., *Marine Aquaculture in the United States: Environmental Impacts and Policy Options*, Pew Oceans Commission (2001), https://fsi-live.s3.us-west-1.amazonaws.com/s3fs-public/marine_aquaculture_pew_2001.pdf.

[105] Endangered and Threatened Species; Proposed Endangered Status for a Distinct Population Segment of Anadromous Atlantic Salmon (Salmo salar) in the Gulf of Maine, 64 Fed. Reg. 62627, 62635 (Nov. 17, 1999).

[106] *Id.*

[107] DPEIS, *supra* note 1 at 138.

[108] *Id.* (noting a potential mitigation measure as "sterilization").

subsequent interbreeding … include a loss of genetic diversity."[109] Studies have also shown that when farmed and wild fish interbreed their offspring have diminished survival skills, reduced fitness, and potentially altered life history characteristics such as altered timing of development events.[110] Researchers in Ireland, for example, have found that the interactions of farm escapees and wild salmon reduced the overall fitness of wild species and could lead to the extinction of wild populations.[111]

Currently in California, shellfish aquaculture relies almost exclusively on cultivation of three non-native species: The Pacific oyster (Crassostrea gigas), Mediterranean mussel (Mytilus galloprovincialis) and Manila clam (Venerupis (Ruditapes) philippinarum).[112] This has resulted in persistent populations of Pacific oysters outside cultivation on Catalina Island and from Los Angeles Harbor south to the Tijuana River Estuary and potentially in Tomales Bay.[113] The Pacific oyster is invasive and poses risks to marine species and the environment.[114]

Even when facilities use broodstock collected from the wild, escaped fish pose a threat to wild stocks.[115] The longer a broodstock line is developed (i.e., bred to improve growth, quality, and

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[109] Fisheries and Oceans Canada, *Newfoundland and Labrador Region, Stock Assessment of Newfoundland and Labrador Atlantic Salmon* (2016), http://waves-vagues.dfo-mpo.gc.ca/Library/40619655.pdf ("Genetic analysis of juvenile Atlantic Salmon from southern Newfoundland revealed that hybridization between wild and farmed salmon was extensive throughout Fortune Bay and Bay d'Espoir (17 of 18 locations), with one-third of all juvenile salmon sampled being of hybrid ancestry."); *see also* Mark Quinn, *DFO study confirms 'widespread' mating of farmed, wild salmon in N.L.* (Sept. 21, 2016), https://www.cbc.ca/news/canada/newfoundland-labrador/farmed-salmon-mating-with-wild-in-nl-dfo-study-1.3770864.

[110] This occurs because farmed fish selected for aquaculture are bred to thrive in controlled, rather than wild, environments. Congressional Research Service, Open Ocean Aquaculture, at 7 (Aug. 9, 2010), https://crsreports.congress.gov/product/pdf/RL/RL32694/19; *see also* Yajie Liu et al., *Fishy Fish? The Economic Impacts of Escaped Farmed Fish*, Aquaculture Economics & Management (July 2014), https://www.researchgate.net/publication/264125499_FISHY_FISH_THE_ECONOMIC_IMPACTS_OF_ESCAPED_FARMED_FISH (exploring the economic impacts of escaped fish on commercial and recreational fishing).

[111] *Id.*

[112] California Coastal Commission, *Coastal Development Permit Application Guidance* (July 2020), https://documents.coastal.ca.gov/assets/cdp/Draft-CDP-Application-Guidance-Aquaculture-and-Marine-Restoration.pdf

[113] *Id.*

[114] *Id.*

[115] NMFS, Draft Programmatic Environmental Impact Statement: Pacific Islands Region Aquaculture Management Program (May 7, 2021), https://www.regulations.gov/document/NOAA-NMFS-2021-0044-0003.

disease resistance, etc.) the greater the chance that their genes may begin to drift from their wild counterparts.[116]

NMFS itself notes in its recent biological opinion on aquaculture in the Puget Sound, that efforts to recapture escaped fish result in significant bycatch.[117] These efforts are undertaken despite the likely resultant harm and infeasibility of recapture.[118] In Puget Sound, a "normal" year without a large-scale failure still results in thousands of escaped fish (0.3% of total farmed fish) wreaking havoc on local wild fish populations and habitats.[119] These escaped fish can also travel into tributary rivers and streams, resulting in longer-term, and wider-ranging habitat effects.[120]

Thus, NMFS cannot rely on ineffective methods of mitigation in the DPEIS nor rely on the NPDES permitting process as sufficient to fulfill its "hard look" obligation under NEPA.

5. NMFS inadequately assessed cumulative impacts on federally listed species, and other wildlife.

NMFS concedes that "[o]ffshore aquaculture activities have the potential to cause 'take' of protected species during site assessments, construction, operations, and decommissioning."[121] NMFS's Atlas reveals that eighteen threatened and endangered species occur in the Southern California Bight, including several whale species, several sea turtle species, giant manta rays, black and white abalone, the Guadalupe fur seal, and the gulf grouper.[122] Additionally, nineteen species of marine mammals may occur in and around proposed areas,[123] and fourteen fish species whose Essential Fish Habitat overlaps with proposed AOA sites.[124] Furthermore, Santa Monica Bay and the Santa Barbara Coast serve as nurseries for great white sharks.[125] NMFS even admits that "[g]iven the high occurrence of these species, it is unlikely that aquaculture activities can avoid

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[116] *Id.*
[117] NMFS, Reinitiation of Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Environmental Protection Agency's Approval of Washington State Department of Ecology's Sediment Management Standards (Feb. 16, 2022), https://wildfishconservancy.org/wp-content/uploads/2022/04/2022_02-16_FinfishRearingReinit_WCRO-2018-00286-3.pdf.
[118] *Id.* at 105.
[119] *Id.* at 126.
[120] *Id.* at 62-63.
[121] DPEIS, *supra* note 1 at 110.
[122] Atlas at 25.
[123] *Id.* at 25-26.
[124] *Id.* at 193-195.
[125] Marc Cota-Robles, *Drone footage captures cluster of juvenile great white sharks off Pacific Palisades coast* (Aug. 11, 2021), https://abc7.com/great-white-shark-pacific-palisades-will-rogers-state-beach-california-population/10945063/; Beth Farnsworth, *Santa Barbara Coast is a nursery 'hot spot' for great white sharks* (Jan. 27, 2022), https://keyt.com/news/santa-barbara-s-county/2022/01/27/santa-barbara-coast-is-a-nursery-hot-spot-for-great-white-sharks/.

interactions"[126] and admits that indirect impacts to marine mammals and other wildlife may occur as well.[127] Because the proposed facilities will be located in, or near, species' migration routes or in their habitat, NMFS must sufficiently analyze the designations' cumulative effects on species.[128]

In the DPEIS, NMFS acknowledges the panoply of protected species in the Southern California Bight and states specifically that "[c]ritical habitat for humpback whales (*Megaptera novaeangliae*) overlaps all Alternative 2 AOA options" and "Loggerhead sea turtles are the most likely to be found near the Alternatives."[129] Nevertheless, NMFS asserts that "risk and severity of interactions with Federally-protected species would need to be analyzed for each project sited in an AOA."[130]

Industrial aquaculture may impact these species in numerous ways. Namely, entanglement from ropes, lines, and net pens may harm endangered species and other wildlife in the proposed area. This risk is significant considering the large scale of the proposed designations and current estimations that entanglement in fishing gear already results in the deaths of some 300,000 marine mammals each year.[131] Entanglement can lead to life-threatening side effects for whales because it can interfere with their ability to swim, feed, and breathe.[132] In 2020, 13 of the 52 confirmed entanglements in U.S. waters occurred on the West Coast (accounting for 25 percent of all confirmed live entanglements that year),[133] seven of which occurred in the Southern California Bight[134] where many endangered whale species migrate and live.[135] Despite these confirmed entanglements, NMFS claims that "better assessment of the entanglement monitoring processes and reliability in assessing aquaculture operations globally is needed to determine if the few recorded events are an accurate representation of the potential for entanglement."[136] NMFS must use the "best available science" to assess the risks of entanglement of federally protected species.

Moreover, the facilities' propensity to act as fish aggregating devices (FADs) further exacerbates risks of entanglements and vessel strikes, as species are drawn to the facilities.

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[126] Atlas at 194.

[127] *Id.*

[128] *See* 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.02.

[129] DPEIS, *supra* note 1 at 106.

[130] *Id.* at 110.

[131] European Union, *Entanglement in fishing gear and other installations* (Jan. 4, 2022), https://marine-mammals.info/entanglement/.

[132] NOAA, *National Report on Large Whale Entanglements Confirmed in the United States in 2020*, at 1 (June 2022), https://media.fisheries.noaa.gov/2022-06/National%20Report%20on%20Large%20Whale%20Entanglements%20Confirmed%20in%20the%20United%20States%20in%202020.pdf.

[133] *See id.* at 5-7 (breaking down which how many confirmed entanglements there were per species and in which region).

[134] *Id.* at 7.

[135] Atlas at 193 (species such as the blue whale, humpback, gray whale are known to be found in the area depending on the season).

Industrial aquaculture may attract predators as a result of fish escapes, food drifting outside the pens, and other animals aggregating around the pens.[137] An increase in the presence of predators of ESA-listed species and other species could lead to adverse effects such as injury or death. The FAD effect may result in more frequent encounters with protected species, which could increase the likelihood of injury from structures or equipment associated with the facility.[138]

Also, NMFS must assess anthropogenic noise pollution from these facilities and the boats that serve them. NMFS's Atlas acknowledges that the designations may increase marine traffic.[139] Noise pollution from this traffic can harm marine mammals by masking their communications at almost all frequencies these mammals use.[140] "Masking" refers to a "reduction in an animal's ability to detect relevant sounds in the presence of other sounds."[141] Such an impairment to communication could also result in harmful impacts to these protected species and warrants thorough assessment.

NMFS must also assess light pollution from the facilities, boat traffic, and other coastal zone development that will be necessary to support offshore aquaculture.[142] Light pollution harms species by affecting mating cycles and habits,[143] as well as rendering fish more active at night and increasing their exposure to predators.[144] Light pollution at night can also disorient marine birds.[145]

Instead of assessing these risks, NMFS claims that "[t]here are many established mitigation methods required for marine industries under ESA, MMPA, and MBTA that would be incorporated into project designs and operations plans through the permitting process."[146] Relying on future mitigation measures for *individual* projects does not evaluate the impact of these *programmatic* AOA designations.

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[137] Luke T. Barrett, et al., *Impacts of marine and freshwater aquaculture on wildlife: a global meta-analysis*, Reviews in Aquaculture (2018).

[138] *Id.*

[139] Atlas at 44.

[140] *See e.g.,* Hildebrand, J.A., Impacts of Anthropogenic Sound, in Marine Mannal Research: Conservation Beyond Crisis (Reynolds, J.E. III et al., eds. 2006); Weilgart, L., 2007, The Impacts of Anthropogenic Ocean Noise on Cetaceans and Implications for Management, 85 Canadian J. Zoology 1091-1116 (2007).

[141] National Research Council, *Ocean Noise and Marine Mammals*, at 96 (2003), *available at* http://www.nap.edu/openbook.php?record_id=10564&page=R1.

[142] Atlas at 44, 205.

[143] *See* Sonia Aronson, *Study draws Southern California coastal light pollution into focus* (Mar. 17, 2020), https://phys.org/news/2020-03-southern-california-coastal-pollution-focus.html (UCLA and USC scientists are attempting to map light pollution in southern California in order to understand how it affects native and endangered aquatic species).

[144] *Light Pollution Makes Fish More Courageous* (Sept. 21, 2018), https://www.sciencedaily.com/releases/2018/09/180921113456.htm.

[145] *Id.*

6. NMFS failed to take a hard look at cumulative impacts on coral.

NMFS notes that "The two AOA options [in Alternative 3] are within 5 km (2.7 nm) of hard bottom substrate, deep sea corals, and rocky reefs,"[147] thus NMFS must also fully assess impacts on coral. Hardbottom areas include a range of animal and plant life including a thin veneer of live corals.[148] NMFS itself has expressed increasing concern that these fragile deep-sea coral reefs, sponges, and their associated resources may be in serious danger.[149] The additional coastal development needed to sustain the aquaculture industry would only increase the stress on these communities. Due to the proximity of the AOAs to these critically fragile habitats, NMFS must sufficiently analyze the cumulative impacts of the proposed projects to hardbottom areas.

However, NMFS did not sufficiently analyze such impacts, stating only that "[s]eafloor impacts are more likely with finfish aquaculture due to deposition of feces and uneaten feed and potential deposition of elements within feed," but offering only "depositional modeling" as a mitigation measure. This is an inadequate analysis of impacts to coral.

7. NMFS failed to consider the impacts of DDT in their cumulative impact analysis.

NMFS must assess the cumulative impacts of designating an AOA near old DDT dump sites. In 2020, scientists found up to 500,000 barrels of the banned pesticide DDT dumped in the Pacific Ocean off Catalina Island near NMFS's proposed AOA option CN1-B.[150] Investigations have determined that "[b]etween 1947 and 1971, Montrose Chemical Corporation … dumped millions of pounds of chemical sludge containing DDT … off the California coast [and] into the Los Angeles wastewater system."[151] EPA's recent map shows the 14 deep-water disposal locations' approximate placement in the Southern California Bight, near the Channel Islands and NMFS's Northern Study Area.[152]

DDT is highly toxic and carcinogenic and linked to a wide variety of health problems in both humans and wildlife.[153] Specifically, DDT plays a significant role in the development of a

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[147] *Id.* at 81.
[148] Atlas at C-5.
[149] Thomas F. Hourigan *et al.*, *The State of Deep-Sea Coral and Sponge Ecosystems of the United States*, at 99-100 (Dec. 2017), https://spo.nmfs.noaa.gov/sites/default/files/OHC4_v2.pdf (maps showing where coral populations have been found in the Southern California Bight, compared to where trawling and fixed gear industries occur); Atlas at 114 (describing marine pollution in the Southern California Bight as a "major stressor[ ] on deep-sea coral communities.").
[150] Samantha Haugen, *How Barrel After Barrel of DDT Ended Up On the Ocean Floor*, OCEAN BLUE PROJECT (Jan. 13, 2021) https://oceanblueproject.org/ddt-effects-on-the-environment/.
[151] Haugen *et al.*, *supra* n. 132.
[152] EPA, *Southern California Ocean Disposal Site #2 Investigation*, https://www.epa.gov/ocean-dumping/southern-california-ocean-disposal-site-2-investigation.

specific type of cancer in sea lions.[154] It is also very durable, and as decades of science has shown, biomagnifies and bioaccumulates as it travels through food webs. As a result, marine wildlife and fish populations are still recovering from the toxic effects of illegal dumping. NMFS must assess DDT's potential to harm human health by accumulating in farmed fish, as well as the cumulative impacts the proposed designations may have on species already harmed by toxic DDT. NMFS does not evaluate the impact of DDTs stating only that "[e]levated concentrations of several contaminants (including PCBs and DDTs) in fishes have been found in Santa Monica Bay."[155] Such statement is not an adequate analysis of impacts from DDTs.

8. NMFS inadequately accounted for sewage and oil spills and how they affect aquatic life.

NMFS also needs to assess the AOA designations' cumulative impacts in an area already recovering from numerous recent sewage and oil spills. Santa Monica Pier currently has poor water quality,[156] in part from storm drain runoff and recent oil spills.[157] In 2021, 89 sewage spills have occurred in Los Angeles County, amounting to 20,322,566 gallons of sewage/waste flowing into the ocean and other bodies of water.[158] Similarly, in Santa Barbara County, there were 3 sewage spills over the same time frame, amounting to 5,643 gallons of sewage/waste flowing into the ocean.[159] And these figure do not even include the oil that has spilled into waterways, and in some areas, still requires clean-up. NMFS's Atlas acknowledges numerous recent oil spills including a 2015 spill of more than 100,000 gallons at Refugio Beach in Santa Barbara and an October 2021 spill of an estimated 125,000 gallons off the coast of Huntington Beach.[160]

While NMFS references previous oil spills and accompanying impacts, it nevertheless continues to rely on "[e]xisting regulatory mechanisms, programs, and protocols applicable to shellfish aquaculture" as sufficient to "minimize risks of seafood safety impacts"[161] and further relies on "[s]ite specific NEPA analyses"[162] to evaluate such harms. NMFS must evaluate these harms in this programmatic EIS.

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[154] *Id.*
[155] DPEIS, *supra* note 1 at 127.
[156] *See* Heal the Bay, *2021-2022 Beach Report Card* (2022), https://healthebay.org/wp-content/uploads/2022/06/Beach-Report-Card-2021-2022.pdf (the report considers factors such as rain fall average, water quality, and sewage/oil discharge to rate beaches across the West Coast to provide information to the general public on conditions and public health concerns).
[157] *Id.* at 12, 19.
[158] *Id.* at 31.
[159] *Id.* at 30.
[160] Atlas at 196.
[161] DPEIS, *supra* note 1 at 227.

9. NMFS did not adequately consider impacts from marine debris.

As NMFS acknowledges, "Marine debris is a problem in the SCB."[163] Industrial shellfish operations create water pollution with toxic plastic and Styrofoam from cages, rack-and-bags, trays, surface or floating structures, or long lines suspended over the tide bed. For example, geoduck (clam) aquaculture uses PVC tubes stuck into the bed at a rate of 42,000 tubes per acre, which are covered with plastic "anti-predator" netting. The plastic gear used in production can be dislodged in storms or break down into microplastics, adding more plastics to our oceans and beaches and acting as a poison pill to marine species that ingest microplastics coated in whatever pollutants are in the water (including the very shellfish grown for human consumption).[164]

According to the California Coastal Commission, one of the shellfish farms currently active in California uses roughly 1,000 total miles of nylon rope and line and over 250,000 individual plastic mesh baskets. The Coastal Commission historically imposes multiple best management practices including monitoring and cleanup requirements to reduce generations of marine debris, however, large-scale growth in offshore aquaculture operations in the Santa Barbara Channel would inevitably result in generation of marine debris. Mitigation for such impacts would be difficult, at best, in the marine-operational environment.

Nevertheless, NMFS continues to rely on future permitting as an end-run around its obligation to evaluate impacts of marine debris, claiming that "[l]ikely all water quality impacts will be mediated and monitored through [Best Management Practices] in permits, in accordance with the rules and regulation."[165] Furthermore, despite the pervasiveness of marine debris, NMFS claims that "[a]quaculture operations would not likely meaningfully contribute to the marine debris problem in the area."[166] Such minimizing, conclusory statements are insufficient under NEPA.

10. NMFS failed to consider impacts from pesticide use.

NMFS acknowledges that "[p]ersistent organic pollutants (POPs) of concern in the Pacific Ocean include pesticides"[167] but fails to address these impacts by claiming, "facilities in coastal State waters do not utilize any insecticides, fungicides, or rodenticides, nor does it use any regulated antifoulants."[168] This is insufficient.

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[163] *Id.* at 83.

[164] Bendell, L.I., *Favored use of anti-predator netting (APN) applied for the farming of clams leads to little benefits to industry while increasing nearshore impacts and plastics pollution*, Marine Pollution Bulletin (2015).

[165] DPEIS, *supra* note 1 at 87.

[166] *Id.*

[167] *Id.* at 83.

NMFS must also consider pesticide use in industrial shellfish production, which creates its own suite of risks and adverse impacts. Pesticide use to clear away wild species and allow intensive shellfish farming has harmful impacts on biodiversity.[169] For example, in Washington state, shellfish growers have historically used pesticides to kill native burrowing shrimp, recently changing from carcinogenic carbaryl to experiments with the neonicotinoid imidacloprid.[170] Currently, Washington permits shellfish growers to use the herbicide, imazamox, to control Japanese eelgrass.[171] If used at facilities in the AOAs, these pesticides and herbicides would not only kill the target species — they would also harm other invertebrates, fish, and the species that rely on these species as a food source.

11. NMFS inadequately assessed greenhouse gas emissions from increased vessel traffic.

NMFS must also assess climate change impacts from increased vessel traffic. The AOA designations could potentially result in dozens of offshore industrial aquaculture operations, with the farthest area 46.3 kilometers offshore.[172] These facilities will inevitably increase vessel traffic, and as a result, emit more harmful greenhouse gases.

NMFS does not evaluate these emissions, instead claiming that "[p]otential impacts to air quality associated with marine vessels is likely minimal, depending on the individual project."[173]

12. NMFS must thoroughly assess impacts on sensitive areas near the proposed AOAs.

a. NMFS must assess impacts on areas of special biological significance.

The proposed AOA designations will impact numerous areas of special biological significance, which NMFS is required to assess. Maintained by the State Water Resources Control Board, these areas support a variety of aquatic life and unique species. Here, for example, NMFS

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[169] *See e.g.*, CFS, *Water Hazard 2.0: Continued Aquatic Contamination by Neonicotinoid Insecticides in the U.S.* (2017), http://bit.ly/32rDyov; Morrissey, C. A., et al., *Neonicotinoid contamination of global surface waters and associated risk to aquatic invertebrates: a review*, Environment International 74:291-303; Margaret Eng et al., *A neonicotinoid insecticide reduces fueling and delays migration in songbirds* (2019), Science, https://science.sciencemag.org/content/365/6458/1177; D. Goulson, *An overview of the environmental risks posed by neonicotinoid insecticides*, 977-87, Journal of Applied Ecology, 50(4) (2017).

[170] Wash. Dept. of Ecology, *Burrowing shrimp control (Imidacloprid)*, https://www.ecology.wa.gov/Regulations-Permits/Permits-certifications/Aquatic-pesticide-permits/Burrowing-shrimp-control-Imidacloprid.

[171] Mallory Gruben, *Ecology reissues permit for 'low toxcitiy' Japanese eelgrass herbicide*, The Daily News (March 7, 2020), https://tdn.com/news/local/ecology-reissues-permit-for-low-toxcitiy-japanese-eelgrass-herbicide/article_b8b79f47-6f7b-5676-8ba6-0014b3ef63b2.html.

[172] Atlas at 14.

placed the Northern Study Area near the biologically diverse Channel Island chain,[174] which already faces threats from development and contamination from shipping lanes.[175] Additionally, NMFS placed cluster CN-1 near the Santa Barbara and Anacapa Island Area of Special Biological Significance, which also faces threats from urban runoff from mainland coastal development, contamination from shipping channels, and oil development.[176] Other areas of special biological significance in the Southern California Bight near the proposed AOAs include the Northwest Santa Catalina Island Area of Special Biological Significance, the San Clemente Island Area of Special Biological Significance, and the San Nicolas Island & Begg Rock Area of Special Biological Significance.

b. NMFS must assess impacts on state and federal marine protected areas.

Beyond areas of specifical biological significance, NMFS must also assess impacts on state and federal marine protected areas. NMFS proposes to designate these AOAs near numerous national marine sanctuaries and marine protected areas, such as the Channel Islands National Marine Sanctuary, which protects endangered species, sensitive habitat, historic shipwrecks, and cultural resources.[177] Other marine protected areas in the Southern California Bight near the proposed AOAs include Point Dume State Marine Reserve and Marine Conservation Area, Campus Point Marine State Conservation Area, Point Conception State Marine Reserve, and Chumash Heritage National Marine Sanctuary.[178]

13. NMFS must address environmental impact of land-based hatcheries.

NMFS notes that "[m]ost species reared in net pens undergo a hatchery biosecurity phase at a land-based facility."[179] Because breeding is necessary for aquaculture, NMFS must evaluate the environmental impacts of land or nearshore hatcheries.

14. NMFS overlooked impacts to local economies and markets for wild fish.

NMFS again relied on "[p]roject-specific NEPA analyses…[to] further analyze disproportionate impacts to small, local, and independent businesses which could also lead to greater adverse impacts on fishing communities."[180]

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[174] DPEIS, *supra* note 1 at 74.

[175] State Water Resources Control Board, *California's Areas of Special Biological Significance*, https://www.waterboards.ca.gov/water_issues/programs/ocean/asbs_map.shtml.

[176] *Id.*

[177] Atlas at Appendix C-5.

[178] California Department of Fish & Wildlife, *Southern California Marine Protected Areas*, https://wildlife.ca.gov/Conservation/Marine/MPAs/Network/Southern-California#27158536-campus-point-state-marine-conservation-area.

[179] DPEIS, *supra* note 1 at 164.

However, NMFS must take a hard look at economic harms to coastal communities, food producers (on land and at sea), and other marine-reliant industries. Commercial and recreational fishing, tourism, and recreation account for a large portion of Southern California's economy and workforce,[181] with the majority of marine jobs in tourism and recreation.[182] California's fishing industry also supports seafood markets regionally, statewide, and internationally.[183]

Members of the wild-capture fishing industry have collectively voiced their trepidations over attempting to coexist with the marine aquaculture industry, stating that "this emerging industrial practice is incompatible with the sustainable commercial fishing practices embraced by our nation for generations and contravenes our vision for environmentally sound management of our oceans."[184]

NMFS's proposed AOA designations could close off and essentially privatize large swaths of the ocean that are currently available for numerous other commercial purposes, such as fishing, tourism, shipping, and navigation. Finally, given what we know about economies-of-scale and the business models of modern agriculture and terrestrial food production, we can only expect a similar trend at sea: that is, the marine finfish aquaculture industry could easily push out responsible, small-scale seafood producers and crop growers. This dynamic creates an alarming imbalance of power, and allows corporations to dominate business structures, production methods, and management policies within the industry. Not to mention that giving corporations disproportionate influence over food production also severely limits consumer choices.[185]

a. NMFS must adequately acknowledge the possibility of physical displacement of local fishermen.

Instead of unequivocal statements such as "[t]he chance of displacement and the severity of impact on fishers would depend on the compatibility of gear types resulting in coexistence or competition for space,"[186] the DPEIS must assess the cumulative impacts of aquaculture projects'

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[181] Atlas at 13.

[182] *Id.* at 192 (tourism and recreation accounts for 75 percent of marine jobs, followed by the transportation sector which accounts for 19 percent).

[183] *Id.* at 13.

[184] Open letter to Members of the U.S. House of Representatives and Senate, Dec. 4, 2018, re: Opposition to marine finfish aquaculture in U.S. waters, *available at* http://foe.org/DecFishFarmingSignOnLetter/.

[185] *See World's 100 Largest Seafood Companies*, Undercurrent News (Oct. 7, 2016) https://www.undercurrentnews.com/report/undercurrent-news-worlds-100-largest-seafood-companies-2016/; Tom Seaman, *World's top 20 salmon farmers: Mitsubishi moves into second place behind Marine Harvest*, Undercurrent News (June 29, 2016) https://www.undercurrentnews.com/2016/06/29/worlds-top-20-salmon-farmers-mitsubishi-movesinto-second-place-behind-marine-harvest/; Aslak Berge, *These are the world's 20 largest salmon producers*, Undercurrent News (July 30, 2017) http://salmonbusiness.com/these-are-the-worlds-20-largest-salmon-producers/.

expansion on local commercial fishermen. California is "the largest ocean-based economy in the U.S.," with thousands of commercial fishing vessels fishing offshore of Southern California.[187] NMFS's Atlas already acknowledges potential impacts on commercial fishing operations and the significant geographical overlap between the AOAs, commercial traffic, and fishing trawls.[188] NMFS also explicitly acknowledges that commercial fishing supports many communities along the coastline by providing employment, income, and revenue from seafood sales, stating that the seafood industry in California supported more than 150,000 jobs in 2017.[189] The change in the availability of resources and wild fish stocks due to the prolonged presence of aquaculture may drastically alter the patterns and routes of commercial fishermen. Changing migration patterns, species displacement, or hypoxia may force wild fish and fishermen into new waters. Therefore, NMFS must also address these cumulative future impacts on the physical displacement of local fishermen.

b. NMFS did not adequately assess harms to markets for wild fish.

NMFS again punted this question relying on "site specific NEPA analysis" to assess "key trade-off factors when considering market interactions."[190] However, because AOA designations intend to allow for more industrial aquaculture, it must also assess the AOA designations' impact on the value of local catch.

Aquaculture corporations in the Bight could potentially flood local and state-wide markets with farmed versions of native species, thus decreasing the price of the same wild stocks and consequently harming local fishermen. For example, salmon farming and its resulting constant supply of farmed salmon in the global market drastically reduced the price of salmon—wild or farmed—worldwide.[191] Indeed, rather than complementing wild-capture fisheries in the Bight,[192] offshore aquaculture in the Bight may flood the market with an abundance of farmed finfish—resulting in net loss to the local fishermen. In the worst-case scenario, flooding the market with farmed fish could lead to local fishermen's' inability to continue operating due to competition and the harm to wild fish. This could lead to large numbers of unemployment and closure of many commercial fishing operations.

c. NMFS must fully assess impacts to wild caught fisheries.

NMFS acknowledges that "changes in revenue, value, and profitability of wild-caught fisheries may occur domestically if AOA products replace some of the current import market share

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[187] Atlas at 13.
[188] *Id.* at 74-76.
[189] *Id.* at 13.
[190] DPEIS, *supra* note 1 at 187.
[191] R. Naylor *et al., Salmon Aquaculture in the Pacific Northwest: A global Industry with Local Impacts*, 45 Environment, No. 8 (Oct. 2003) at 18-39.
[192] NOAA, Press Release, NOAA Announces Regions for First Two Aquaculture Opportunity Areas under Executive Order on Seafood (Aug. 20, 2020).

in the region and in the U.S,"[193] and thus must also assess the AOA designations' impacts on wild caught fisheries. NMFS cannot rely on "site specific NEPA analyses"[194] to address these concerns.

Rather than replacing wild fish consumption, farmed fish production in other regions has instead exacerbated the diminishing populations of wild fish. This will be especially true in offshore aquaculture farming carnivorous fish species not native to Southern California, which would require a diet high in fishmeal and oil often derived from wild-caught fish stocks that are already under pressure due to increased coastal development and oil/sewage spills.[195] The industry's ever-growing demand for feed jeopardizes the survival of wild stocks and disrupts the balance of the marine ecosystem.[196] The removal of wild fish to produce fish feed reduces the natural supply of food for the farmed fish's wild counterparts, as well as seabirds and other marine life.[197] Over ten years ago, the FAO reported that most reduction fisheries were already fully exploited and some were considered overexploited, meaning they were already producing catches at or near the maximum sustainable level, and they risked depletion of stocks if catches were not reduced.[198]

B. Any mitigation measures must have adequate explanation and support.

NMFS claims that this DPEIS "does not propose any avoidance, minimization, mitigation, and monitoring measures."[199] While NMFS can use terms in a DPEIS to prevent harm from an impact, the "feasibility of mitigation measures is not self-evident," and the record still needs to support the conclusion that the measures attached to the DPEIS will actually have the intended effect.[200] NMFS must support the conclusion that their proposed conditions will render significant impacts from oxygen depletion, pathogen spread, antibiotic resistance, fish escapes, federally listed species and other wildlife, and local economies insignificant. Failing to properly support their conclusions renders them arbitrary and capricious and contrary to law.

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[193] DPEIS, *supra* note 1 at 192.

[194] *Id.*

[195] Albert Tacon & Marc Metian, *Fishing for Feed or Fishing for Food: Increasing Global Competition for Small Pelagic Forage Fish*, 38 Ambio, No. 6 (Sept. 2009) at 294-302; R. Naylor & M. Burke, *Aquaculture and Ocean Resources: Raising Tigers of the Sea*, 30 Annual Review of Envtl. Resources, 185-218 (2005); Brian Halweil, *Farming Fish for the Future* 20 (Worldwatch Inst. 2008).

[196] Changing Markets Foundation, *Until the Seas Run Dry* (2019), http://changingmarkets.org/wp-content/uploads/2019/04/REPORT-WEB-UNTILL-THE-SEAS-DRY.pdf.

[197] Tacon & Metian, *supra* n. 165; Marine Aquaculture Task Force, Woods Hole Oceanographic Inst., *Sustainable Marine Aquaculture: Fulfilling the Promises, Managing the Risks* 16 (27).

[198] FAO, *The State of the World Fisheries* (2012), http://www.fao.org/docrep/016/i2727e/i2727e.pdf.

[199] DPEIS, *supra* note 1 at 378.

[200] *See O'Reilly v. U.S. Army Corps of Eng'rs*, 477 F.3d 225, 234 (5th Cir. 2007) (holding that the agency did not provide a rational basis for determining that the USACE has adequately complied with NEPA because "the EA provides only cursory detail as to what those measures are and how they serve to reduce those impacts to a less-than-significant level.").

III. NMFS must initiate formal programmatic ESA Section 7 consultation on the proposed AOA designations and prepare a Biological Opinion.

NMFS must conduct ESA consultation at this programmatic stage despite the fact that future, site-specific activities will occur. *See Env't Def. Ctr. v. Bureau of Ocean Energy Mgmt.*, 36 F.4th 850, 885 (9th Cir. 2022). NMFS acknowledges that numerous listed species may be present in throughout the Southern California Bight, even overlapping with the proposed AOAs, yet NMFS has yet to consult with the Services or prepare a biological opinion as required by 16 U.S.C. § 1536(c)(1). Nevertheless, NMFS claims that "more detailed information that may be required to consult with NMFS and USFWS on specific activities associated with project designs and alternatives."[201]

The ESA regulations plainly state that "[a]ny request for formal consultation may encompass … a number of similar individual actions within a given geographical area or a segment of a comprehensive plan. This does not relieve the Federal agency of the requirements for considering the effects of the action as a whole."[202] Accordingly, NMFS must engage in programmatic consultation regarding impacts of these AOA designations on federally protected species throughout the Southern California Bight.

As detailed above, offshore aquaculture facilities present serious environmental concerns, both on an individual level and cumulatively. Based on this fact and the ESA regulations, it is therefore unequivocal that AOA specific designations or consultation on each individual permit aquaculture facilities must obtain in the future does not relieve NMFS of its duty to consult on the AOA designations at a programmatic level.

While AOA-specific or project-specific consultation is also clearly required for any project that may affect listed species, NMFS cannot justify its potential designation of multiple AOAs in the Southern California Bight based on that later, site-specific consultation. Relying only on site-specific consultation fails to capture the cumulative impacts that the southern California AOA designations may have on listed species. The only way to ensure that the designations will not jeopardize listed species is to complete a programmatic consultation – otherwise the Services are not provided the opportunity to identify which areas may be problematic for listed species, and to provide reasonable and prudent measures to minimize harm, such as measures to ensure that NMFS gathers and analyzes sufficient data to prevent jeopardy to listed species.

A. Numerous endangered and threatened species would be threatened by AOA designations.

The Atlas documents numerous threatened and endangered species vulnerable to the impacts of offshore aquaculture facilities in the Southern California Bight. Critical habitat for the

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[201] DPEIS, *supra* note 1 at 106.

[202] *Nat'l Wildlife Fed'n v. Brownlee*, 402 F. Supp. 2d 1, 10 (D.D.C. 2005) (citing 50 C.F.R. § 402.14(c)).

humpback whale overlaps with the Northern Study Area,[203] while NMFS lists seventeen other endangered and threatened species known to occur in the Southern California Bight.[204] These species include numerous other endangered whale species, several sea turtle species, giant manta rays, black and white abalone, the Guadalupe fur seal, and the gulf grouper.[205]

B. NMFS's AOA designations pose a risk of direct, indirect, and cumulative adverse impacts on listed species.

AOA designations would thus pose a risk of direct and cumulative adverse harm to these ESA listed species, which, as discussed above, must be analyzed through formal consultation. In addition to cumulative impacts discussed above, discharges from offshore aquaculture operations typically contain organic and inorganic solids, nutrients, and chemicals used in the prevention and treatment of various diseases. Any of these discharges could impair the water quality in the receiving water and harm endangered species, especially when discharged from multiple facilities. At elevated concentrations, chlorine and ammonia are toxic to aquatic life, while discharged nutrients could cause periodic extreme decreases in dissolved oxygen. These impacts must be assessed on a programmatic level to ensure the protection of endangered species.

C. NMFS cannot commit resources to the proposed designations without first consulting with the Services.

Under Section 7(d) of the ESA, NMFS may not act until the agency consults with the Services, and the Services concur with NMFS's determination. Section 7(d) of the ESA provides that, once a federal agency initiates consultation on an action under the ESA, the agency "shall not make any irreversible or irretrievable commitment of resources with respect to the agency action which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures which would not violate subsection (a)(2) of this section."[206]

Since the purpose of Section 7(d) is to maintain the environmental status quo pending the completion of consultation, Section 7(d) prohibitions remain in effect while NMFS completes its programmatic consultation. These prohibitions must also remain in effect throughout the consultation period and until the federal agency has satisfied its duty under Section 7(a)(2) to insure that the action will not result in jeopardy to listed species or adverse modification of critical habitat. Hence, NMFS may not designate AOAs until it has complied with the statutory mandates of the ESA.

D. NMFS must consult with the Services for a Biological Opinion prior to designating AOAs.

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[203] Atlas at 36.
[204] *Id.* at 25.
[205] *Id.*
[206] 16 U.S.C. § 1536(d).

Due to the far-reaching nature of the proposed designations and the multiple impacts on species throughout southern California, NMFS will also need to prepare a Biological Opinion (BiOp). The result of formal consultation is the preparation of a BiOp by the expert wildlife agencies (FWS and NMFS) which provide their analysis of the best available scientific data on the status of the species and how they would be affected by the proposed designations.[207] Additionally, a BiOp must include a description of the proposed action, a review of the status of the species and critical habitat, a discussion of the environmental baseline, and an analysis of the direct and indirect effects of the proposed action and the cumulative effects of reasonably certain future state, tribal, local, and private actions.[208]

E. Incidental take statements must be prepared on an individual level.

While formal programmatic consultation is required, it would be improper and unlawful for any incidental take statement to be issued as part of the Services' biological opinion.[209] Numerous different ESA-protected species and their designated critical habitats are likely to be adversely affected. It remains unclear whether sufficient protections at the programmatic level will be implemented to ensure that listed species are not jeopardized by cumulative impacts from activities covered by these designations.

Moreover, there is no feasible way that the Services can predict, let alone quantify, the amount of incidental take of currently-listed species that will result from offshore aquaculture facilities throughout the Southern California Bight in the years to come. Further, the Services could not possibly analyze or quantify incidental take for future-listed species that will be adversely affected by the proposed AOA designations. Rather, incidental take can only occur, and can only be analyzed and appropriately permitted, at the site-specific and species-specific level. Therefore, the programmatic consultation should acknowledge that it is a framework programmatic

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[207] When preparing a biological opinion, the consulting agency must (1) "review all relevant information," (2) "evaluate the current status of the listed species," and (3) "evaluate the effects of the action and cumulative effects on the listed species," 50 C.F.R. § 402.14, using "the best scientific and commercial data available." 16 U.S.C. § 1536(a)(2); *see also Greenpeace v. Nat'l Marine Fisheries Serv.*, 80 F. Supp. 2d 1137, 1149-50 (W. D. Wash. 2000) (remanding biological opinion where agency failed to "meaningfully analyze" the risks to the species and the key issues).

[208] *See* Consultation Handbook at 4-14 to 4-31.

[209] It is well-settled that programmatic biological opinions do not require an incidental take statement where those opinions explicitly mandate future site-specific consultations for take authorizations. *See Gifford Pinchot Task Force v. USFWS,* 378 F.3d 1059, 1067–68 (9th Cir.) *am. by* 387 F.3d 968 (9th Cir. 2004); *Forest Serv. Employees for Env't Ethics*, 726 F. Supp. 2d at 1224–1225; *W. Watersheds Project v. BLM*, 552 F. Supp. 2d 1113, 1139 (D. Nev. 2008); *Swan View Coal., Inc. v. Turner,* 824 F. Supp. 923, 934–35 (D. Mont. 1992). Here, should the Services issue a no-jeopardy opinion on the AOA designations, it should not be accompanied by an incidental take statement because all incidental take should only be authorized, if at all, via a Section 10 permit or Section 7 consultation.

consultation under which any incidental take will be subsequently authorized under a permit-specific Section 7 or Section 10 process.[210]

IV. NMFS must also comply with the Marine Mammal Protection Act.

Due to potential "takes" of marine mammals, NMFS must obtain proper authorization before finalizing any AOA designations. Offshore aquaculture facilities approved under this program could result in harassment of nineteen marine mammal species in the proposed areas.[211] Thus, NMFS must complete an accurate assessment of risks posed by designations to marine mammals.

V. NMFS must comply with the MBTA.

NMFS has also failed to consider whether the AOA designations may result in the "take" of migratory birds, despite the fact that migratory birds will likely interact with offshore aquaculture facilities. Several of NMFS's proposed sites fall within Important Bird Areas,[212] which provide habitat for migrating birds. Now, pursuant to the MBTA, NMFS must undertake this evaluation before finalizing the AOA designations.

VI. NMFS must ensure protection of essential fish habitat, as required under the MSA.

The MSA established procedures to identify, conserve, and enhance Essential Fish Habitat (EFH) for species regulated under a federal Fisheries Management Plan.[213] The MSA requires consultation with NMFS on all actions, including proposed actions, which may adversely affect EFH.[214] To "adversely affect" means any impact that reduces the quality and/or quantity of EFH, and may include direct (e.g., contamination or physical disruption), indirect (e.g., loss of prey or reduction in species fecundity), site-specific, or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions.[215] When NMFS is consulted on impacts to EFH under the MSA, it must "recommend to such agency measures that can be taken by such agency to conserve such habitat," and, should the action agency fail to adopt those measures, it must explain its reasons for not following those measures.[216]

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[210] *See* 80 Fed. Reg. 26,832 (May 11, 2015) (adding definition of "framework programmatic action" to 50 C.F.R. § 402.02 and adding 50 C.F.R. § 402.14(i)(1)(6) on incidental take statements not being required at the programmatic level where subsequent actions resulting in incidental take will be separately consulted on); *see also* Interagency Handbook at 4-50-51 (stating that in programmatic consultations that cannot determine anticipated levels of incidental take "the incidental take statement should indicate that the issue will be reexamined during the consultation process for site-specific actions under the umbrella of the larger planning document.").

[211] Atlas at 26.

[212] *Id.* at 112, 131.

[213] 16 U.S.C. §§ 1801 *et seq.*

[214] *Id.* § 1855(b)(2).

[215] 50 C.F.R. § 600.810.

[216] 16 U.S.C. § 1855(4).

Here, before NMFS can finalize any designations, NMFS must ensure that none of the proposed sites will adversely affect the EFH for all federally managed fish species. NMFS's Atlas identifies fourteen fish species whose EFH overlaps with proposed AOA sites,[217] rendering this consultation all the more essential.

VII. NMFS must consult on National Marine Sanctuaries.

The National Marine Sanctuaries Act established procedures to ensure protection of National Marine Sanctuaries. NMFS's proposed AOAs are located near Marine Protected Areas, with the Northern Study Area even overlapping with the Channel Islands National Marine Sanctuary.[218] This critical sanctuary protects 1,470 mi^2 of ocean waters around the Northern Channel Islands: Anacapa, Santa Cruz, Santa Rosa, San Miguel, and Santa Barbara Islands and protects endangered species, sensitive habitat, historic shipwrecks, and cultural resources.[219] As a result NMFS must consult with itself regarding whether the designations are likely to destroy, injure, or cause the loss of any sanctuary resource.[220]

VIII. Designating the AOAs without a consistency determination would violate the Coastal Zone Management Act.

NMFS has yet to submit a CZMA consistency determination to the pertinent California agencies so that they and the public can comment on the designations' consistency with California's Coastal Management Program. This failure to make such a determination violates the CZMA and its regulations. NMFS's regulations specify that federal agencies must provide state agencies with a consistency determination "at the *earliest* practicable time in the planning … of the activity."[221] Submitting consistency determinations to California after NMFS's NEPA review and eventual designation plainly delays this determination beyond the "earliest" time in the process. Furthermore, NMFS's proposed designation of major areas of southern California will undoubtedly impact protected areas in California's Coastal Management Program as discussed *supra*. Allowing California agencies to review the NMFS consistency determination is vital, given how the proposed designations likely conflict with the protections currently provided in California's Coastal Management Program.

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[217] Atlas at 195.
[218] *Id.* at 55.
[219] *Id.* at Appendix C-5.
[220] 16 U.S.C. § 1434(d); *see also Greenpeace Foundation v. Mineta*, 122 F.Supp.2d 1123, 1127 n.5 (D. Haw. 2000) (noting that where "NMFS is both the acting and consulting agency … NMFS consults with itself").
[221] 15 C.F.R § 930.36 (b)(1) (emphasis added).

CONCLUSION

For the foregoing reasons, NMFS should halt its AOA designations until proper federal oversight has been established. If NMFS does proceed, the agency must comply with the mandates of NEPA, the MMPA, the MSA, the ESA, the NMSA, the CZMA, and the MBTA.

Thank you for your consideration of these comments.

Sincerely,

Center for Food Safety

Don't Cage Our Oceans

Santa Barbara Channelkeeper

Los Angeles Waterkeeper

Environmental Defense Center

Ashley Eagle-Gibbs, Esq., Executive Director
Environmental Action Committee of West Marin

Submitted Via: Regulations.gov **Submitter Name/Organization**: James Mitchell - Legislative Director, Don't Cage Our Oceans

DON'T CAGE OUR OCEANS



February 13, 2025

Celia Barroso
Regional Aquaculture Coordinator, California
National Marine Fisheries Service
West Coast Region
501 W. Ocean Blvd., Ste. 4200
Long Beach, CA 90802

Submitted online at Docket No. NOAA-NMFS-2022-0051-0048

RE: Draft Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal Waters of Southern California

Dear Ms. Barroso:

Don't Cage Our Oceans is a coalition of over sixty seafood businessesand organizations working to stop industrial-scale offshore finfish farming while uplifting values-based seafood systems led by local communities. Values-based and more responsible forms of aquaculture are community-driven, responsibly sited and appropriately scaled, and use more appropriate

species and methods. We respectfully submit these comments in response to NOAA's "Draft Programmatic Environmental Impact Statement for Identification of Aquaculture Opportunity Areas in Federal Waters of Southern California." Please note that we also endorse the comments submitted by the Center for Food Safety.

We support Alternative 1, the No Action Alternative, in which no AOAs would be identified in federal waters offshore of Southern California. In addition, our coalition neither endorses nor objects to the identification of AOAs for aquaculture activities that **explicitly** forbid finfish farming (e.g., the sub-alternatives). While seaweed and bivalve farming are wholly distinct from finfish farming and have far less harmful impacts than the latter, we nonetheless believe that existing state law is best designed to regulate that activity in state waters.

There are several reasons why the most prudent option is for NOAA to take no action in designating AOAs pursuant to Executive Order 13921. Chief among these is that NOAA lacks the legal authority to regulate aquaculture in federal waters in the first place. Furthermore, there are grave economic and ecological consequences in allowing offshore finfish farming in U.S. federal waters.

Legality

NOAA asserts that this DPEIS "is not a regulatory or permitting action and does not propose to authorize or permit any specific aquaculture-related activities or individual aquaculture projects." Indeed, it does not have that authority. Yet while the agency is indeed not issuing permits with this specific document, it nonetheless notes that "Future proposed aquaculture projects may tier from the PEIS if the lead agency determines the PEIS is appropriate for its needs." The agency is well aware of the end goal. Indeed, NOAA *also* states that the purpose of this DPEIS "is to identify AOAs in Federal waters," with "the goal of identifying AOAs…to support the development of domestic commercial aquaculture."

The agency's intent here is worth noting. Contrary to the agency's downplaying of the ramifications of this DPEIS, the idea is that this document would provide a foundation and expedite any future agency regulatory action by having this very document play a central role in complying with NEPA and other environmental laws.

For many years, NOAA has asserted authority in setting up and permitting an unprecedented nationwide system of commercial offshore aquaculture facilities across all U.S. waters, even though Congress has not approved any legislation granting the agency authority to do so. In fact, the courts have affirmed the agency's lack of authority to oversee aquaculture activities in federal waters.

In 2020, the 5th Circuit Court of Appeals case *Gulf Fishermen's Association v. National Marine Fisheries Service* held that NOAA does not have authority to permit or regulate aquaculture in U.S. federal waters, as there is no Congressional authorization to do so under the Magnuson-

Stevens Fishery Conservationand Management Act (MSA).[1] For years, NOAA had claimed that the MSA had provided authority under the contorted view that aquaculture falls under the statutory definition of "fishing" for purposes of the MSA, as fish are ultimately extracted from net pens, and that NOAA could thus create a fishery management plan (FMP) to regulate aquaculture. The 5th Circuit Court saw through this flawed justification, and ruled against it.

Across several administrations, the agency has acted as a promoter of industrial aquaculture, contrary to the will of American fishermen and coastalresidents. Following the aforementioned court ruling, EO 13921 sought to grant NOAA authority where Congress had not. Yet executive orders cannot confer authority on agencies because the president's powers are executive, not legislative, in nature.[2] Rather, the president's authority to act "must stem either from an act of Congress or from the Constitution itself."[3] As a result, EO 13921 cannot allow NOAA to establish a new offshore aquaculture industry in the absence of any statutory authority granted by Congress.

Notably, the other key provision that facilitated offshore aquaculture in that executive order was challenged in court. In *Don't Cage Our Oceans vs. United States Army Corps of Engineers*, the U.S. District Court for the Western District of Washington found that the U.S. Army Corps of Engineers (the Corps) had violated a number of environmental statutes in its effort to expedite and facilitate the issuing of Nationwide Permit 56. And just as NOAA argues here in the DPEIS that it is not regulating anything, the Corps also (unsuccessfully) alleged that its actions would have no bearing on aquaculture development.

While the Corps acknowledged numerous adverse impacts of the large fish farm structures it was authorizing in the permit, it failed to actually assess them. As the court explained, the Corps lacked the "logical bridge between the multiple acknowledged adverse impacts"—including those described by the agency itself as "high risk"—and the agency's "conclusion that the impacts of NWP 56 would be no more than minimal or would be insignificant." The court concluded: "Because the Corps narrowed its [environmental assessment] to disclose but not account for many foreseeable effects of NWP 56, its findings of minimal effects and no significant impacts are insufficiently supported and explained."

Here, the whole point of this DPEIS is to determine where best to encourage industrial aquaculture (especially of the finfish variety) in federal waters. The claim that this doesnothing to promote the industry under the argument that no permit is being issued is unconvincing.

Absent *any* plain text in support, NOAA cannot establish its authority to designate AOAs in Southern California. In June 2022, the U.S. Supreme Court made plain that an agency must

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[1] *Gulf Fishermens Ass'nv. Nat'l Marine Fisheries Serv*., 968 F. 3d 454 (5th Cir. 2020).

[2] *Doe #1 v. Trump*, 957 F.3d 1050, 1062 (9th Cir. 2020)(citing *Youngstown Sheet & Tube Co. v. Sawyer*, 343 U.S. 579, 587 (1952) ("[T]he President's power to see that the laws are faithfully executed refutes the idea that he is to be a lawmaker.").

[3] *Id.* at 585.

"point to 'clear congressional authorization' for the authority it claims."[4] Congress has never given NOAA the authority to regulate aquaculture in federal waters, and the courts have agreed with this interpretation.

Just last year, in the landmark decision ***Loper Bright Enterprises v. Raimondo***, 603 U.S. 369 (2024), the U.S. Supreme Court overturned the *Chevron* doctrine, and further cemented the idea that federal agencies cannot legislate where there is ambiguity. Given that the aforementioned cases of *Gulf Fishermen's Association* and *Don't Cage Our Oceans* were litigated in a *Chevron* world, the bar is now higher yet for NOAA to convince any court that it has found ambiguity in any statute and should be granted deference when it comes to aquaculture in federal waters.

Congress has repeatedly demonstrated immenseskepticism of offshore finfish aquaculture, an industrial activity that is resoundingly opposed by American fishermen and coastal residents. However, even if NOAA's permitting and regulating of aquaculture were to be legal, there are a variety of other compelling reasons why this activity should not move forward.

The federal government's "water grab" and misappropriation of taxpayer dollars is overwhelmingly rejected by the public

Aquaculture Opportunity Areas are the ocean-based equivalent of a land grab; they are a "water grab" by the federal government to benefit specific corporate interests, and to the detriment of existing shoreside industries, such as fishing, tourism, and recreation. The public trust doctrine is a legal principle that U.S. waters belong to all Americans, and the government must protect and maintain these resources for the public's use. Cordoning off large portions of Southern California waters for the exclusive use of a single out-of-state or foreign company harms the public, coastal communities, and the livelihoods of residents who live and work along the water.

Alternative 2 ("Santa Barbara Channel") would have the agency take a combined 15,000 acres offshore the Santa Barbara and Ventura counties in the Santa Barbara Channel. The proposalis eight AOA options located between 5-10 nautical miles offshore. While sub-alternative 2(a), ("macroalgae and shellfish aquaculture only") is less problematic than sub-alternative 2(b) ("all types of commercial aquaculture"), neither option avoids the harm of handing over America-owned waters to private interests. Sub-alternative 2(b) is worse in that the proposal would be primarily of interest to industrial finfish farming corporations, often of international ownership, who would have the financial capital to build out the astonishing quantity of sea cages, mooring lines, floating feed barges and other related infrastructure.

Alternative 3 ("Santa Monica Channel") is also an untenable option, where the agency is proposing two AOAs offshore of Los Angeles County in Santa Monica ***near a confirmed toxic***

[4] *W. Virginia v. EPA*, No. 20-1530, 2022 WL 2347278, at *3 (U.S. June 30, 2022)(citing *Util. Air Regul. Grp. v. EPA*, 573 U.S. 302, 324 (2014)).

radioactive dumpsite.[5] (For more on this, see the last section of this comment letter.) These locations are just a little over 4 miles offshore and would feature a combined 1,500 acres. These proposals are barely a mile beyond the state water line, and sub-alternative 3(b) in particular ("all types of commercial aquaculture") would feature the federal government snubbing California's state law banning most forms of finfish farming. Sub-alternative 3(a) ("shellfish and macroalgae aquaculture only") is a poor idea because shellfish and seaweed absorb and bioaccumulate toxins from their surrounding environment. Toxic and radioactive seaweed, shellfish, and finfish pose a direct risk to the health of American consumers.

Finally, Alternative 4 ("Combination of Geographic Areas") is the most reckless of all proposals in that it combines the above suggested alternatives, featuring up to ten AOAs spanning 16,500 acres. While sub-alternative 4(a) is again for shellfish and macroalgae only, 4(b) would actively harm American economic and conservation interests by allowing "all types of commercial aquaculture" (read: finfish). **Tragically, sub-alternative 4(b) (allowing finfish aquaculture) is also the agency's preferred alternative**; in other words, NOAA's preference is the one that is most harmful to Americans who live and work along our coasts, and also incorporate toxic and radioactive farmed products.

Don't Cage Our Oceans members assert that sub-alternatives 2(b), 3(b), and (4b) are the worst possible decisions in that they would allow finfish aquaculture in federal waters off of southern California. Sub-alternatives 2(a), 3(a), and 4(a) are misguided at best in that they are unlikely to be economically viable to coastal residents who aspire to raise shellfish and seaweed in a responsible manner. Community-owned and operated macroalgae and shellfish aquaculture is best achieved under existing state law.

Offshore finfish aquaculture proponents have requested long-term (25-year) leases for their facilities spanning hundreds of acres, which would essentially block off a swath of public oceans for more than an entire generation. In this DPEIS, NOAA is proposing to carve up and hand control of our federal ocean spaces, a public resource that should be managed for the benefit of all Americans, to private companies and corporate interests. In doing so, **NOAA is actively harming America's fishing families and the many small businesses in coastal communities that support them.** NOAA should instead focus on supporting independent fishermen, fishermen co-ops, and small businesses that provide seafood to local and regional American markets.

Few want to see this industry get a foothold in our public waters except for the large agriculture and pharmaceuticalcorporations and their shareholders[6] who see an opportunity to profit from industrially produced fish that require enormous feed and drug inputs. In the prior Administration, NOAA listening sessions for its strategic plan on aquaculture and related initiatives revealed that **people overwhelmingly oppose** the inclusion of marine finfish

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[5] Fausey, Callie. *Radioactive Waste and DDT: UCSBScientist DavidValentine Releases New StudyPointingto Disposal of Radioactive Waste in Pacific Ocean,* February 22, 2024. Available at: https://msi.ucsb.edu/news/radioactive-waste-and-ddt

[6] *See* Stronger America Through Seafood. https://www.strongerthroughseafood.org/sats-members

aquaculture as part of NOAA's vision in the first place. In prior listening sessions for the Southern California AOAs, a substantial majority of Californiaresidents opposedtheir creation.

Commercial fishermen – already struggling due to rising costs, a lack of institutional support, and the lingering impacts of COVID on their industry – are especially threatened by the prospect of industrialfinish farming in Southern California. If farmed fish from facilities sited within AOAs are actually sold in the U.S., they will likely undercut wild fisheries, and **drive small fishing businesses to closure**. The impacts of global salmon farming on small-boat salmonfishermen in Alaska during the 1990s are a textbook example of this effect, which caused economic insecurity and contributed to permit loss in small fishing communities.

American commercial fishermen have repeatedly voiced their concerns over being forced to coexist with a taxpayer-subsidized marine aquaculture industry, stating that "this emerging industrial practice is incompatible with the sustainable commercial fishing practices embraced by our nation for generations and contravenes our vision for environmentally sound management of our oceans."[7] NOAA has failed to secure public buy-in or societal license to push forward industrial fish farms in federal waters.

That NOAA would nonetheless enthusiastically pursue the permitting of factory fish farms that are known to harm the very fisheries that the agency is tasked with conserving and managing is deeply troubling. Indeed, despite all of the data that NOAA provides in this DPEIS outlining the enormous contribution of the fishing and tourism industries to California's economy (amounting in the billions of dollars), the agency simply brushes those concerns aside.

Creating AOAs to promote offshore finfish farming harms fishing families and fishing communities

NOAA's AOA Atlas already concedes potential impacts on commercial fishing operations and the significant geographical overlap between the AOAs, commercial traffic, and fishing.[8] The agency also explicitly acknowledges that commercial fishing supports many communities along the coastline by providing employment, income, and revenue from seafood sales, stating that the seafood industry in California supported more than 150,000 jobs in 2017.[14] So why would we want to threaten these valuable fisheries with near-guaranteed fish escapes from aquaculture facilities?

Fish Escapes Have And Will Occur

California already has a ban on salmonid, transgenic, and non-native finfish farming in its own state waters. Yet the threat of fish escaping into Federal *and Californian state waters* is

[7] Open letter to Members of the U.S. House of Representatives and Senate, Dec. 4, 2018, re: Opposition to marine finfish aquaculture in U.S. waters, http://foe.org/DecFishFarmingSignOnLetter/.

[8] Morris, J.A. Jr, MacKay, J.K., Jossart, J.A., Wickliffe, L.C., Randall, A.L., Bath, G.E., Balling, M.B., Jensen, B.M., and Riley, K.L. 2021. An Aquaculture Opportunity Area Atlas for the Southern California Bight. NOAA Technical Memorandum NOS NCCOS 298. Beaufort, NC. 485 pp. <https://doi.org/10.25923/tmx9-ex26>, 74-76.

inevitable, because fish escapes are a regular and ongoing occurrence in the industry. After a massive 2017 fish escape of Atlantic salmon from an aquaculture facility in state waters, the state of Washington investigated the site's operator, Cooke Aquaculture, and found that the company lied about both the cause of the escape and its magnitude.[9] The true number of fish that escaped ended up being roughly 263,000 Atlantic salmon in the Pacific Ocean, much higher than Cooke Aquaculture was willing to admit.[10] Just last month, the state of Washington voted to keep all commercial finfish net pens out of its state waters once and for all. Unfortunately, Cooke Aquaculture continues to operate in Maine state waters, and in 2023, over 50,000 of their juvenile farmed salmon escaped in Machias Bay.[11]

Around the world, industrial finfish aquaculture has repeatedly resulted in fish escapes, which impact wild fish and other marine wildlife. For example, in January 2020, 73,600 salmon escaped from a net pen in Mowi, Scotland, marking the third major escape in the area since October 2019.[12] In Norway, approximately 4,000,000 fish escaped in a single year.[13] AquaChile reported the escape of 787,929 fish in 2013 due to bad weather that damaged cages.[14] In 2018, 680,000 fish escaped from Marine Harvest Chile, 109,515 from Bakkafrost Faroe Islands, and 120,000 from Huon Aquaculture in Tasmania.[15] Recognizing the regularity of fish escapes from ocean-based net pens, the U.S. Council on Environmental Quality has stated that it "must be *assumed* that escapes will occur" from net pens.[16]

Fish escapes can disrupt the marine ecosystem and threaten wild fisheries. Farmed fish are genetically inferior fish, and when they interbreed with wild fish populations, they bring down the fitness and survivability of the wild fish. Escapes are occurring en masse, right now, and by "leaders" in this risky industry.

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[9] Wilson, Deborah. *Report blames negligence, not eclipse, for Washington fish farm collapse.* CBC, February 2, 2018. https://www.cbc.ca/news/canada/british-columbia/fish-farm-collapse-cooke-aquaculture-report-washington-state-1.4516075

[10] Mapes, Lynda V. *Fish farm caused Atlantic salmon spill near San Juans, then tried to hide how bad it was, state says*. Seattle Times, February 2, 2018. Accessible at: <https://www.seattletimes.com/seattle-news/fish-farm-caused-atlantic-salmon-spill-state-says-then-tried-to-hide-how-bad-it-was/>

[11] French, Edward. *Salmon escape raises concerns about seals, risk to wild fish.* The Maine Monitor, Aug. 26, 2023. https://themainemonitor.org/salmon-escape-raises-concerns-about-seals-risk-to-wild-fish/

[12] *Escape calls high energy salmon sites into question*, The Fish Site (Jan. 20, 2020), https://thefishsite.com/articles/mowi-reports-mass-salmon-escape-from-colonsay.

[13] Nat'l Marine Fisheries Service Pac. Islands Reg'l Off., Draft Programmatic Env't Impact Statement (DPEIS) 171 (2021).

[14] Lola Novarro, *Here are the largest recorded farmed Atlantic salmon escapes in history*, IntraFish (Feb. 1, 2019), https://www.intrafish.com/aquaculture/here-are-the-largest-recorded-farmed-atlantic-salmon-escapes-in-history/2-1-388082.

[15] *Id.*

[16] Council for Environment Quality & Office of Science and Technology Policy, Case Study No. 1: Growth-Enhanced Salmon, at 23 (2001), https://clintonwhitehouse5.archives.gov/media/pdf/salmon.pdf; *CEQand OSTPAssessment: Case Studies of Environmental Regulations for Biotechnology*, https://hygeia-analytics.com/wp-content/uploads/2016/12/RP_RegGETech_CEQ.pdf.

In 2024, 65,000 atlantic salmon smolts escaped from a Mowi facility; farmed cod were found in nets around a farm which ultimately resulted in the culling of the entire net pen; 13,500 atlantic salmon escaped due to a tear at yet another Mowi facility; 14,000 atlantic salmon escaped from a Lerøy facility - the largest escape in the prior two years; and between 100 and 1,000 atlantic salmon escaped from a facility, leading to interbreeding between wild and farmed salmon. Incredibly, this non-exhaustive list *only includes facilities in Norway - the world's leader in industrial aquaculture.*

Beyond just escapes, in Scotland in 2024 liquid waste was seeping onto public beaches, exposing sheep, cows, and cats to disease. In British Columbia, Grieg Seafood allowed 7,000-8,000 liters of diesel fuel to spill into the Esperanza inlet, polluting the water and contaminating clam beds. Sea lice, a common parasite in industrialaquaculture, was also found across Norway and Scotland.

Less than a month into 2025, 15,000 farmed salmon escaped from a damaged net pen in Norway. The pen was operated by aquaculture giant Lerøy and the fish it contained had previously been found to have pancreatic disease as well as a bacterial pathogen called *moritella viscosa.* Both of these ailments could be passed on to wild fish surrounding the escapement. Unfortunately, an escape of this magnitude is not uncommon. As we go further into 2025, it is guaranteed that more of these disasters will arise.

Fish Farms in Southern California will Incubate and Spread Diseases to Wild Stocks

Floating CAFO-style fish farms incubate and proliferate parasites and diseases (e.g., sea lice) that then spread to the wild fish populations. This is harmful to both the marine ecosystem and wild fisheries, and runs contrary to the Administration's plan to Make America Healthy Again. There is more evidence that pathogens from farmed salmon spread to wild salmon: piscine orthoreovirus (PRV) is widespread in farmed salmon and is associated with heart and skeletal muscle inflammation.[17] *Tenacibaculum maritimum* is known to cause disease and mortality.[18] The toxic chemicals that offshore fish farm operators use to treat these diseases are widely known to harm other marine life and commercially-sought species as well, as discussed further below.

There are documented studies of large populations of sea lice having left their origin sites of fish farms into the broader ocean environment, both in the Atlantic and Pacific oceans. In March 2022, a study from *Scientific Reports* notes: "Our results suggest that salmon lice in the Pacific Ocean have recently evolved substantial resistance to the antibiotic EMB ["SLICE"], and that salmon-louse outbreaks on Pacific farms will therefore be more difficult to control in the coming

[17] Palacios G, Lovoll M, Tengs T, Hornig M, Hutchison S, et al. (2010) Heart and Skeletal Muscle Inflammation of Farmed Salmon Is Associated with Infection with a Novel Reovirus. PLOS ONE 5(7): e11487. https://doi.org/10.1371/journal.pone.0011487

[18] Avendaño-Herrera R, Toranzo AE, Magariños B. Tenacibaculosis infection in marine fish caused by Tenacibaculum maritimum: a review. Dis Aquat Organ. 2006 Aug 30;71(3):255-66. doi: 10.3354/dao071255. PMID: 17058606.

years."[19] A May 2021 study from *Royal Society* shows how the industry is losing the "arms race" in the North Atlantic Ocean because multiresistant salmon lice are dispersed throughout.[20]

An October 2024 study from *Science Advances* showed that three pathogens are prevalent in farmed Atlantic salmon in British Columbia, spill over to wild Pacific salmon, and are linked to negative impacts on wild salmon; they include Piscine orthoreovirus, *Tenacibaculum* spp., and sea lice (*Lepeophtheirus salmonis*).[21]

As parasites develop resistance to these chemicals, there is a growing trend to increase the level of toxicity of the chemicals used in response; this of course further increases the load of toxic chemicals in the marine environment. NOAA must assess these potentialdischarges since these pathogens, parasites, and the chemicals used to treat them can easily spread to wild fish, including wild populations that are listed as endangered or threatened under the Endangered Species Act.

The chemicals used as anti-foulants, antibiotics, and pesticides are often **carcinogenic and toxic to marine life**; these chemicals (e.g., organophosphates, cypermethrin) are openly discharged into the marine environment. In fact, up to 75% of antibiotics used by the industrial aquaculture industry directly absorb into the surrounding environment.[22] In Nova Scotia, the use of the antibiotic EMB resulted in "widespread damage to wildlife," including "substantial, wide-scale reductions" in crabs, lobsters and other crustaceans close to marine finfish facilities.[23] None of this squares with the Administration's goal to Make America Healthy Again.

Creating AOAs would harm marine life and degrade water quality

As referenced earlier, the AOAs have generated minimal interest from companies looking to engage in shellfish or seaweed farming. NOAA is fully aware that the farming of high-trophic level finfish — that is, carnivorous or omnivorous fish that require high animalprotein inputs — is the ultimate endgame for these public-turned-private spaces.

Industrial offshore finfish aquaculture **leads to overfishing** of forage fish. Most farmed marine fish require large amounts of fish in their feed – much of this comes from wild forage fish,

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[19] Godwin, S.C., Bateman, A.W., Kuparinen, A. *et al.* Salmon lice in the Pacific Ocean show evidence of evolved resistance to parasiticide treatment. *Sci Rep* 12, 4775 (2022). https://doi.org/10.1038/s41598-022-07464-1.
[20] Fjørtoft Helene Børretzen, Nilsen Frank, Besnier Francois, Stene Anne, Tveten Ann-Kristin, Bjørn Pål Arne, Aspehaug Vidar Teis and Glover Kevin Alan. 2021. Losingthe'arms race': multiresistant salmonlice are dispersed throughout the North Atlantic Ocean *R. Soc. open sci.* 8: 210265. https://doi.org/10.1098/rsos.210265.
[21] Martin Krkosek *et al.*, Pathogens from salmonaquaculturein relation to conservation of wild Pacific salmonin Canada. *Sci. Adv.* **10**, eadn7118 (2024). DOI:10.1126/sciadv.adn7118
[22] United Nations, Fron*tiers 2017: EmergingIssues of Environmental Concern*, at 15 (2017), https://www.unenvironment.org/resources/frontiers.
[23] Rob Edwards, The Sunday Herald, *Scottish government accused of colluding with drug giant over pesticides scandal* (June 2, 2017), http://www.heraldscotland.com/news/15326945.Scottish_government_accused_of_colluding_with_drug_giant_over_pesticides_scandal/.

including anchovies, menhaden, sardines and other small fish that are critically important to the diet of marine wildlife, including birds, dolphins, sharks, and other fish. Removing massive amounts of forage fish from our oceans reduces prey availability for other marine species and can change relationships in our ecosystem with potential widespread consequences.

NOAA must assess impacts of these industrial facilities on all species, not just those that are listed under the Endangered Species Act. The agency's AOA Atlas reveals that 18 threatened and endangered species can be found in the southern Californiabight, including several whale species, several sea turtle species, giant manta rays, black and white abalone, the Guadalupe fur seal, and the gulf grouper.[24] Additionally, nineteen species of marine mammals may traverse the proposed areas,[25] and fourteen fish species whose Essential Fish Habitat overlaps with proposed AOA sites.[26]

Furthermore, Santa Monica Bay and the Santa Barbara Coast serve as nurseries for great white sharks.[27] NOAA even admits that "[g]iven the high occurrence of these species, it is unlikely that aquaculture activities can avoid interactions."[28]It also admits that more indirect impacts to marine mammals and other wildlife may occur as well.[29] Because the proposed facilities will be located in, or near, species' migration routes or in their habitat, NOAA must analyze the AOA designations' cumulative effects of this project and other proposed projects for the full term of any proposed permit on species.[30]

Entanglement from ropes, lines, and net pens may harm endangered species and other wildlife in the proposed areas, especially as the facilities' propensity to act as fish aggregating devices (FADs) further exacerbates risks of entanglements and vessel strikes as species are drawn to the facilities. Recently, NOAA has admitted that industrial aquaculture may attract predators as a result of fish escapes, food drifting outside the pens, and other animals aggregating around the pens.[31] The FAD effect may result in more frequent encounters with protected species, increasing the likelihood of injury from structures or equipment associated with the facility.[32]

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[24] Morris, J.A. Jr., *supra* n. 7 at 52. at 194.
[25] *Id.*
[26] *Id.*
[27] Marc Cota-Robles, *Drone footagecapturescluster of juvenilegreatwhite sharksoff Pacific Palisadescoast* (Aug. 11, 2021),
https://abc7.com/great-white-shark-pacific-palisades-will-rogers-state-beach-california-population/1094 5063/;
Beth Farnsworth, *Santa Barbara Coast is a nursery 'hot spot' for great white sharks* (Jan. 27, 2022),
https://keyt.com/news/santa-barbara-s-county/2022/01/27/santa-barbara-coast-is-a-nursery-hot-spot-f
or-great-white-sharks/.s/
[28] Morris, J.A. Jr., *supra* n. 7 at 194.
[29] *Id.*
[30] *Id.*
[31] Luke T. Barrett, et al., *Impacts of marine and freshwater aquaculture on wildlife: a global meta-analysis*, Reviews in Aquaculture (2018).
[32] *Id.*

Waste from intensive finfish farming (excess feed, fish poop, and any chemicals used on the fish or pens) readily flows from the net pens into surrounding waters. In many cases, the nitrogen outputs associated with the concentrated rearing of hundreds of thousands of fish in a limited area is equivalent to the sewage output of major U.S. cities; worse, in this case, it is *untreated.*

Nutrient pollution decreases oxygen levels in our waters, killing off aquatic life and creating low-oxygen "dead zones" and harmful algal blooms.[33] Harmful algal blooms produce toxic chemicals that can kill fish and other vertebrates by affecting their central nervous systems, and can cause serious illness in humans with severe or chronic respiratory conditions.[34]

Southern California has already been experiencing an increase in harmful algal blooms in recent years and harbors some of the world's highest concentrations of domoic acid, an algal toxin dangerous to wildlife and people who eat local seafood.[35] NOAA must consider the likelihoodof algal blooms in all study areas and assess the potential harms that could occur to the region, including harm to the local fishing industry from more frequent and severe disruptions due to Domoic Acid.

CAFO-style fish farming does not feed Americans or help alleviate hunger

In raising marine carnivorous finfish, it takes more fish to feed the farmed fish than for people to simply eat the lower-trophic level fish in the first place.[36] This is an **inherently unsustainable and energy-intensive model** that leads to a **net loss in fish and animal protein**, mocking the purported "feed the world" claims of NOAA and industry alike.

Opening up American waters to foreign investors and large corporations doesnot guarantee that the farmed fish would be sold domestically, beyond limited distribution to a handful of high-end restaurants and boutique grocery retailers, nor that it will be affordable to most consumers: instead, production will follow the highest profit margins, and leave us with little else than a mess. In short, this approach would not contribute to feeding America.

Scientifically unsound in conception and siting

It is astonishing that NOAA — an agency with so many experienced scientists and fishery regulators on staff — is pushing forward in creating AOAs for offshore finfish farming. This siloed approach to management demonstrates a fundamental lack of understanding of fisheries on the

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[33] Donald Boesch *et al.*, Pew Oceans Comm'n, *Marine Pollution in the United States* 20-22(2001).

[34] NOAA, Harmful Algal Blooms, https://oceanservice.noaa.gov/hazards/hab/.

[35] Donald Boesch *et al.*, Pew Oceans Comm'n, *Marine Pollution in the United States* 20-22 (2001). [34] Crable, M. Climate change could make toxic algal blooms in our oceans more deadly. *Phys.org* (2020) https://phys.org/news/2020-07-climate-toxic-algal-blooms-oceans.html

[36] Patricia Majluf *et al.*, A review of the global use of fishmeal and fish oil and the Fish In: Fish Out metric. *Sci. Adv.* **10**, eadn5650(2024). DOI:10.1126/sciadv.adn5650.

part of the agency's proponents, and a grave miscalculation of the critical roles of science and public input on the fisheries regulatory process.

Finally, two of the proposed AOAs in the Alternative 3 (CN1-A and CN1-B) are near a known toxic and radioactive dumpsite.[37] In 2020, scientists found up to 500,000 barrels of the banned pesticide DDT dumped in the Pacific Ocean off of Catalina Island near NOAA's proposed AOA option CN1-B.[38] Following these discoveries, in July 2022 the EPA launched an investigation into this dumpsite and several other areas in southern California.[39] It was later revealed that while the plumes around the barrels contained DDT, the corroding barrels themselves still currently contain radioactive waste.[40] DDT is highly toxic and carcinogenic and linked to a wide variety of health problems in both humans and wildlife; unfortunately it is also very durable, as it biomagnifies and bioaccumulates as it travels through food webs.[41] It is inconceivable that NOAA deemed these areas ideal at any stage of the siting process.

The agency's assessment does not reflect the findings of the October 2024 *Science Advances* issue on aquaculture, where peer-reviewed North American scientists detailed the many shortcomings of ocean-based finfish farms. Our coalition members encourage agency staff to talk with fellow staff from various line offices, and to also engage with scientists and colleagues *outside* of the finfish aquaculture industry.

The logic behind many of the tables included in this DPEIS is alarming. NOAA repeatedly insists that the No Action Alternative would lead to poor siting of proposed fish farms (and notes the many harms caused by offshore finfish aquaculture), *while ignoring that it is not actively aiding those very companies to set up fish farms through NOAA-provided funding and related advocacy efforts.* Indeed, the agency then argues that its preferred alternatives *mitigate* the harms it otherwise plans to inflict upon American coastal communities.

For the many reasons above, our members strongly urge NOAA to refrain from identifying any federal waters offshore in Southern California as Aquaculture Opportunity Areas. We recommend the No Action Alternative.

Sincerely,

James Mitchell

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[37] Jacob T. Schmidt, Mong Sin Christine Wu, Hailie E. Kittner, J. Samuel Arey, Douglas E. Hammond, Earth 182A Group, and David L. Valentine. Disentangling the History of Deep Ocean Disposal for DDT and Other Industrial Waste Off Southern California. Environmental Science & Technology 2024 58 (9), 4346-4356 DOI: 10.1021/acs.est.3c08575.

[38] Samantha Haugen, *How Barrel After Barrel of DDT Ended Up On the Ocean Floor*, OCEAN BLUE PROJECT (Jan. 13, 2021) https://oceanblueproject.org/ddt-effects-on-the-environment/.

[39] EPA, Southern California Ocean Disposal Site #2 Investigation, https://www.epa.gov/ocean-dumping/southern-california-ocean-disposal-site-2-investigation

[40] Schmidt et al., *supra* note 37.

[41] EPA, *supra* note 39.

Legislative Director
Don’t Cage Our Oceans
North American Marine Alliance
jmitchell@dontcageouroceans.org
202-643-1830

Comment ID Number: E-20250122-03
Submitted Via: Email **Submitter Name/Organization:** Murphy Niu, CS Dept. UCSB

Emailed Comment:

Dear Ms. Barroso,

I am deeply concerned about the proposed Aquaculture Opportunity Areas (AOAs) in the Santa Barbara Channel. This fragile ecosystem, now one of only nine Whale Heritage Areas, hosts the highest density of gray whales on Earth. These magnificent creatures rely on the channel's rich feeding grounds to survive their epic pole-to-pole migrations.

However, industrial fishing gear poses a grave threat, as entanglements are the leading cause of whale fatalities. Expanding aquaculture in this sensitive area will exacerbate pollution, habitat destruction, and vessel traffic—further endangering marine life and disrupting the balance of our coastal ecosystem.

I urge NOAA to reconsider the scale and location of AOAs, prohibit offshore finfish farming, and prioritize sustainable solutions that protect our ocean and its invaluable wildlife.

Sincerely,

Murphy Niu

Comment ID Number: E-20250122-04
Submitted Via: Email **Submitter Name/Organization:** Michelle Rainville, Santa Barbara

Emailed Comment:

I am writing to express my grave concerns and opposition to aquaculture in the Santa Barbara Channel.

The Channel is a very rich source of food for marine animals and therefore attracts a huge quantity and variety of species, which means more animals will be impacted by any negative effects of aquaculture. Aquaculture is not appropriate in the Channel.

Additionally, the marine environment in the Channel can be treacherous for mariners and their vessels. I would expect it would be equally treacherous for aquaculture equipment. Aquaculture should be placed in a milder environment, not in the area south of Point Conception.

Lastly, aquaculture can have negative impacts on wild populations, so I don't believe aquaculture is appropriate, period, but especially in a special and unique place on the planet such as the Channel. The NMFS should be promoting sustainable practices that the community actually wants.

Please protect our Channel!

Michelle Rainville

Comment ID Number: E-20250122-06

Submitted Via: Email **Submitter Name/Organization:** Nathan Garrison, Co-Founder, Sharkbanz.com

Emailed Comment:

Dear Ms. Barroso,

I am writing to express significant concerns with the proposed aquaculture project in the proposed AOA's of the Santa Barbara Channel. This area is one of the most important marine ecosystems on earth. The Santa Barbara Channel is a critical habitat for various cetacean species, including blue, humpback, and fin whales, which are seasonally present from early spring to late fall. Orcas and grey whales mingle with an estimated 25,000 dolphins that call the channel home.

Have you ever spent time on these waters? On the right day, you will find yourself in awe. To damage them in any way is a crime.

My mom lives in Maine, and us and her neighbors have personally watched as the aquaculture industry in that state has run roughshod over the environment, causing significant harm to the ecosystems and even the residents of the area through poisoned seafood with PFAS, water pollution in the bays, and reduced recreational fishing opportunities.

The Santa Barbara Channel's strong currents, storms, and winds make it a vulnerable site, unsuitable for large-scale industrial aquaculture infrastructure. Pollution, habitat destruction, and entanglement risks posed by aquaculture in the Santa Barbara Channel can harm sensitive marine ecosystems. Increased vessel traffic and escaped fish have the potential to disrupt the livelihoods of local fishermen who rely on healthy, productive waters. Are you aware of the size of the waves and powerful winds that exist in these waters? Any aquaculture installations would be destroyed, further littering the channel with debris and polluting the waters. Debris will also pose a risk to the commercial fishermen and recreational boaters of the area, many of whom travel at night and would be at considerable risk to floating debris from these aquaculture installations.

The Santa Barbara Channel's resources are for the local, sustainable, and community based organizations who have called these waters home for generations. They are not for industrial takeover, and they are not for sale.

This aquaculture project in the SBC should not be allowed to proceed at any level.

You will find that there are a large number of individuals and organizations who will fiercely defend the Santa Barbara Channel and it's animals with every last ounce of energy in our bodies. Please reconsider this concept, and discard it as a bad idea.

Sincerely,

Nathan Garrison

Comment ID Number: E-20250123-04

Submitted Via: Email **Submitter Name/Organization:** Haewon, Professor, UCSB

Emailed Comment:

Dear Ms. Barroso,

My name is Haewon, and I am a professor at UCSB as well as a proud resident of Santa Barbara. As someone who deeply cares about ocean wildlife and the well-being of our coastal ecosystems, I am writing to express my concerns regarding the proposed Aquaculture Opportunity Areas (AOAs) in the Santa Barbara Channel.

This fragile ecosystem, now recognized as one of only nine Whale Heritage Areas, hosts the highest density of gray whales on Earth. These magnificent creatures depend on the channel's rich feeding grounds to sustain their epic pole-to-pole migrations.

However, industrial fishing gear already poses a significant threat to whales, with entanglements being the leading cause of fatalities. Expanding aquaculture in this sensitive area will only exacerbate issues such as pollution, habitat destruction, and vessel traffic—further endangering marine life and disrupting the delicate balance of our coastal ecosystem.

I urge NOAA to reconsider the scale and location of the AOAs, prohibit offshore finfish farming, and prioritize sustainable solutions that safeguard our ocean and its invaluable wildlife.

Thank you for considering these concerns.

Sincerely,

Haewon

Comment ID Number: E-20250123-01

Submitted Via: Email **Submitter Name/Organization:** Katharine Gerhardt

Emailed Comment:

I am writing to submit my comment to strongly oppose the installation of offshore industrial fisheries in the Santa Barbara Channel. This is a terrible idea for a variety of reasons and must never be allowed in our precious channel. The pollution from dead livestock, the migratory path disruption, the negative impact on native species...list goes on and on. Please do not approve this project. I live here, I surf in these waters and all the pollution from the Channel boats ends up on my beaches and in my body. This is not a good idea for anyone other than people profiting off selling these sick farmed fish.

Aloha,

Katharine Gerhardt

Comment ID Number(s): E-20250124-01, E-20250126-01

Submitted Via: Email (2), duplicate letter sent by multiple commenters **Submitter Name/Organization:** 1. Natalie Kilmer 2. Carl Bender, Ojai, CA

Emailed Comment:

To Whom it may concern,

Our family opposes the proposed aquaculture in the Santa Barbara Channel. We swim and surf almost daily in the Ventura area and are concerned about the environmental impacts including genetic contamination, disease transmission to local native species, water pollution, and habitat degradation. We want to urge policymakers to improve local fisheries through watershed protections, and keeping water in rivers, with less diversion. Promote healthy fisheries! We could instead put money and resources toward restoring the SF Bay delta the largest estuary on the US West coast. Another idea would be to put funds toward restoring the flows in the rivers here locally with fewer diversions. We also need a better fish ladder in the Ventura River at Casitas Diversion. Aquaculture is not a good option in the SB Channel.

There are many examples of aquaculture disrupting the natural cycle along the West Coast. Let's learn from others mistakes.

All the best,

Comment ID Number: E-20250205-02

Submitted Via: Email **Submitter Name/Organization:** Gus Albertsen

Emailed Comment:

dear Ms Barroso ,

I would like to express concern regarding the proposed plan to get industrial Aquaculture in the Santa Barbara channel. I agree that Santa Barbara has many seafood companies and I would love to see them flourish,. However, I care about the marine environment and I do not want to destroy the aquatic species that live in the Santa Barbara channel. I support the kind of Aquaculture that uses multiple species to harvest and farm at the same time, Integrated Multi Trophic Aquaculture . Integrated Multi Trophic Aquaculture significantly decreases nutrient pollution due to the use of two species using the same resources to grow. This method would hopefully decrease nutrient pollution in the Santa Barbara channel. Thanks for your time

sincerely,

Gus Albertsen

Comment ID Number: E-20250130-01

Submitted Via: Email **Submitter Name/Organization:** Deane Plaister

Emailed Comment:

Dear Ms. Barroso,

As a longtime resident of the Santa Barbara area and a staunch advocate for a healthy ocean environment, I would like to comment on the proposed development of Aquaculture Opportunity Areas in the Santa Barbara Channel. As has been seen in similar projects in other parts of the world, there are a number of significant threats involved with maintaining large-scale fish pens on the open ocean: Concentration of nutrients from fish waste and uneaten feed leading to algal blooms; antibiotics used to deter diseases in the overcrowded conditions of fish pens flowing into the surrounding waters, fueling the evolution of superbugs resistant to future drugs; escapes of non-native or genetically modified fish (almost a certainty) confounding the ecology and/or polluting the genome of naturally occurring fish stocks; infrastructure needed to support such operations bringing the threat of entanglement for local or migrating whale populations, sea turtles, and other sea life, not to mention their posing another hazard to navigation for fishing or pleasure boats and other craft. And all this industrial development is proposed in a stretch of water famous for its heavy winds, currents, and rough seas. These do not seem like ideal conditions for operating a relatively fragile system of pens.

I would ask that NOAA downsize the scale and number of proposed AOA operations and site them in areas not deemed as particularly sensitive habitat for naturally occurring sea life or its migration routes. While some kinds of locally run shellfish and macroalgae aquaculture may be appropriate, I would oppose the industrial-scale raising of finfish in the Channel. Our thriving, local, wild-caught fishing industry does not need the pollution or disease that fish pens can bring. Whatever level of aquaculture is eventually permitted in the Channel, it should be carefully regulated and thoroughly monitored for all the potential hazards noted above.

Thank you for hearing my concerns,

Deane Plaister

Comment ID Number: E-20250207-01

Submitted Via: Email **Submitter Name/Organization:** Bob Crocco, Santa Barbara

Emailed Comment:

With several Marine Sanctuaries off the coast of California, it would be both counterproductive (and counterintuitive) to allow a commercial finfish industry in the Santa Barbara Channel. A well run farmed shellfish industry would be acceptable and allow for commercial activity.

Please reject a finfish farming initiative.

Thank you

Bob Crocco

Comment ID Number: E-20250123-02

Submitted Via: Email **Submitter Name/Organization:** Judith Smith, Santa Barbara, CA

Emailed Comment:

Dear Ms. Barroso,

I own my own home on a cliff on The Mesa in Santa Barbara directly across from The Santa Barbara Channel. I look at The Santa Barbara Channel everyday and our healthy ocean and swim in the ocean without a wetsuit two to three times a week year round. I am very involved with keeping the ocean clean. I am writing because I am very concerned about the impact of having industrial scale aquaculture, especially offshore finaquaculture, on15,000 acres in the sensitive area of the Santa Barbara Channel.

As a layperson, I have read about much smaller levels of acquaculture happening in other places in California. The set up for AOAs requires massive amounts of poles, wire, lines, nets. The proximity of these large sites to sensitive habitats, critical migration corridors, as well as serious questions about regulatory oversight and long-term environmental, social and economic impacts represent a tremendous red flag to the construction of these sites in the Santa Barbara Channel. The scale and location of the proposed AOAs in the Santa Barbara Channel threatens our environment, local fisheries and coastal communities.

The Santa BarbaraChannel's strong currents, storms, and strong winds make it a vulnerable site unsuitable for the large-scale infrastructure industrial aquaculture demands. Pollution, habitat destruction, and entanglement risks will affect sensitive marine ecosystems. Increased vessel traffic and escaped fish have the potential to disrupt the livelihoods of local fishermen who rely on healthy, productive waters.

Thousands of Dolphins and Whales (including our Great White Whales, the largest Whales in the world, who live nowhere else on Earth) will, no doubt, be harmed by Industrial-size Aquaculture. The Santa Barbara Channel is a pristine, wild, algae-rich forest.

People come from all over the world to visit this internationally famous site. The NOAA should be protecting this environmental wonder instead of threatening its ecosystem by building AOAs.

Thank you for considering these comments.

Sincerely,

Judith Smith

Comment ID Number: E-20250211-02

Submitted Via: Email **Submitter Name/Organization:** Malka Drucker

Emailed Comment:

Please work to keep them out of the Santa Barbara Channel.

Comment ID Number: E-20250123-03

Submitted Via: Email **Submitter Name/Organization:** Kristy Porteous

Emailed Comment:

Dear Ms. Barroso,

I am writing to express concerns about the proposed Aquaculture Opportunity Areas (AOAs) in the Santa Barbara Channel. The scale and location of the proposed AOAs threaten our environment, local fisheries, and coastal communities.

The Santa Barbara Channel's strong currents, storms, and winds make it a vulnerable site, unsuitable for large-scale industrial aquaculture infrastructure. Pollution, habitat destruction, and entanglement risks posed by aquaculture in the Santa Barbara Channel can harm sensitive marine ecosystems. Increased vessel traffic and escaped fish have the potential to disrupt the livelihoods of local fishermen who rely on healthy, productive waters.

Prioritizing industrial aquaculture over sustainable, community-based solutions, could cause lasting harm to the Channel's ecology and economy. I urge NOAA to reduce the scale of AOAs, avoid sensitive areas, prohibit offshore finfish farming, and move towards sustainable aquaculture practices with strong environmental safeguards that balance food production with environmental health.

Thank you for considering these comments.

Sincerely,

Kristy Porteous

Summary of Suggestions:

- **Smaller, Well-Sited AOAs**

Reduce the size and number of AOAs, avoiding sensitive habitats and critical migration routes.

- **Prohibit Offshore Finfish Aquaculture**

Until robust safeguards are in place, we oppose offshore finfish farming due to its significant risks to water quality, wildlife, and ecosystems.

- **The Channel is not Well-Suited for Commercial Aquaculture**

The Santa Barbara Channel is subject to large waves, strong currents, and damaging winds. This could lead to compounding impacts from escaped fish, debris pollution, and unforeseen environmental impacts.

- **Strengthen Oversight and Monitoring**

Require effective, centralized regulatory oversight, robust monitoring, and adaptive management plans to ensure transparency and accountability.

- **Promote Sustainable Alternatives / Small-Scale Aquaculture**

Support small-scale, well-managed shellfish and macroalgae farming, which can provide ecosystem benefits like water filtration and carbon sequestration.

Comment ID Number: E-20250210-01

Submitted Via: Email **Submitter Name/Organization:** Irene Cooke, Goleta, CA

Emailed Comment:

I am vehemently opposed to allowing underwater fish farms in the Santa Barbara Channel. The dangers to natural ecosystems cannot be ignored: pollution, oxygen-depleted dead zones, waste containing antibiotics, pesticides and fish feces, whale and dolphin entanglements, and releases of non-native fish, to name a few.

Please do not approve this dangerous proposal.

Sincerely,

Irene Cooke

Comment ID Number: E-20250210-02

Submitted Via: Email **Submitter Name/Organization:** Peggy Merizalde, Fearless Grandmothers

Emailed Comment:

BNet-pen finfish farming, which has beren is proposed by the U.S. Government, can be a dirty business (pollution, oxygen-depleted dead zones, waste that can contain antibiotics, pesticides and fish feces, whale and dolphin entanglements, Large operations close to each other amplify impacts. So the fact that nearly all the proposed sites are clustered together in the Santa Barbara Channel is a real concern. Cultivation of aquatic organisms in a manner that has a high potential to impact natural ecosystems, such as net-pen fish farming in coastal waters should not be permitted.

Thank you for reconsidering this project.

Peggy Merizalde

Comment ID Number: E-20250211-01

Submitted Via: Email **Submitter Name/Organization:** Melissa Riparetti-Stepien

Emailed Comment:

Having fish farms so close together in such a pristine beautiful place not healthy for anyone, native fish, dolphins, humans, sea weed etc.

No fish farms in SB Channel. This is a horrible proposal.

Sincerely, Melissa Riparetti-Stepien

Comment ID Number: E-20250211-03

Submitted Via: Email **Submitter Name/Organization:** Carol Millar, Co-owner, Millar and Associates Plans and Permits

Emailed Comment:

Dear Administrator,

Knowing the health hazards of eating farmed fish, my family has ceased to consume anything but wild caught – and knowing that many fish are threatened, we're careful about which ones we eat.

But now I'm particularly concerned about fish farming happening right off the coast of my town, Santa Barbara. I'm a 63 year old native Santa Barbaran, so I very well know how stressed our coastal waters are. I've seen the degradation happen during my lifetime, and even with a quick search AI comes up with a host of reasons to not have fish farms. See below:

Environmental issues

- **Pollution**: Fish waste, uneaten feed, and chemicals from fish farms pollute the ocean
- **Disease:** Fish farms can spread disease to wild fish populations
- **Habitat damage**: Fish farms can damage coastal ecosystems
- **Escaped fish:** Farmed fish can escape into the wild and compete with native fish

Animal welfare issues

- **Overcrowding:** Fish are often kept in small spaces, which can lead to stress, aggression, and physical injuries
- **Poor diet:** Farmed fish may be fed wild-caught fish that are contaminated
- **Starvation**: Fish may be starved before transport, grading, or slaughter
- **Suffocation:** Fish may be gassed with carbon dioxide or left to suffocate on ice

Fish farming also raises human health and food safety concerns. Chemicals used to prevent disease and parasites in fish can accumulate in fish tissue.

But apart from all those reasons a group I trust, The Sierra Club, is also opposed. Because I know they base their recommendations on real science, I urge you to please not stress these coastal waters more by allowing fish farming.

Thank you for your attention,

Carol Millar

Comment ID Number: E-20250211-04

Submitted Via: Email **Submitter Name/Organization:** Tracey Willfong, Santa Barbara

Emailed Comment:

To whom it may Concern:

Please make sure there are strong safeguards in proposed offshore Aquaculture expansion in the Channel.

Please take hard look at the Ecological, Social, and Economic risks before advancing expansion.

Prioritize Safeguards, Accountability, and Transparency.

Any expansion must be guided by Science, Trust, and Community Engagement.

We can not afford any environmental mistakes.

Thank you for considering this plea,

Tracey Willfong

Comment ID Number: E-20250212-01

Submitted Via: Email **Submitter Name/Organization:** Bill Woodbridge, Santa Barbara

Emailed Comment:

I am appalled that consideration is even being given to this toxic environmental disaster. Allowing 8 underwater fish fare totaling 15,000 acres in the Santa Barbara Channel would have detrimental impacts on marine mammals, cause the introduction of non-native fish species into SB Channel waters and cause massive nutrient pollution from the finfish farms. Net-pen finfish farming, which is proposed in this document, is a dirty business causing pollution, oxygen-depleted dead zones, waste that can contain antibiotics, pesticides and fish feces, whale and dolphin entanglements, and releases of non-native fish, which resulted in a ban in Washington state. Large operations close to each other amplify impacts. So the fact that nearly all the proposed sites are clustered together in the Santa Barbara Channel is a real concern. Cultivation of aquatic organisms in a manner that has a high potential to impact natural ecosystems, such as net-pen fish farming in coastal waters, should be discouraged.

Thank you for your common sense in denying these fish farms!

Bill Woodbridge

Comment ID Number: E-20250213-01

Submitted Via: Email **Submitter Name/Organization:** Terry Quinn

Emailed Comment:

I am writing to express my concern about the proposal to allow for 8 underwater fish farms in the Santa Barbara Channel. One concern is that the introduction of non-native fish species can have a negative impact on the endemic marine animals in the Channel. Another concern is that the net-pen finfish farming proposal would introduce pollution, and can create oxygen-depleted dead zones. Lastly, the proposed fish farms create further pollutants such as antibiotics, pesticides, and fish feces.

I strongly urge that the establishment of the net-pen finfish farming proposal in the Santa Barbara Channel be abandoned.

Thank you.

Terry Quinn

Comment ID Number: E-20250213-02

Submitted Via: Email **Submitter Name/Organization:** Kim Golden, Santa Barbara, CA

Emailed Comment:

I am strongly opposed to Fish Farming in Santa Barbara Channel waters based on Sierra Club positions.

Kim Golden

Comment ID Number: E-20250213-03

Submitted Via: Email **Submitter Name/Organization:** Jane Fehrenbacher

Emailed Comment:

The proposal to establish net-pen finfish farming in the Santa Barbara Channel is extremely wrong headed. Please do not allow the dirty and dangerous project.

Sincerely,

Jane Fehrenbacher

Comment ID Number: E-20250215-01

Submitted Via: Email **Submitter Name/Organization:** R D

Emailed Comment:

After reviewing the EIS and proposed actions and effects as well as the alternatives it has come to my attention that the seafloor is a vital part to not only the ocean ecosystem but to the maintaining of earth's climate control as well. The seafloor houses much of earth's carbon dioxide and when the seafloor is disrupted or destroyed by anchors and waste that like fish food and excrement from the farms (Alternative 2: Santa Barbara Channel, b). With these factors in play there can be a creation of 'dead zones' on the seafloor which adversely affect the environment and subsequently affect humans through the food chain as sea creatures could be displaced. I believe that another proposed alternative could be that instead of having big aquacultures there could be (1) an amount of more but smaller aquacultures spread out across the sea to try and reduce the size of these possible 'dead zones' on the seafloor. Instead of using anchors they could also use floating piers which have been proven to have less effect on the natural habitat. I also think that having these aquacultures are not healthy for human health as the fish are bred and could have potential diseases which could even get out into the open waters and affect other sealife nearby. These fish would also be ingesting microplastics which are found to be in higher concentration offshore which then would also affect the health of humans and have an impact on food security (Public Health Topics Related to Seafood Nutrition).

Comment ID Number: E-20250220-01

Submitted Via: Email **Submitter Name/Organization:** Carolyn Chaney, Social Justice Ministry of Live Oak Unitarian Universalist Congregation of Goleta, CA

Emailed Comment:

Speaking for the Social Justice Ministry of Live Oak Unitarian Universalist Congregation of Goleta, CA, we have concerns about the impacts to marine mammals and the introduction of non-native fish species into SB Channel waters as well as nutrient pollution from the finfish farms. Net-pen finfish farming, which is proposed in this document, can be a dirty business (pollution, oxygen-depleted dead zones, waste that can contain antibiotics, pesticides and fish feces, whale and dolphin entanglements, and releases of non-native fish--resulting in a ban in Washington state. Large operations close to each other amplify impacts. So the fact that nearly all the proposed sites are clustered together in the Santa Barbara Channel is a real concern.

This channel is home to dolphins, whales and many fish species, and it is our home, too. Fish farming goes against one of our basic religious principles: Respect for the interdependent web of life of which we are a part. Please do not allow fish farming in the Santa Barbara channel.

Carolyn Chaney

"Tell me, what do you plan to do with your one wild and precious life?" Mary Oliver

“Of all the paths you take in life, make sure a few of them are dirt.” John Muir

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Comment ID Number: E-20250215-02

Submitted Via: Email **Submitter Name/Organization:** Gabrielle DeMarco

Emailed Comment:

Dear Ms. Barroso,

I am submitting this comment regarding NOAA-NMFS-2022-0051, which concerns the Draft Programmatic Environmental Impact Statement (DPEIS) for the Identification of Aquaculture Opportunity Areas (AOAs) in Federal Waters in the Southern California Bight (SCB) (Executive Summary).

While I recognize the economic benefits and the growing demand for increased domestic seafood production, as well as the need for 500-2,000 acres of aquaculture, I have concerns about the impact that offshore finfish farming could have on small-scale fisheries in the Southern California region.

Concerns:
Currently, the DPEIS outlines that the AOA zones considered would potentially be suitable for finfish, shellfish, macroalgae, or muti-species aquaculture. Simultaneously, DPEIS acknowledges that offshore aquaculture, especially finfish operations (Alternatives 2b, 3b, and 4b), could create increased competition with wild-caught seafood. This could drive down prices, placing significant financial strain on small-scale fisheries, which already operate on tight margins. Additionally, the high capital investments required for offshore aquaculture projects tend to favor larger corporations over independent fishermen (Table ES-1; Markets and Regional Food Systems). Beyond the financial impacts, finfish aquaculture poses substantial ecological risks that could disrupt current ecosystems, further affecting the economic stability of small fisheries. Research has also shown that fish grown in captivity tend to catch and spread bacterial infections more quickly (Mugimba, 2021). Until the AOAs proposed impact on both small-scale fisheries and the dangers associated with finfish farming are dealt with, they remain extremely alarming.

Recommendations:
To ensure that these offshore Aquaculture Opportunity Areas (AOAs) remain equitable for all and meet the economic demand for seafood, I strongly recommend that NOAA prioritize subalternative 4a (shellfish and macroalgae aquaculture over finfish farming). Shellfish and macroalgae require less ecological intervention and are not as directly competitive with larger wild-caught fish markets (Kunselman, 2024). Additionally, they offer ecological benefits like water filtration which slows disease transmission rates. I also urge NOAA to implement protections for small-scale fisheries by ensuring access to resources and funding opportunities within the AOA framework. Grants and subsidies would help prevent large-scale fisheries from overwhelming the market and allow small-scale operations to remain viable.

The development of AOAs should not come at the cost of small-scale fisheries, local fishing economies, or marine ecosystems. If the goal is to meet the increased demand for seafood in a sustainable and controlled manner, it should not come at the expense of the economic capital of artisanal fishing. The global demand for seafood is growing, and alongside it, industrial and large-scale fisheries are expanding, which risks overwhelming artisanal livelihoods. I wholeheartedly support responsible aquaculture as a means of improving food security and fostering economic growth, while acknowledging that many impacts remain to be addressed. It is essential that NOAA adopts a balanced approach that does not limit access for those who rely on local fish to make a living while also prioritizing sustainable aquaculture methods. I urge NOAA to favor shellfish and macroalgae aquaculture over finfish farming and to implement economic protections for small-scale fishers during this transition.

Comment ID Number: E-20250215-02

Thank you for considering my comments. I hope that NOAA will take these concerns into account during the final implementation process.

Sincerely,
Gabrielle DeMarco

Comment ID Number: E-20250219-01

Submitted Via: Email **Submitter Name/Organization:** Dave Colker, Executive Director, Ventura County Commercial Fishermen's Association (VCCFA)

Emailed Comment:

Dear SoCalAOA WRC - NOAA

I am writing on behalf of the Ventura County Commercial Fishermen's Association (VCCFA), a 501(c)6 organization committed to promoting high-protein, non-genetically modified seafood products for our communities. Our mission includes advocating for the free flow of seafood products to market and removing trade barriers that limit our industry's growth.

We are concerned about the potential impact of the Aquaculture Opportunity Areas (AOA) proposed in the Draft Programmatic Environmental Impact Statement (DPEIS) for Southern California's federal waters. These areas, if designated for aquaculture, may severely affect our ability to provide this vital food source.

We have been unable to find relevant information on the AOA proposal from your website and have encountered technical issues retrieving data. It is critical that local commercial fishermen have a voice in this decision-making process, as removing harvestable grounds could hinder our ability to continue supplying our products to the public.

We request detailed information on which fishing grounds will be affected by the AOA and urge you to include local stakeholders in the ongoing conversation. Given the potential ramifications for our industry, we need further clarification before offering any support for this initiative.

While we acknowledge that aquaculture may have a role in the broader supply chain, we are concerned about its impact on the commercial fishing community. Please consider this letter as a formal request to halt the current process until we have the opportunity to provide input.

Our members and I are available for further discussion and would appreciate being included in the final report.

There is also concern that has been raised to if NOAA has authority to conduct this research and thus the legitimacy of the findings vs Congressional approval. I would like to have a conversation to find out if United States Congressional Approval was given for the Executive Order.

Thank you for your time and consideration.

Sincerely,

Dave Colker

Comment ID Number: E-20250220-11

Submitted Via: Email **Submitter Name/Organization:** Zack Gold

Emailed Comment:

Dear NOAA Aquaculture Program,

Thank you for the opportunity to provide comment on the West Coast Region Southern California Aquaculture Opportunity Area. I strongly support the need for increased aquaculture production in the US and thank the agency for making efforts to expand American Seafood Security.

However, I have five major concerns with the proposed AOA DPEIS and siting exercise: 1) ignoring water quality data layers, 2) failure to mitigate for ongoing NOAA fisheries monitoring, 3) not using this opportunity to leverage structures to enhance ocean observations, 4) ignoring endangered and protected species migration patterns (including by your own agency!), and 5) farming of high trophic level and non-native species requiring high feed inputs and not solving American seafood import discrepancies.

I have a few concerns regarding the scientific data layers and information used by the AOA in the siting of this proposed region. First, the selected AOA on the West Coast in Santa Monica Bay and the Santa Barbara Channel is in proximity to the sewage outfalls of over 25 million Southern California residents. In particular, the Santa Monica Bay AOA is only a few kilometers from the Hyperion sewage outfall and this information does not appear to have been considered in the site selection process. Previous research has documented that there are high contaminant loads of a wide array of chemicals including endocrine disruptors, microplastics, heavy metals, and narcotics among others in this sewage outfall. It is unclear how the AOA's incorporate this information to site a marine farm, especially one that may be raising filter feeders like oysters or mussels that are known accumulators of pollutants and sensitive to water quality concerns. NOAA should be coordinating with EPA as well as state agencies and county and city sanitation districts in ensuring the siting of aquaculture is located given the risk of pollutants. This is especially concerning given that Hyperion has had a suite of high-profile sewage spills with millions of gallons of raw sewage entering into Santa Monica Bay in and around these proposed areas. No one wants to eat a raw oyster from a sewage spill - definition of vomit-inducing. Siting aquaculture in areas with the potential for this does not sound like strategic planning. The AOA process should have taken water quality parameters into consideration. Similarly, recent fires and mudslides in the Los Angeles area destroyed tens of thousands of homes leading to runoff of unimaginable contaminant loads as captured by surveys by NOAA CalCOFI. Fires and runoff are increasing in Los Angeles with increasing climate change, increasing the rate and frequency of water quality contamination from incinerated human structures. The DPEIS does not account for these water quality parameters and suggests that this planning exercise was not done properly in coordination with water quality scientists. NOAA Aquaculture of all agencies should know how important clean water is for clean seafood. Ignoring water quality considerations in the siting and DPEIS is not only disappointing but frankly dangerous to American public health.

Second, the AOAs did not account for disruption to ongoing surveys in and around this region. The AOAs are squarely located within the CalCOFI grid. How will establishing farms within a 75 year biological oceanographic time series impact CalCOFI's ability to continue to maintain critical ocean observations? Will NOAA Aquaculture be mitigating these impacts in the same way that offshore energy has been required to mitigate impacts to ongoing fisheries surveys? How can one arm of Fisheries execute this planning exercise without discussing it with your coworkers? Classic NOAA silo-ing and disorganization. Were NOAA Fisheries scientists even consulted in this planning exercise and if so why were the summaries of such internal consultations not made publicly available? Such mitigation measures

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are critical and need to be planned and organized in the siting stage of a marine spatial planning exercise like this one.

Likewise will establishing these farms which will be polluters come with the requirement for ongoing ocean observations? This is an opportunity for the co-location of ocean sensors with aquaculture structures that both enhance our ocean observing infrastructure and provide critical information. If the public is going to be leasing parts of the ocean to private corporations we should be getting something in return. The very least should be enhanced ocean observations and mitigation of ongoing science exercises. Aquaculture is not different. There should be a mitigation fund that both supports ongoing aquaculture research as well as biological oceanography to monitor and mitigate any environmental impacts from these installations. NOAA and the state of CA are struggling to maintain ocean observations given continued divestment/flat budgets and aging infrastructure. This opportunity to install new ocean infrastructure should be capitalized on and science should be funded to install new sensors for water quality and oceanography measurements.

Additionally, this region is a migratory pathway for a suite of endangered and protected species including those actively managed and monitored by NOAA. There is little mention in the DPEIS about coordination and mitigation of loss of habitat for these species including marine mammals (grey whales, blue whales, fin whales) and basking sharks. All of these species are at historically low populations after human exploitation. This process did not discuss the loss of critical habitat and migratory pathways for these species. Aquaculture infrastructure increases the risk of entanglement and at a minimum requires disruption to seasonal migration patterns through these waters. Previous research has demonstrated that there are historic abundances of these species within the region and loss of any critical habitat and disruption to migration patterns is concerning. Did NOAA aquaculture consult the NOAA Office of Protected Resources in the DPEIS process and siting exercise? And if so why was there minimal information reported about impacts on protected species including marine mammals and elasmobranchs? The siting of this infrastructure in this highly productive region is concerning and risks recovery efforts for these species.

Lastly, why is NOAA aquaculture supporting the farming of non-native species and high trophic level species? Does NOAA Aquaculture read any of NMFS scientist's own research? Farming non-native species as proposed here increases the risk of the introduction of invasive species and novel pathogens. Work in Tasmania has demonstrated that aquaculture can serve as a bed for zoonotic diseases to marine mammal populations. Likewise, NOAA and USGS as well as state agencies spend hundreds of millions per year countering ongoing marine invasive species. Actively farming non-native species is asking for an invasive species event to occur. NOAA should not be jeopardizing other NOAA efforts to save and recover these species. As a Southern California native, I strongly encourage you to embrace our vernacular and repeat after me: "Locals only dude."

Furthermore, we should not be supporting aquaculture of species that do not have a net positive feed ratio. We should not be having aquaculture in SoCal that takes highly nutritious wild caught fish that most Americans don't want to eat and essentially fattening up non-native Seriola that can sell for a higher market price versus the forage fish itself. This only worsens global food insecurity in the name of profits. We should not be subsidizing, supporting, and permitting aquaculture that does not positively increase our ability to feed Americans and provide healthy and sustainable food. Higher trophic level species are incredibly inefficient from a feed ratio given that at best conversion rates of feed from one trophic level to another are ~25-40%. Skip the high trophic and only permit primary producers and primary consumers.

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They have higher conversion rates and increased yields. There is a reason that we do not have industrial farming of any secondary or tertiary consumers in terrestrial farming - the land and resource requirements are astronomically inefficient to farm predators. Do the same in American aquaculture – keep it low in the food chain and ensure that aquaculture is netting more food to enhance our food security not just profits.

Promote science. Protect ecosystems. Bottom of the food chain. Locals only.

Sincerely,

Long time native of Santa Monica with a PhD in marine ecology

These comments reflect my personal views and were written as a private citizen

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Comment ID Number(s): E-20250122-01, E-20250122-02, E-20250122-05, E-20250122-07, M-20250211-01 **Submitted Via:** Email (4) and Mail (1), duplicate form letter sent by multiple commenters **Submitter Name/Organization:** 1. Brandon Hopper 2. Christopher Lincoln, Concerned Citizen/Flying Fish Productions 3. Jennifer Reinish, Santa Barbara, CA 4. Becka Doering 5. David Mendelson, Channel Island Marine and Wildlife Institute Volunteer and lead rescuer

Emailed Comment:

I am writing to express concerns about the proposed Aquaculture Opportunity Areas (AOAs) in the Santa Barbara Channel. The scale and location of the proposed AOAs threaten our environment, local fisheries, and coastal communities.

The Santa Barbara Channel's strong currents, storms, and winds make it a vulnerable site, unsuitable for large-scale industrial aquaculture infrastructure. Pollution, habitat destruction, and entanglement risks posed by aquaculture in the Santa Barbara Channel can harm sensitive marine ecosystems. Increased vessel traffic and escaped fish have the potential to disrupt the livelihoods of local fishermen who rely on healthy, productive waters.

Prioritizing industrial aquaculture over sustainable, community-based solutions, could cause lasting harm to the Channel's ecology and economy. I urge NOAA to reduce the scale of AOAs, avoid sensitive areas, prohibit offshore finfish farming, and move towards sustainable aquaculture practices with strong environmental safeguards that balance food production with environmental health.

Thank you for considering these comments.

Submitted Via: Email **Submitter Name/Organization:** Barbara A. Holzman, Professor Emerita, SFSU

February 4, 2025

Barbara A. Holzman, PhD
Professor Emerita, SF State University
642 Surf View Drive
Santa Barbara, CA93109

Celia Barroso Regional Aquaculture Coordinator,
California National Marine Fisheries Service
West Coast Region
501 W. Ocean Blvd., Ste. 4200
Long Beach, CA 90802
socalaoa.wcr@noaa.gov

Re: Public Comment onthe Draft Programmatic Environmental Impact Statement (DPEIS) for the Identification of Aquaculture Opportunity Areas (AOAs) in Federal Waters of Southern California.

I would like to urge the **No Action** alternative be the decision on the above-named draft EIS regarding aquaculture opportunities in the Santa Barbara Channel for the following reasons.

1. The negative impact on marine mammals who live in or migrate through the area could be immense and negatively impact the populations which would have worldwide implications.
2. The somewhat unpredictable ocean currents and intense winds could lead to massive polluting effects on the channel thereby affecting local populations of fish and other wildlife both negatively affecting the local economy of the area both in fishing and ecotourism. Increased fertilizer, nonlocal food supplies necessary to maintain these proposed aquaculture activities can damage the balance of the entire marine ecosystem of the area and may in turn affect populations globally.
3. The location of the proposed areas are in direct conflict with areas of previous DDT contamination and any disturbance to the sea floor with anchoring devices to allow for aquaculture could stir up contaminants and lead to massive longterm destruction of the oceanic food webs also negatively impacting the natural productivity and health of the channel Southern California Bight which could lead to massive die offs of wildlife populations and also contamination of the commercial fisheries products harvested in the area. This could endanger the health and well-being of the public as well as the economy of the Southern California area.

1. **The negative impact on marine mammals who live in or migrate through the area could be immense and negatively impact the populations which would have worldwide implications.** The Santa Barbara Channel is one of the most biologically productive marine ecosystems on our planet. The water circulation and upwelling of the channel are complex and highly dynamic with the mixing of major currents coming from opposite directions and colliding

in a transition zone around the northern Channel Islands. This creates ideal conditions for plant and animal life in the area. The area was declared one of 10 World Whale Heritage Sites for its incredible diversity of marine mammals including at least seventeen species of cetaceans who callthechannel home or migrate through its rich and productive waters. Aquaculture operations could create conditions where whales can get entangled and trapped in gear further endangering current dwindling populations. It would alter paths of migration and access to Biological Significant Areas for feeding, further endangering marine mammal populations. Gray whales travelling through to their breeding ground are already stressed from diminish food supplies in northern waters. Requiringthem to alter their migration patterns to avoid these aquaculture areas willfurther stress a dwindling population leading to the possible demise of the entire population of gray whales that live in North Pacific waters. For this reason alone A NO ACTION ALTERNATIVE SHOULD BE SELECTED.

2. **The unpredictable ocean currents and intense winds in the proposed areas could lead to massive polluting effects on the channel thereby affecting localpopulations of fish and other wildlife both negatively affecting the localeconomy of the area both in fishing and ecotourism. Increased fertilizer, nonlocalfood supplies and antibiotics necessary to maintain these proposed aquaculture activities can damage the balance of the entire marine ecosystem of the area and may in turn affect populations globally.** The Santa Barbara Channel is affected by gale force winds, which may negatively impact any proposed aquaculture ventures, as well as lead to lack of containment of foreign marine stocks brought into the area for aquacultural production. This could disrupt the entire marine ecosystem causing major declines in the health and numbers of native fish, crustaceans and shellfish negatively impacting the localfishery and entire ecosystem. This could in turn have a negative impact on the marine mammals in the channel. The potential for contaminants from these proposed operations including external inputs offertilizer, antibiotics and other compounds willdisrupt the balance of the marine ecosystem that could lead to destruction of naturalfood webs and negatively affect productive fishery and recreational activities in the channel. NOAA's own website notes" Maintaining healthy fish populations is vitalto our nation's economy-important for commercial and recreational use, integral to our coastal communities, and providing healthy sources of protein" (https://www.fisheries.noaa.gov/find-species). Such aquacultural activities willthreaten the fragile marine ecosystem of the area. Artificial inputs to this fragile ecosystem can lead to significant negative impacts on all life in the channel. There is an abundance of scientific literature that address additional nonlocal inputs to natural environment and the often-tragic effects they have on localnative populations. NOAA has scientists that know this, have study it and have published on it. Surely you can use the expertise in your own agency to discourage this activity and support a NO ACTION alternative.

3 **The location of the proposed areas are** in **direct conflict with areas of previous DDT contamination and any disturbance to the sea floor with anchoring devices to allow for**

aquaculture could stir up contaminants and lead to massive longterm destruction of the oceanic food webs also negatively impacting the natural productivity and health of the channel Southern California Bight which could lead to massive die offs of wildlife populations and also contamination of the commercial fisheries products harvested in the area. This could endanger the health and well-being of the public as wellas the economy of the Southern California area. Please don't let history repeat itself, the disastrous affects of the dumping of DDT in the area 50 years ago destroyed countless populations of fish, seabirds, and other marine organisms. The extant of the contamination is stillnot completely known and stirring up these contaminants withthe construction of aquacultural operations can lead to further destruction of an already fragile and stillrecovering ecosystem. Any proposed activity that has the potential to impact the sea floor in anyway should not be considered. A NO ACTION alternative is the best solution.

I urge the use of the precautionary principle in this endeavor "if a product, an action or a policy has a suspected risk of causing harm to the public or to the environment, protective action should be supported before there is complete scientific proof of a risk" (Olsen and Motarjemi, 2014). The potential for catastrophic declines in the current populations of marine mammals, fish and other wildlife, due to the addition of structural components that willimpede marine mammal travelfor feeding and breeding, exotic inputs to the fragile marine ecosystem and the potentialfor disturbing settled contaminant that could affect the health of dictates a NO ACTION decision on this EIS. For the health of the channel, the marine sanctuaries, the two national parks and the health and welfare of our local community. I urge you to drop these areas from consideration for aquacultural operations. The potential for catastrophe far outweighs the potential of an insignificant economic gain for a very few. I believe a thorough risk benefit analysis that included the threats to marine mammals, wildlife, localfish and shellfish stocks, ecotourism, and localfisheries as well as the physical and mental health of the local community would recommend a decision of NO ACTION.

Thank you for your time.

Sincerely,



Barbara A. Holzman. PhD
drbarbarah@gmail.com

Submitted Via: Email **Submitter Name/Organization:** Renee Angwin - Program Manager, Aquaculture ; Jason Giffen - Vice President, Planning and Environment, Port of San Diego

February 20, 2025

National Marine Fisheries Service West Coast Region
Attn: Celia Barroso, Regional Aquaculture Coordinator, California 501 W. Ocean Blvd., Ste. 4200
Long Beach, CA 90802

Subject: Comments on NOAA-NMFS-2022-0051
Dear Ms. Barroso,

The San Diego Unified Port District (District) is pleased to take this opportunity to provide feedback during the public comment period when the National Oceanic and Atmospheric Administration (NOAA) is preparing a Draft Programmatic Environmental Impact Statement (DPEIS) to analyze the potential environmental impacts that could result from identifying Aquaculture Opportunity Areas (AOAs) in federal waters off of Southern California.

The District is a public corporation and regional government entity created in 1962 through the California State Legislature's adoption of the San Diego Unified Port District Act (Port Act). Through the Port Act, the District was granted the state tidelands and submerged lands around San Diego Bay and is entrusted to manage the diverse waterfront uses on these lands in a manner that is consistent with the Public Trust Doctrine, promoting and balancing navigation, commerce, fisheries, and recreation, as well as aligning with its mission to enhance and protect the environment.

Growing Opportunities for Aquaculture in Southern California

Aquaculture is a growing opportunity for new environmental and economic business development in Southern California. This opportunity is being driven nationally by the need to support the development of a sustainable domestic marine aquaculture industry. Currently, 65% of the seafood that Americans consume is imported, half of which is already produced from aquaculture.

- In economic terms, this has contributed to over $20.3 billion in trade deficit in 2023, affecting the economic health of the United States. California supports the fifth largest economy in the world, which can and should be bolstered by supporting sustainable fisheries as well as the development of a sustainable, domestic marine aquaculture industry.
- In sustainability terms, the carbon footprint or energy used to import seafood from other counties far exceeds the energy required to harvest and deliver seafood in and to U.S. seafood markets. In California alone, the current demand for seafood is the highest in the Nation at approximately 25% of total U.S. imports, exceeding 280,000 metric tons annually. This represents an opportunity for nearly $5 billion in total economic benefit if California could harvest this through sustainable fisheries and aquaculture and reduce its dependence on imports.

Subject: Comments on NOAA-NMFS-2022-0051

While there is a clear food production component to this demand, aquaculture also offers multiple co-benefits, such as products for non-consumptive uses, fisheries enhancement, ecosystem restoration, bioremediation, carbon sequestration, mitigation banking, habitat enhancement and otherwise improving water quality and ecosystem productivity.

Moving Forward Together

Aquaculture at the District is not just a vision, but a present reality. Through the establishment of the Aquaculture & Blue Technology Department and its Blue Economy Incubator, the District has broadened this exploration by partnering with successful early-stage companies and the scientific community to inform the future of shellfish and seaweed cultivation in and around San Diego Bay. Additionally, the District also partnered with NOAA's National Ocean Service, National Centers for Coastal Ocean Sciences, to conduct a constraints and opportunities analysis, as well as an aquaculture interaction with sensitive habitats analysis, with a focus on shellfish and seaweed. This effort directly informed the development of the Shellfish and Seaweed Aquaculture Program (SSAP), identifying nearly 1,200 acres at three in-water sites in and around San Diego Bay to be analyzed through an upcoming Programmatic Environmental Impact Report (PEIR) process. This effort will provide a programmatic framework for the District to guide and approve future shellfish and seaweed activities, streamline the permitting pathway, reduce the barriers to entry for operators, and further support the growth of the regional blue economy.

The District strongly supports an in-depth scientific and programmatic approach to identifying Federal AOAs and evaluating the impacts of siting aquaculture in those locations as part of the PEIS process. This is a key ingredient of a solid long-term planning effort and sets a foundation for progress that will promote sustainable aquaculture practices and advance the blue economy of the Southern California region. Ocean planning is the groundwork needed for successful aquaculture development and demonstrates the value of dialogue and data in informing sound policy decisions.

The District is committed to supporting sustainable aquaculture development to benefit California and the Nation and will continue our cross-governmental collaboration efforts with NOAA. We look forward to future cooperation on research, development, assessment, and implementation of new strategies and technologies to advance marine aquaculture in our state. If you have any questions, please do not hesitate to contact Paula Sylvia at (619) 686-6491 or via email at psylvia@portofsandiego.org, or myself at (619) 686-6473 or via email at jgiffen@portosandiego.org.

Sincerely,

Jason Giffen
Vice President, Planning & Environment

Submitted Via: Email **Submitter Name/Organization:** Alan Alward, Frank Emerson, Co-Chairs Alliance for Communities of Sustainable Fisheries (ACSF)

Alliance of Communities for Sustainable Fisheries
256 Figueroa Street #1, Monterey, CA 93940
(831) 239-1219
www.alliancefisheries.org

February 19, 2025

Ms Celia Barroso

RAC-CA NMFS West

Sent electronically to: socalaoa.wcr@noaa.gov

RE: Comments on the Aquaculture Opportunity Areas Draft Programmatic Environmental Impact Statement; **Qualified Support of Alternative 4a.**

Dear Ms Barroso and Interested Parties,

Who we are.

The Alliance of Communities for Sustainable Fisheries (ACSF) is a 24-year-old 501(c)(3) not-for-profit educational organization, founded for the purposes of connecting fishermen with their communities, and to represent fishing interests in state and federal processes. The ACSF is a regional organization, with commercial fishing leader representatives from Monterey, Moss Landing, Santa Cruz, Morro Bay, Santa Barbara, and Pillar Point harbors, and Port San Luis, on our Board of Directors. Port communities, several recreational fishing organizations, and the California Wetfish Producers Association also have representatives on our board. Thus, the ACSF represents a large cross-section of fishing and community interests for the Central Coast of California.

Please accept the following comments on the Draft Programmatic Environmental Statement (DPEIS) for Aquaculture Opportunity Areas (AOA) offshore Santa Barbara and Ventura counties.

General Comments

<u>Lack of consultation with fishermen who have utilized this ocean space for generations.</u>

The NOS-developed Atlas is a peer-reviewed science product that claims to have been vetted by a panel of experts. However, as documented in a July, 2022 Pacific Fishery Management Council (PFMC) letter, numerous errors are made, including mis-using location monitoring data sets. Even more perplexing is that we can find no Santa Barbara and Ventura area fishermen who were consulted to ground truth the proposed areas of least conflict. To quote the PFMC letter:

"This above results in less confidence in the analysis provided in terms of potential impacts to fisheries and fishing communities. As such, we recommend NOAA engage with the local commercial and recreational fishing industries in an effort to validate and correct the datasets provided in the Atlas and used in the Area identification process."

The ACSF believes that the eight northern region aquaculture sites must be put on hold until NOAA consults with the regional fishing industry. If corrections to the Atlas are not made, at minimum NOAA should consult with local fishermen to obtain finer-scale information about the proposed Selected Site Options and alternative locations.

The AOAs must not be used for finfish aquaculture.

The ACSF strongly believes that finfish offshore aquaculture has no place offshore of California.

Offshore finfish aquaculture can pose environmental and socio-economic risks, including but not limited to: impacts to wild fish tocks; fish escapes; spread of diseases, viruses, and parasites; pharmaceutical use such as antibiotics; untreated discharge of industrial wastewater; interactions with, and impacts on, marine wildlife; and siting issues that can affect vulnerable marine ecosystems and interrupt competing ocean uses. We do not believe that all or even most of these harms can be mitigated through best management practices.

Second, finfish aquaculture has the potential to seriously upend the social, cultural, and economic fabric of wild-capture fisheries and the communities that depend upon and identify with these historic fisheries. Finfish aquaculurists would not develop these businesses if they did not believe that their products will have a competitive advantage over wild-captured seafood. This will, of course, gut the value of wild capture products.

Perhaps even more disturbing is the question: Why is the US government and NOAA seeking to advance finfish aquaculture instead of enabling its existing fisheries to harvest greater percentages of the total allowable catch (to OY) of many west coast species? The groundfish fishery, for example, has left close to thirty million pounds of fish unharvested each year since the ITQ system was adopted. The ACSF respectfully submits that NOAA would be more helpful to fishermen and US citizens if it put more effort into enabling more fish to be harvested responsibly and fisheries to be successful. West coast fisheries do not have an overfishing problem, but many do have an underutilization problem.

Shellfish and seaweed grow-areas. The ACSF is supportive of these types of mariculture, provided they are located in areas of little fishing activity. As stated above, there has been no consultation by NOS/NMFS on the best locations for these operations with local fishermen. Presuming shellfish and seaweed grow areas need bottom anchors, they should not be located in sensitive habitats, such as EHF Conservation areas or Habitat Areas of Particular Concern.

Compensation-mitigation. In the event that for-profit mariculture and/or aquaculture companies displace fishermen from productive fishing grounds, those companies should compensate fishermen by annual payments into a regional "fisheries resiliency fund". Currently, California's Coastal Commission is working on issues created by the offshore wind industries' displacement of fishermen. There is a public process (called the "7c Working Group") that is identifying a socioeconomic methodology to identify the level of compensation. Resiliency funds are a big part of this process, and NMFS should look to that process for guidance should aquaculture projects displace fishermen from productive grounds. The DPEIS is silent about compensation as a mitigation.

Thank you for considering comments from the Alliance of Communities for Sustainable Fisheries. **To reiterate, the ACSF supports Alternative 4a, with qualifications, and will vigorously oppose any alternative that includes offshore finfish aquaculture.**

Alan Alward

Co-Chair

Frank Emerson

Co-Chair

CC

California Coastal Commission

Submitted Via: Email **Submitter Name/Organization:** Michael Rust, PhD, Senior Research Fellow, Hubbs Seaworld Research Institute

February 20, 2025

Celia Barroso
Regional Aquaculture Coordinator, California
National Marine Fisheries Service
West Coast Region
501 W. Ocean Blvd., Ste. 4200
Long Beach, CA 90802

Sent by email to: socalaoa.wcr@noaa.gov

I suggest that NOAA identify all 10 AOS options as AOA's for all kinds of aquaculture (option 4 b plus). The EO called out developing 10 AOAs for all industry types - not just shellfish and seaweeds. This PEIS would satisfy the original EO.

As next steps, NOAA should consider doing baseline environmental surveys of all 10 AOS options. Then NOAA could undertake cumulative impact modelling studies using more realistic data to identify what environmental, economic and social issues could be first limiting using the following alternatives:1) no farms in the AOA, 2) maximum levels of finfish (assume yellowtail) farms only in the AOAs, 3) maximum levels of shellfish (assume mussels) only in the AOAs, 4) maximum levels of seaweed (assume Kelp) only in the AOAs, and 5) a balanced IMTA mix of finfish (10-15%), Shellfish (30-40%) and Kelp (50-60%) managed at the basin scale rather than at the farm scale. This would provide an upper estimate of potential impacts, highlighting those areas that are unlikely to be significant so that those that remain could be addressed by proponents in EISs at the project level. NOAA and permitting agencies could then begin to consider mitigation options that would be realistic given the maximum potential size of an industry. Basically, start with the maximum estimate of possible cumulative impacts and then determine at what point in industry growth will mitigation be necessary. Having that done upfront will give the agencies leverage and provide justified permit conditions to first adopters as the industry grows.

The last option above, a balanced basin scale IMTA would approximate a no net increase or decrease in nutrients or oxygen but adds complexity so that option may warrant more work. To illustrate I did some back of the envelop calculations assuming 1000 acres of surface growing area would be available in the 16,500 acres of AOS bottom area. The 16:1 bottom area to surface area considers scope for anchoring and space between cages/longlines however I did not attempt to determine if this ratio was appropriate in the specific AOSs for any farm. If the species mix was yellowtail, mussels and kelp, NOAA could estimate the maximum production to use in it's models to predict environmental impacts, carbon sequestration, economic data, habitat created, risks of escapes and so on. It would allow industry projects to use data to scale for their EIS's in the future.

Component	**Stocking Density per Acre**	**Total Production (1,000 Acres)**
Seriola (Yellowtail)	20-40 tons per acre	20,000 - 40,000 tons
Mussels	50-100 tons per acre	50,000 - 100,000 tons
Sugar Kelp	100-200 tons per acre	100,000 - 200,000 tons

Market Value from a balanced IMTA could be:
Yellowtail Market Value: $10–$20 per kg → $200M - $800M revenue
Mussel Market Value: $2–$5 per kg → $100M - $500M revenue
Kelp Market Value: Market Value: $1–$5 per kg → $100M - $1B revenue
That is a $500M-$2B/yr industry with a somewhat balanced nutrient impact.

FAD effect is not the correct concept. FADs just aggregated fish making them easy to catch and are often seasonal in nature, artificial reefs are designed to enhance or create habitat and are more permanent. FADs do not increase fish populations while well-functioning artificial reefs do (see the large volume of work by Milton Love and NOAA, for example (https://www.pnas.org/doi/10.1073/pnas.1411477111). Aquaculture structures are somewhere between these two types of structures having connections between surface and bottom structures and being more permanent than a FAD. There are ample studies showing that aquaculture farms of all types function as habitat and serve as a source of nutrition for wild stocks. Finfish, shellfish and seaweeds would all have different levels of habitat value depending on if you were evaluating protection, provisioning, reproduction or some other aspect of habitat value. We might predict that the IMTA model would provide the most complex habitats which may or may not have value. A better concept than FAD effect would be habitat value. This would also make the PEIS more useful for project specific EISs if there was an estimate for the various components

Climate effect – The DPEIS mentions that the climate impact could be positive or negative depending on the option, however having more life in the sea can only have a positive impact. This is argued in NOAA's and the NSF's recent reports[1] on ocean-based carbon sequestration. Both documents argue the restoring more biomass to the ocean (including animals) will increase blue carbon deposition. This is as true for farmed blue carbon as well as wild blue carbon. Certainly, much more data is available for seaweeds and carbon, but expansion of the mass balance models for shellfish and finfish would also show carbon sequestration unless we have found a way around the law of conservation of mass.

Thank you for the opportunity to comment.

Michael Rust, PhD.

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[1] National Academies of Sciences, Engineering, and Medicine. 2022. *A Research Strategy for Ocean-based Carbon Dioxide Removal and Sequestration*. Washington, DC: The National Academies Press. https://doi.org/10.17226/26278.

Cross, J.N., Sweeney, C., Jewett, E.B., Feely, R.A., McElhany, P., Carter, B., Stein, T., Kitch, G.D., and Gledhill, D.K., 2023. Strategy for NOAA Carbon Dioxide Removal Research: A white paper documenting a potential NOAA CDR Science Strategy as an element of NOAA's Climate Interventions Portfolio. NOAA Special Report. NOAA, Washington DC. DOI: 10.25923/gzke-8730

Comment ID Number: E-20250220-06
Submitted Via: Email **Submitter Name/Organization:** Glen Spain - NW Reg. Director, General Legal Counsel of PCFFA, IFR. Chris Voss - President, CFSB, Board Member of PCFFA and IFR

Pacific Coast Federation of Fishermen's Associations (PCFFA)
and Institute for Fisheries Resources (IFR)
NW Regional Office
PO Box 11170, Eugene, OR 97440-3370
Phone: (541)689-2000 Response Email: fish1ifr@aol.com

Celia Barroso
Regional Aquaculture Coordinator, California
National Marine Fisheries Service West Coast Region
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socalaoa.wcr@noaa.gov

20 February 2025
Sent Via Email

Comments on: *Draft Programmatic Environmental Impact Statement (DPEIS) for the Identification of Aquaculture Opportunity Areas (AOAs) in Federal Waters of Southern California*

To the Comment Coordinator:

These are the written comments of our two organizations, for the record on this NEPA process.

There are multiple concerns about siting industrial-scale aquaculture operation in the identified Aquaculture Opportunity Areas (AOAs) off the southern California coastline, which are also some of the finest and most productive ocean commercial fishing grounds in the region.

Those concerns were raised and enumerated in detail in a *Declaration of Mr. Christopher Voss*, who is the President of the Commercial Fishermen of Santa Barbara (CFSB) and a long-time Board member of PCFFA and IFR, filed in the case *Don't Cage Our Oceans, et al. vs. U.S. Army Corps of Engineers, et al.* (U.S. Dist. Court of the Western District of Washington State (Seattle), Case No 2:22-cv-01627-KKE) in which both PCFFA and IFR are co-Plaintiffs. This was a successful case challenging the legality and sufficiency of the Corps Nationwide Permit No. 56 (Aquaculture), which is a case still ongoing.

Comment ID Number: E-20250220-06

PCFFA-IFR Comments
DPEIS AOAs Siting
20 February 2025

Mr. Voss's Declaration is attached as our comments, detailing those concerns. Our two organizations reiterate his concerns as raised in that Declaration, as they are concerns which you should fully address in this NEPA process.

Thanks for the opportunity to comment.

Sincerely,

Glen H. Spain, J.D.
NW Regional Director and
General Legal Counsel
For PCFFA and IFR

Attached Declaration of Christopher Voss

UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON AT SEATTLE

DON'T CAGE OUR OCEANS, *et al.*,

Plaintiffs,

vs.

U.S. ARMY CORPS OF ENGINEERS, *et al.*,

Defendants.

Case No. 2:22-cv-01627-KKE

DECLARATION OF CHRISTOPHER VOSS IN SUPPORT OF PLAINTIFFS' MOTION FOR SUMMARY JUDGMEN

DECLARATION OF CHRISTOPHER VOSS

I, Christopher Voss, declare that if called as a witness in this action I would competently testify of my own personal knowledge as follows:

1. My name is Christopher John Voss. I am 62 years old and I live in Santa Barbara, California, and am a commercial fisherman and owner/operator of the California fishing vessel *F/V Bella B*. It's a 32-foot lobster fishing vessel originally from the East Coast. I have been a commercial fisherman, and in particular fishing and working the waters near my home port of Santa Barbara, for nearly all of my adult life.

2. I was born in Santa Barbara and started commercial fishing as a deckhand in Santa Barbara waters at age 17. I attended and graduated from the University of California at Santa Barbara in 1984 with an undergraduate degree in aquatic biology. After graduation and working locally in the trades for a year, I fully committed to making my living from commercial fishing. I bought a hull from the East Coast and finished it off to trap and dive. I began trapping lobsters and crabs and diving for sea urchin in 1988. I then was awarded an abalone permit and dived locally for abalone until that fishery closed in 1997.

3. I married in 1983 and raised my family in Santa Barbara. In order to succeed as a fisherman it is wise to participate in as many fisheries as possible. Starting in 1988, I went to Bristol Bay Alaska to drift gillnet salmon every summer until 2015, when I turned that operation over to my son. I also had a half interest in a trawler that I fished for shrimp and cucumbers out of Santa Barbara in the late 1990's and early 2000's. In all, I have engaged in trap fisheries (mostly for lobster), trawl fisheries, drift gillnet fisheries and dive fisheries in and around Santa Barbara and Alaska. As a result I know firsthand the problems participants in each of these fisheries face. Since I have turned my Alaska operation and my lobster permit over to my son I have more time to represent the fishing industry on issues that threaten us all.

4. I have been President of the Commercial Fishermen of Santa Barbara (CFSB), our local commercial fishing port association, for nine years now. CFSB is one of many member

associations which make up the Pacific Coast Federation of Fishermen's Associations (PCFFA), one of the Plaintiffs in this case, and as President of CFSB either I, or a designated Representative of CFSB (usually our Executive Director), hold down a CFSB-designated seat on the Board of Directors of both PCFFA and IFR, which have overlapping Boards of Directors.

5. CFSB is a separate nonprofit IRC 501(c)(3) organization incorporated in the State of California that has been in existence since 1971 (some 52 years), and which represents the interests of all the individual participants and commercial fishing permit owners who fish in each of the different commercial ocean fisheries that work out of the Port of Santa Barbara. This would include fishing boats in all six major gear-type fisheries: bottom-trawl; long-line; trap fisheries (e.g., lobster or rock crab); dive fisheries (e.g., abalone or sea cucumber); set gill-net, and drift gill-net fisheries.

6. The CFSB seven-member Board of Directors is structured to include representatives or participants from each of these six types of local Santa Barbara fisheries. This way CFSB as an organization has an awareness of the issues that our members in each of these fisheries face individually, and we try to help them with those issues, but CFSB as an organization also pursues broader and bigger issues and interests that affect all Santa Barbara fishermen collectively.

7. One of those "bigger issues" that will affect all of our fishing interests in our port is the current effort to develop large areas of the waters near the Port of Santa Barbara for industrial-scale ocean aquaculture. Creating industrial-scale aquaculture operations off Santa Barbara is provided for under the U.S. Army Corps of Engineers Nationwide Permit (NWP) No. 56. This is why CFSB, as both a PCFFA and IFR voting member association, supports the current PCFFA and IFR effort to challenge the legality of Nationwide Permit (NWP) No. 56.

8. Based on my broad experience in all of these Santa Barbara-area ocean fisheries, I believe that the current proposal, as being implemented under NWP No. 56 to establish industrial-scale finfish and other aquaculture operations in "Aquaculture Opportunity Areas (AOA)" in and around the waters of Santa Barbara, could directly harm myself, my family, the Commercial

Fishermen of Santa Barbara (CFSB) and other participants in commercial ocean fisheries in and around Santa Barbara in a number of ways.

9. Two types of industrial-scale aquaculture operations are being proposed for these AOA areas: algal/bi-valve aquaculture and finfish aquaculture. While our concerns are primarily around finfish aquaculture impacts on wild ocean fisheries, there are potential negative impacts from both types of aquaculture that greatly concern CFSB members, including myself. These include, but are not limited to, the following concerns:

A. Overwhelming Local Seafood Markets: As we have seen in the past with farm-raised salmon, farm-fish products can be dumped on local seafood markets in ways that crush those markets, driving the processor (*ex-vessel*) prices they pay to fishermen for their local wild-catch seafood way down even to the point where it becomes impossible for wild-catch ocean fishermen to make a living. I saw this happen in our west coast salmon markets in the 2000's with the dumping of large volumes of farm-raised salmon from Norway and Chile on our markets, crushing *ex-vessel* prices. This is why I supported efforts in the U.S. to require seafood labeling laws so consumers could distinguish between wild-caught and farm-raised salmon in the marketplace. That problem could easily happen again with an influx of large volumes of farm-raised finfish from these operations on local markets.

B. Aquaculture Operations are Major Pollution Sources: Industrial-scale aquaculture operations can create huge nitrogen loads (like confined animal feedlots on land), especially in closed bays like the fjords of Norway, Chile and New Zealand, and there have been damaging environmental problems from pollution coming from these ocean net-pen operations in many places. Nitrate-driven eutrophication of estuaries is a concern already in many harbors. The food for these net-pen operations has to come from somewhere and it has to go somewhere. Serious negative environmental impacts on local water quality from nitrogen-rich plumes from these kinds of aquaculture operations can occur.

C. Spread of Parasites and Diseases to Wild Fish Stocks: Another problem common to open-ocean farm-fish operations is the spread of parasites and diseases from confined net-pen fish to passing wild fish populations migrating through. This is particularly true for salmon, which migrate widely. The concentration of so many fish inside net pens means that both diseases and parasites can become epidemic in that population – which is why so many of these operations have to rely on chemical disinfectants and multiple vaccinations to try to limit these kinds of outbreaks. Transmission of diseases from net-penned, farm-raised salmon to wild salmon migrating though is thought to be a real concern. In British Columbia, open-ocean salmon net-pen systems are believed to encourage the spread of sea lice and fish viruses to wild stocks. This is why many of those open ocean net-pen operations are now being closed down by the Canadian government, with similar closures in the State of Washington.

D. Spatial Exclusions and Fishing Grounds Compactions: Proposed industrial-scale aquaculture operations will also have a large spatial "footprint" that will require excluding commercial fishing boats, further limiting the areas our people have access to for fishing. Commercial fishing activity will necessarily be further excluded from those AOA's as these operations grow in size and area. Multiple impacts from being driven out of traditional fishing grounds could have serious consequences. For instance, not only will our boats be excluded from AOA's but fishing efforts regionally will become more "compacted" in fewer remaining fishable areas, which could have many negative impacts, including leading to over-utilization of key habitat areas (and thus more closures), plus more boats fishing on top of each other, increasing competition among fishing boat owners for ever more limited fishing grounds. At some point, some boat operations may be squeezed out of business entirely, simply as a result of having to fish in more constricted and more heavily fished (and thus less productive) areas.

In the case of bi-valve and algal aquaculture operations, these types of aquaculture operations would take up an even larger "footprint" than finfish operations, making competition for the remaining fishing grounds that much more of a concern. This is particularly true in the Ventura Flats ocean area, which is a shallower area near Santa Barbara harbor traditionally one of that port's most productive fishing areas, but this area is now being considered as a site for many 1,000s of acres of commercial algal aquaculture.

With the combined impacts of MPA exclusions, transportation lane exclusions, likely offshore wind energy areas and a number of habitat areas already off-limits to commercial fishing, there is less and less area allocated to commercial fishing every year. The loss of traditional fishing grounds from the "cumulative impacts" of all these closures, plus even more new restrictions likely within AOA's, is of great concern to me and our fishermen.

E. Additional Navigational Challenges: Avoidance of areas in the AOA's will also present additional navigational challenges to the commercial fishing fleet, especially in rough weather. This challenge is also complicated by the fact that the kind of open-ocean net pens that finfish aquaculture typically uses are not always stable in rough weather, and have been known to break off and drift away from anchor points in pieces.

F. Bottom Debris and Other Pollution Problems: Historically, industrial-scale aquaculture operations have left behind debris and multiple pollution problems once they are moved or decommissioned. Our concern is that these operations will also leave these sorts of problems behind them, more or less permanently polluting our fisheries. The issue of the massive, highly polluted shell mounds which developed around existing offshore oil rigs shows what can happen, unless there are enforceable guarantees that the ocean bottom areas these operations occupy will be cleaned up after these operations leave the area.

G. Escapes from Open-Ocean Net Pens and Other Aquaculture Facilities: Our industry, and our CFSB members, are also very concerned about the potential negative ecological impacts that could occur from fish that escape open-ocean net pens. Such escapes are widespread, almost inevitable – in spite of multiple industry assurances that this will not happen. These escaped farm-fish then become by definition "invasive species" which compete with local stocks unless they are bred entirely from local species. Even with the use of only local species, there are still serious concerns about genetically modified fish (which are being bred more and more for aquaculture uses) being introduced into local gene pools, where they may interbreed and create a kind of persistent "genetic pollution" that could have multiple negative long-term effects on natural wild population's genetic fitness, essentially forever. But if the aquaculture operation uses only local species as their production base, then the sale of those farmed fish into local markets can still crush the local production of those same wild stocks, throwing our wild fish harvesters out of work.

H. Whale and Other Marine Life Entanglements: Many of our traditional ocean fisheries are being preemptively closed down or greatly restricted, in many places, in order to prevent endangered whale, marine mammal and loggerhead sea turtles from becoming entangled in fishing gear. Yet similar entanglement problems are also likely within proposed industrial-scale aquaculture operations. Any marine animal population decreases, particularly among Endangered Species Act (ESA)-listed species, from aquaculture operations greatly concerns our fishing fleet as it just increases the likelihood of further compensating restrictions being put on our fisheries, such as the California Dungeness crab fishery. Travel of maintenance vessels to and from the aquaculture operations themselves, plus potential increased concentration of ships in existing shipping lanes necessary to avoid these new AOA barriers, will also likely increase the likelihood of marine mammal ship strikes, which are already a well-known major source of marine mammal (particularly whale) mortalities.

I. Impacts from Aquaculture Site Surveys and Construction are Unknown: Aquaculture facilities will have to be placed where they can firmly anchor on the seabed, which means geological (probably acoustic, explosion-type) sonic site surveys will have to be made, and these surveys will likely have adverse impacts on fish populations (sonic surveys can kill or deafen many species of fish as well as marine mammals). There will also be impacts on local fish populations from the actual facilities' construction, again from loud noises creating pressure waves that can be conducted far distances underwater. We have concerns about all these impacts on our fish populations and fisheries, but none of these impacts have been well studied nor considered to date in any detail.

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10. I, along with SFSB member, are particularly concerned about any proposals for halibut and yellowtail species aquaculture farming proposals, as there is an active and profitable fishery for both of these species locally. And if aquaculture operators are going to attempt raising salmon in the offshore environment, that too is an issue of great concern to us. Additionally, we are concerned about the impacts of aquaculture on the following fisheries: rock crab, lobster, ridgeback shrimp, sea cucumber and white sea bass. Most of these species occur in abundance on the Ventura Flat shelf and in the AOA areas designated, and if any of our boats were excluded from these highly abundant fisheries, this would result in a great loss to our port and its economic survival.

11. Personally, I am concerned that future restrictions on local Santa Barbara fisheries will directlyaffect the value of my family's fishing permits and directly cut into our family's future income, particularly for my son and daughter. My daughter is in the seafood distribution industry, and my son currently fishes for lobster in the Channel Islands area. Both of their livelihoods could be negatively affected by both local Santa Barbara reductions in fisheries production, plus increased competition in remaining fisheries areas that could occur as a direct result of fishing boat exclusions from areas proposed for future aquaculture operations.

12. Additionally, as CFSB President I must now spend a great deal of time and effort trying to master these complex issues as well as work to prevent potentially catastrophic impacts on my port and CFSB's individual fishing family members. As CFSB President I have been directly engaged in these issues for at least three years, since the AOA designation proposal was first made public in summer of 2020. As a voting member association of both PCFFA and IFR, CFSB has taken a leading role in educating both PCFFA and IFR, and through those organizations the rest of the west coast commercial fishing industry, regarding these issues and potential problems.

13. It also concerns CFSB (and myself personally) that, as I am informed, the U. S. Army Corps of Engineers (USACE) did not consult with the National Marine Fisheries Service ("NMFS," also known as "NOAA Fisheries") as required under ESA Section 7 on the likely impacts of NWP No. 56 and the consequent likely construction of major, industrial-scale aquaculture operations, on ESA-listed marine species in and migrating through these AOA areas, nor on identifying potential mitigation measures that could minimize or avoid those impacts. This could put multiple ESA-listed marine species at further risk, which would likely result in further restrictions of our fisheries, harming my interests in commercial fishing, as well as the interests of CFBA members. All west coast fisheries are required to be structured so as to minimize impacts on ESA-listed marine species, insofar as our own operations may affect these protected species. But if other marine industries – such as industrial-scale commercial aquaculture – are not similarly regulated under the ESA, the burden of protecting those federally protected species falls unfairly on us and our fleet.

14. Both PCFFA and IFR have previously brought suit against the U.S. FDA over the issue of potential adverse impacts on west coast wild salmon fisheries that may result from FDA approving use of GE salmon in west coast aquaculture operations. That action was *Institute for Fisheries Resources, et al., vs. Alex M. Azar II, et al.,* US Dist. Ct., N. Cal. Case No. 3:16-cv-01574-VC. Both organizations thus have a long history of involvement in offshore aquaculture permitting issues generally, of which this present case is just yet another example.

Christopher Voss

15. In summary, NWP No. 56 opens the door to poorly regulated offshore finfish and other aquaculture facilities that could have devastating consequences for my livelihood, my families' livelihoods and the livelihoods of our CFSB members, as well as the futureeconomic viabilityof ow- local fishing port. A favorable resolution of this case resulting in the*vacatur* of NWP No. 56 would protect the interests of PCFFA, IFR, their member associations such asCFSB, my professional and economic interests, and the interests of many hundreds of fishing-dependent coastal families these organizations represent.

II

II

I declare under penalty of perjury that the foregoing is true and correct.

Executed on November 7, 2023, in Santa Barbara, California:

Christopher Voss

Submitted Via: Email **Submitter Name/Organization:** Kaira Wallace, Regulatory and Community Engagement Associate, Ocean Rainforest

Ocean Rainforest Inc.
6710 Navigator Way
Goleta, CA 93117
kaira@oceanrainforest.com
February 20, 2025

Re: Draft Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal Waters off of Southern California

Submitted via email to socalaoa.wcr@noaa.gov

To Whom It May Concern,

Thank you for the opportunity to comment on NOAA's Draft Programmatic Environmental Impact Statement (PEIS) for the Southern California Aquaculture Opportunity Areas (AOA). I am writing on behalf of Ocean Rainforest Inc. as the Regulatory and Community Engagement Associate. Ocean Rainforest, a seaweed cultivation company based in Santa Barbara, owns and operates an 86-acre demonstration seaweed farm in federal waters of the Santa Barbara Channel.

We recently submitted a commercial permit application to the U.S. Army Corps of Engineers (USACE) for the cultivation of Giant kelp (Macrocystis pyrifera) within the 2,000-acre N2-D AOA (USACE 2024). To our knowledge, we are the first and only applicants proposing to use an identified AOA and therefore have the unique opportunity to set a precedent for future AOA applicants and to utilize this PEIS for our own environmental review. We view this document as a potential starting point from which we could "tier off" by incorporating project-specific NEPA analysis. Given the relevance of this PEIS to our work and permit application, Ocean Rainforest is uniquely positioned to provide meaningful input.

The following comments offer additional insights to enhance this PEIS, mainly focused on sections referencing seaweed cultivation. We appreciate NOAA's efforts to reduce barriers to aquaculture through marine spatial planning (e.g., the 2020 Aquaculture Atlas) and environmental regulatory review. Our team looks forward to the final document and acknowledges NOAA's years of dedicated work in reaching this milestone.

Comments

Chapter 3, Section A, item ii: Aquaculture Management Guidance

This section lists current documents that are available to aid an individual's navigation of the federal permitting process for marine aquaculture. We suggest that the following resources be added to that list:

- 2024 Greenwave California Leasing and Permitting Guide
- 2024 National Aquaculture Development Plan

Chapter 3, Section B, item v: Air Quality and Aesthetics

Marine vessel emissions are discussed in the potential impacts section. The section states that, "Over time, it is likely technology may advance, which could reduce future emissions from vessel traffic traveling to an offshore facility (e.g. automated systems, electric motors, etc.)" (Page 97). We believe aquaculture is particularly well suited to adopting such technologies, including fleet electrification, due to the fixed distance between the harbor or port and the aquaculture site. This is in contrast to fishing vessels that may be out at sea for weeks at a time or might need to follow a desired species, not knowing the exact total distance they will travel and therefore being unable to determine if they will have sufficient electrical charge.

In the same section, emissions related to food production are discussed. It is stated that, "compared to finfish and bivalves, seaweed aquaculture generates the lowest emissions" (Page 98). It should also be noted that seaweed aquaculture could lead to further reductions in overall carbon emissions associated with its operations if the biomass is used to replace high-carbon-footprint products, such as the case for bioplastics (replacing petroleum-based plastics) or biostimulants (replacing up to 30% of conventional fertilizers) (Bullen et. al. 2024; Li et. al. 2023).

Chapter 3, Section D, item iv: Ports and Working Waterfronts

In the potential impacts for Alternative 2: Shellfish and Macroalgae, employment and fiscal impacts of seaweed and shellfish aquaculture being sited near Ventura Harbor are discussed (Page 200). It should also be noted that the Ventura Port District has entered an agreement with the Port of Hueneme to receive $16 million in grants as part of a Commercial Fish Landing Modernization Project to assist in the relocation of Port of Hueneme's commercial fishing facilities to Ventura Harbor (Two Ventura County Ports Drive Innovative Solution to Improve Trade 2024). These funds will be used to increase the offloading capacity in Ventura Harbor and update older infrastructure. Seaweed aquaculture would rely on this same offloading capacity and would benefit from these infrastructure improvements. The increased capacity at Ventura Harbor from this grant would more than suffice to support a new industry such as seaweed aquaculture. Additionally, the Ventura Port District has stated that it will, "continue to actively seek opportunities to collaborate with the aquaculture industry to establish sustainable aquaculture farms that can land product in Ventura Harbor" (Ventura Port District 2021).

Chapter 3, Section D, item viii: Public Health and Safety

In the potential impacts for Alternative 2: Shellfish and Macroalgae, seaweed is only discussed as a food product and concerns are raised about the impacts of a larger company dominating the seafood market due to the enabling of larger-scale cultivation in an AOA (Page 227). However, it should also be noted that seaweed can be used for a variety of products and is not limited to human consumption (Yong et. al. 2024). Concerns about seafood industry domination would be mitigated if the seaweed were used for non-food purposes, such as an agricultural additive, bioplastic, textile, or biofuel. The versatility of seaweed reduces the chances that it will dominate any one industry.

Chapter 3, Section E, item i: Tribal Resources and Cultural Practices

Under Alternative 2: Shellfish and Macroalgae, the importance of harvesting and using seaweed in Indigenous cultures is described. The section states, "Timing and the amount of harvest to remain a sustainable practice is an ongoing struggle between California tribes and colonized areas (Bigelow Laboratory for Ocean Sciences 2024). For example, historic and ongoing restrictions in California coastal access have shown to impact Tribes because both Tribal and non-tribal harvesters share some areas that

may be traditional areas, but do not necessarily have access to the same traditional ecological knowledge of how or desire to maintain seaweed bed/garden productivity for future generations (Bigelow Laboratory for Ocean Sciences 2024)" (Page 241).

It should be noted that if seaweed aquaculture were established in one or more of the AOAs under Alternative 2, it could reduce the pressure of commercial wild harvesting on the local kelp beds and therefore potentially reduce pressure on tribes' access to wild kelp. Japtap and Meena 2022 explain that "Wild harvesting of seaweeds from natural populations can produce various ecological and social consequences if not well managed. For this reason, seaweed farming is an alternative to provide the required amount of seaweed biomass with proper biotic and abiotic interactions".

Chapter 4, Section B, item iv: Alternative 2: Santa Barbara Channel

The section on HABs and Domoic Acid Incidents discusses the growing issue of these events in the SBC and their impacts on shellfish and finfish (Page 260). Seaweed is not mentioned in this section, but it should be included as a potential prevention/remediation for HAB events through its natural ability to absorb excess nutrients from the water.

Land-based nutrient export to the Southern California Bight has been shown to result in chemical changes in seawater acidification, O_2 loss, and impacts pelagic habitat capacity (Frieder et al. 2024). Cultivating seaweed at a significant scale has the potential to mitigate some of those impacts. Roleda and Hurd 2019 explain that "In addition to the economic value of sea-weeds, seaweed farming can have positive environmental impacts because it makes use of nutrient emissions from fish farms and other anthropogenic nitrogen and phosphorus sources that enter the ocean". Though this may be on a small, localized scale due to the relative size of a potential seaweed farm within an AOA compared to the entire SBC, it is a positive impact that should be acknowledged.

Appendix 1, Section A, item i: Oceanography and Climate

This section describes the possible mitigation options and states that pre- and post- construction monitoring could be combined with a gradual expansion of farm sites based on adaptive management frameworks (Page 378). Ocean Rainforest agrees with this concept of adaptive management and believes that the gradual phasing in of infrastructure within an AOA would be the safest and most sustainable way to operate. Importantly, this would provide the other ocean users with the ability to gradually adapt their use of the permitted area instead of immediately utilizing the full extent of the AOA. This would also allow the incorporation of any new technologies that could improve the infrastructure or monitoring methods.

Appendix 1, Section B, item i: Federally Protected Species and Habitat

In reference to Ocean Rainforest's demonstration site, this section states that "USACE and NOAA determined that, based on the state of technology and the size of the facility, remote monitoring was not practicable to reduce the risk of gear entanglement in a recent 86-acre (35 ha) kelp aquaculture project (USACE 2021). Instead, weekly monitoring of the site during the first month following installation and every two-weeks thereafter was required as part of the USACE permit conditions" (Page 381). It should be added that while remote monitoring of all infrastructure is not currently feasible with existing technology, there is potential for change in the future as new technologies are developed and made more accessible and affordable. Additionally, a GPS system is currently used on all buoys that mark the exterior of the demonstration site to assist in monitoring the infrastructure's integrity.

Comment ID Number: E-20250220-07

OCEAN RAINFOREST

Thank you for the opportunity to comment and we look forward to seeing these efforts progress. Ocean Rainforest can be reached for further comment at kaira@oceanrainforest.com or via phone at (650) 455-4558.

Kaira Wallace

Kaira Wallace

Regulatory and Community Engagement Associate

Oceanrainforest.com

Comment ID Number: E-20250220-07

OCEAN RAINFOREST

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Submitted Via: Email **Submitter Name/Organization:** Stacee Karnya - Laboratory Manager I, JoAnne Linnenbrink - Sr. Water Biologist, City of Los Angeles Sanitation and Environment

Environmental Monitoring Division
Hyperion Water Reclamation Plant
12000 Vista Del Mar
Playa Del Rey, CA 90293

February 20, 2025

Subject: Comments regarding the posted *Draft Programmatic Environmental Impact Statement (DPEIS) for the Identification of Aquaculture Opportunity Areas (AOAs) in Federal Waters of Southern California.*

The City of Los Angeles' (CLA) Sanitation & Environment (LASAN) would like to address its concerns in the DPEIS for the Aquaculture Opportunity Areas (AOAs) and the boundary lines proposed in Alternative 3: Santa Monica Channel. Chapter 2, section A of the DEPIS states that one of the parameters that determine the options of AOA includes, "…that this area has a low level of conflict with other ocean users…". The City of LA disagrees that the location of Alternative 3 is in an area with a low level of conflict with other ocean users. The location of Alternative 3 could have a high level of conflict for the LASAN as well as others that conduct ocean monitoring in the area. The proposed location is adjacent to a wastewater ocean outfall and in the vicinity of regularly monitored stations. Not only would the AOA's impact federal and state mandated monitoring research, but also the wastewater treatment actives from LASAN's Hyperion Water Reclamation Plant would have direct impact on the AOAs.

The City of Los Angeles discharges secondary treated wastewater into Santa Monica Bay from the Hyperion Water Reclamation Plant (HWRP). HWRP has two active outfalls (Figure 1): the primary 5-Mile Outfall and 1-Mile Outfall used for emergency auxiliary discharge. Due to these outfalls, LASAN's Environmental Monitoring Division (CLAEMD) is mandated to conduct a comprehensive monitoring program of the receiving waters of Santa Monica Bay (SMB), by directive of National Pollutant Discharge Elimination System (NPDES) Permit No. CA0109991, under the Waste Discharge Requirements (WDRs) contained in the current Order No. R4-2023-0033 (RWQCB 2023). The NPDES Permits are issued jointly by the California Regional Water Quality Control Board, Los Angeles Region (RWQCB), and the U.S. Environmental Protection Agency, Region IX (USEPA). The latter has co-jurisdiction due to the 5-Mile Outfall extending beyond State Waters (3-nautical-mile limit) into federal waters.

To document water and sediment quality around the HWRP outfalls at reference stations and at areas where discharge impacts might reasonably be expected, CLAEMD collect and assess vast amounts of oceanographic, bacteriological, chemical, physical, toxicological, and biological data throughout SMB. The proposed selected sites (CN1-A and CN1-B) and the alternative boundary overlap with CLAEMD's NPDES permit-mandated monitoring areas (Figure 1). The following stations are in the direct vicinity of the proposed AOA location: two trawl stations (C3 and C5A) are located right outside the northern edge of the boundary; one benthic sediment station (C5A) is located on the edge of the southeastern boundary; one water quality station (3805) is within the boundary area and potentially within CN1-A; and water quality stations 3804, 3806, 3706, 3705, and 3706 are immediately outside of the boundary. Water quality surveys are conducted four times a year. During this survey, a CTD cast is made collecting real-time profiles and discrete microbiological and ammonia samples. Epipenthic trawl surveys are conducted twice a year. The nominal coordinates of the trawl stations C3 and C5A are potentially outside the boundary, but the trawl tracks cross the boundary line. Benthic infauna surveys are conducted once a year. Our estimates of the location of the boundary lines indicate that Station C5A would be outside of the boundary, but spillover effects from the AOA could affect the sediment quality at this station.

The location of the AOA would impede CLAEMD from properly conducting NPDES monitoring. It would interfere with the ability for CLAEMD to comply with the Clean Water Act (CWA), Porter-Cologne Act, and the California Ocean Plan. Any waste and or contaminants from the installation of AOAs could impact receiving water and sediment quality at these stations and cause samples to be non-compliance, which could result in financial penalties and additional costly monitoring to LASAN. Potential containments from these AOAs could include copper and microplastics shed from net materials, use of anti-foulants or antibiotics, and nutrients from waste and excess feed. Any re-location of established stations due to restriction of collecting at current stations would require consultations, time, money, and disrupt historic references that are important indicators of environmental status and health in the region.

The AOA sites in Santa Monica will be exposed to and will be directly impacted by discharged wastewater from the HWRP's 5-Mile outfall during typical operation as well as during any potential sewage or overflow events from the outfall pipe. The proposed AOA is approximately 6 km from the terminus of the Y Structure of the 5-Mile Outfall and 5 km from the terminus of the northern leg of the Y structure. Data from the water quality monitoring confirms that the wastewater plume from the 5-Mile Outfall disperses north to northwest during various time of year. The wastewater plume typically is contained below the thermocline, but there is always the risk of the plume coming to the surface when density stratification is weak or absent. It is common for levels of fecal indicator bacteria to occasionally exceed permit limits and have detectable levels of ammonia at the water quality sites in and around the AOA boundary and (Stations 3804, 3805, 3806, 3709, 3705, and 3704). During the 2021 Hyperion Overflow incident, this area and the water quality monitoring stations were directly impacted by the 5-Mile HWRP Outfall. Currently, there is not enough research to indicate what future impact the HWRP will have on the surrounding receiving water environment when higher concentrations of brine is discharged out of the 5-Mile Outfall due to the process of increasing the amount of recycled wastewater to 100% by 2035.

For these reasons, it is LASAN's recommendation that the location of the proposed sites in Santa Monica Channel be reviewed and potentially relocated.

If you have any additional questions or would like additional information on the issues identified in this letter, please do not hesitate to contact Stacee Karyna or JoAnne Linnenbrink.

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JoAnne Linnenbrink, Sr. Water Biologist, 310-648-5845, joanne.linnenbrink@lacity.org

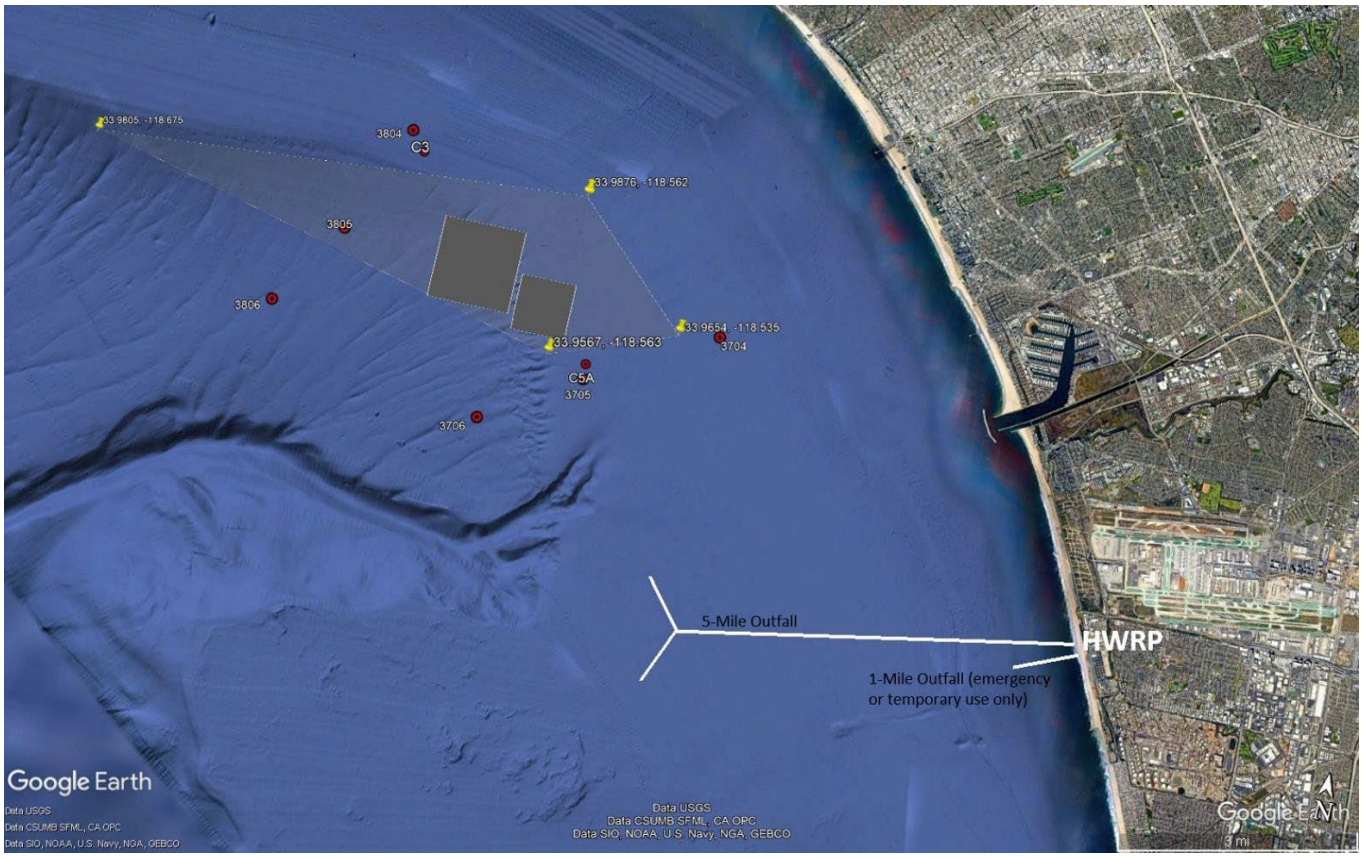


Figure 1: Location of City of Los Angeles' Sanitation and Environment's monitoring stations (red circles), and the Hyperion Water Reclamation Plant (HWRP) and its outfalls (white lines) in and/or near the proposed AOA's sites (grey boxes) and alternative boundary (shaded area between yellow thumbtacks).

Submitted Via: Email **Submitter Name/Organization:** Michael Lee - Executive Director, Tony Vaught - President, California Aquaculture Association

CALIFORNIA AQUACULTURE ASSOCIATION

February 19, 2025

Celia Barroso
Regional Aquaculture Coordinator, California

Andrew Richard
Regional Aquaculture Coordinator Southeast Regional Office

Re: Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal Waters off of Southern California
Docket Number NOAA-NMFS-2022-0051

Draft Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal Waters of the Gulf of Mexico
Docket Number NOAA-NMFS-2024-0135

Dear Ms. Barroso and Mr. Richard:

On behalf of the California Aquaculture Association (CAA)[i], please extend our appreciation to the National Marine Fisheries Service and National Ocean Service staff for their exceptional and thorough work in identifying potential offshore marine aquaculture sites in federal waters.

The effort to designate Aquaculture Opportunity Areas began with five public listening sessions and two 60-day public comment periods in late 2020. These engagements informed the release of two aquaculture atlases in late 2021—covering the Gulf of Mexico and Southern California. This process included 395 stakeholder meetings, involving 1,848 participants from diverse sectors, and analyzed between 204 and 220 data layers encompassing national security, navigation, industry, oceanographic and biological conditions, and regulatory frameworks.

In May 2022, two notices of intent were issued for a 60-day public comment period on the risks, benefits, capacity, species, and gear types, shaping draft Programmatic Environmental Impact Statements (PEIS). In November 2024, a 90-day public comment period on the drafts commenced, supplemented by three public listening sessions. All findingsand public responses were made freely available on the National Marine Fisheries Service and regulations.gov websites.

Thisunprecedented, large-scale effort integrated social, economic, biological, ecological, and regulatory data—an achievement unmatched by any agency in assessing potential ocean uses. Notably, geographic areas initially identified in the atlases were later excluded from consideration in the draft PEIS.

The May 2020 Executive Order that launched this initiative was clear: the goal was to identify suitable aquaculturesites. That goal has been realized. However, site suitability does not guarantee commercially viable seafood production, given the challenges of competing in a global market where 75–80% of U.S. seafood is imported. Additionally, offshore farms must navigate a stringent, costly, and transparent federal and state regulatory framework.

CALIFORNIA AQUACULTURE ASSOCIATION

Critics, including well-funded opponents of U.S. offshore marine aquaculture—particularly finfish farming—have contributed to its slow growth compared to international counterparts. While marine aquaculture presents environmental, economic, social, and cultural risks, these challenges are well understood. Addressing them is a priority not only for American science and technology but also for a global network of researchers working to expand sustainable seafood production.

The future of U.S. marine aquaculture is promising due to several key realities:

1. There is a global imperative to sustainably increase seafood production to meet rising demand. The U.S. has the marine resources to become a major exporter if offshore farmers are granted security of tenure for sites in federal waters.
2. U.S. aquaculture operates within a robust legal, regulatory, and science-driven framework designed to anticipate and mitigate potential impacts.
3. Farm-level management and federal and state regulations are ensuring environmentally responsible siting, operations, and production.
4. Advocates in government, academia, and industry recognize the importance of engaging decision-makers, the public, and even critics with the latest research to provide a factual perspective on risks and rewards.
5. Increased communication, targeted research funding, and expanded commercial-scale farming experience will strengthen the U.S. marine aquaculture sector.
6. Offshore farming carries risks, but the U.S. can learn from nations such as Canada, Chile, China, Japan, Norway, Panama, Mexico, and Mediterranean countries that have made significant advancements in aquaculture.
7. The current federal permitting process is necessarily rigorous, complex, time-consuming, and expensive. Over time, as knowledge and environmental data accumulate, the process may become more efficient, but it must always remain stringent to safeguard ocean resources for future generations.

We are committed to protecting and conserving our oceans while fostering a sustainable and competitive marine aquaculture industry.

Sincerely,

Tony Vaught
President, California Aquaculture Association

[i] The California Aquaculture Association (CAA) is a producer-supported association representing finfish, shellfish, and algae growers and seafood related businesses throughout California since 1983. The CAA promotes commercial production of plants and animals in aquatic systems to satisfy the needs of consumers for wholesome products that are produced by sustainable means conserving California's land and water resources.

February 20, 2025

Celia Barroso
Regional Aquaculture Coordinator, California
National Marine Fisheries Service
West Coast Region
National Oceanic and Atmospheric Administration
501 W. Ocean Blvd., Suite 4200
Long Beach, CA 90802

Re: NOAA-NMFS-2022-0051: Draft Programmatic Environmental Impact Statement for Identification of Aquaculture Opportunity Area(s} in Federal Waters of Southern California - Public Comments of the Ventura Port District
Submitted via email

Dear Ms. Barroso:

On behalf of the Ventura Port District ("VPD"}, thank you for the opportunity to provide comments on the Draft Programmatic Environmental Impact Statement ("DPEIS") for Identification of Aquaculture Opportunity Areas ("AOA") in Southern California.

Ventura Harbor is the home port to the largest commercial fishing fleet in California, and depending on the year, lands the largest amount of fish, principally market squid. As you know, starting in 2015, VPD worked closely with NOAA, commercial fishers, interested parties and other relevant agencies on the Ventura Shellfish Enterprise ("VSE") project, an effort to develop an area for mussel aquaculture farms proximate to the Ventura Harbor. As part of this effort, VPD and its collaborators developed site-specific, detailed, and accurate engineering, economic and environmental analyses regarding shellfish aquaculture and its potential interactions with the area in the Santa Barbara Channel. VPD also engaged in a robust public outreach and education effort to inform and engage with the public, fishers, agency, and academic staff on the role commercial aquaculture can play in addressing social, economic, and environmental impacts that challenge our harbors and oceans. We were very encouraged to see much of that work referenced favorably in the DPEIS and that a significant amount of the analysis, proposed mitigation measures, and work with regulatory agencies, including NOAA, can help establish a framework for potential future aquaculture projects within the Santa Barbara Channel.

Diversification of our commercial fishing fleet is essential to maintain our working waterfront; address the significant impacts of climate change, rising sea temperatures, and changes in growing conditions (in 2020, commercial landings of market squid decreased by over 90%); and provide for commercial fishing that provides sustainable sources of locally-grown seafood. As noted in the DPEIS, shellfish and seaweed aquaculture can provide for additional opportunities and diversification for commercial fishing interests;

provide additional investment in the local economy, including upstream and downstream businesses such as gear suppliers, seafood processors, and restaurants; and create additional employment opportunities. VPD has recently reaffirmed itssupport for shellfish and seaweed aquaculture, which furthers several VPD objectives in continuing to improve and support its working waterfront, including:

1. Engage with commercial fishing and sustainable aquaculture interests in Ventura Harbor
2. Continue improvements of District's Working Waterfront infrastructure
3. Continue to pursue opportunities for diversifying commercial fishing and sustainable aquaculture

For these reasons and as further discussed below, VPD strongly supports consideration of multiple potential AOAs in proximity to Ventura Harbor.

A. VPD Supports Alternative 2.a and the Designation of Sites N2-D and N2-E as AOAs

The economic, policy, and environmental justifications for VPD's support for Alternative Sites N2D and N2E were extensively detailed in our previous July 22, 2022 comment letter concerning NOAA's Notice of Intent.[1] Those justifications remain true today and are incorporated herein by reference. Specifically in reference to the DPEIS, there are additional considerations that support identification of these areas as AOAs:

- The DPEIS discusses the significant upfront costs associated with the permitting, development, and installation of offshore aquaculture. Some of those costs can be avoided through utilizing existing infrastructure and support services provided in Ventura Harbor, which already supports the largest commercial fishing community in California. Over the past 10 years, the harbor has invested over $5.3 million in commercial fishing, providing new, state of the art docks, upgraded commercial storage facilities, improved fish offloading, fishing pier life extension projects, and innovative incentives to support the continued expansion of commercial fishing. This reduces the need for significant onshore infrastructure development and can help facilitate quicker development of Santa Barbara Channel AOAs.
- There is already significant interest in developing offshore aquaculture within potential Santa Barbara Channel AOAs. For example, Ocean Rainforest, whose pilot project was favorably reviewed in the DPEIS, has submitted an application for a commercial-scale, 2,000-acre Giant kelp farm, proposed to be located in Site N2-D. VPD submitted a letter of support for the project on January 8, 2025. Certification of the DPEIS and establishment of Site N2-D as an AOA can help expedite permitting, environmental review, and development of Ocean Rainforest's proposed kelp aquaculture project.
- These locations can take advantage of the ideal conditions for aquaculture, which include good water quality without significant sources of pollution and ideal temperature and nutrient conditions present in the Santa Barbara Channel. There are no known significant sources of pollution that are likely to affect any of the potential Santa Barbara Channel AOA alternative sites. This can be a significant benefit to companies seeking to establish an aquaculture operation, particularly shellfish companies that will require growing area certification.

[1] While we think that Alternative Sites N2-D and N2-E are the most ideal and provide the greatest opportunity for aquaculture farms given their proximity to Ventura Harbor, we generally support the consideration of any of the sites within Alternative 2a.

- As noted in the DPEIS, these two specific locations avoid critical habitat for Humpback whales. While there are mitigation measures and design features that appear promising to reduce or eliminate whale entanglements, these sites have a lower possibility for Humpback whale interaction.
- These sites also benefit from shallower water depths. During the VSE project, VPD obtained feedback from shellfish and seaweed aquaculture companies that these shallower water depths were preferred, and therefore may be subject to greater commercial interest if identified as AOAs.
- As noted in the DPEIS, the farther the aquaculture facility is from shore, the greater the GHG emissions (due to vessel trips), the greater the costs, and the more difficult to conduct monitoring and maintenance operations. Alternative Sites N2-D and N2-E are located closest to Ventura Harbor in comparison to other Santa Barbara Channel alternative sites, which would result in cost savings and logistical and operational advantages.

VPD is excited about the opportunity to continue to develop Ventura Harbor to support both its existing fishery and any aquaculture operations which may be established through the AOA process. The Harbor already has much of the infrastructure that would be needed to service aquaculture projects and we are open to other opportunities to partner with aquaculture companies that want to establish operations that would be serviced by the Harbor. As noted above, VPD has been a strong supporter of aquaculture in the past and would strongly support establishment of an AOA(s) that would facilitate landings and operations in Ventura Harbor.

B. Environmental Analysis

While VPD would have preferred a more in-depth analysis associated with certain species and gear, as discussed in our July 22, 2022 letter, we appreciate the work NOAA has done to prepare the DPEIS and present a thoughtful and balanced analysis of potential environmental impacts that can inform subsequent project-specific proposals. However, VPD respectfully requests correction and/or clarification of the following three issues:

1. The DPEIS states that "A proxy to assess risk to protected species in the SCB may be considered from reviewing regional reports of entanglements in derelict fisheries gear." DPEIS, at 110. While the paragraph goes on to state that "Perspectives are divided on whether or not fixed gear fisheries bycatch should be used as a proxy to estimate risk of longline aquaculture entanglement" and notes several differences between aquaculture gear and fishing gear, NOAA's own data and analysis does not support that aquaculture entanglements occur at anything close to the same frequency as fishing gear. *See* Price, C.S., E.Keane, D. Morin, C. Vaccaro, D. Bean, and J.A. Morris, Jr. 2017. Protected Species & Longline Mussel Aquaculture Interactions. NOAA Technical Memorandum NOS NCCOS 211. 85 pp. ("Since some fishery gears, or components of the gear, are similar or analogous to aquaculture gear, it may be appropriate in certain instances to draw similarities between gear types as proxies, when determining relative risks to marine mammals to inform regulatory and management decisions with respect to aquaculture. However, much aquaculture gear is unique to that industry and direct comparisons to fishery gear may not be valid"). "Proxy" in this context is understood to be analogous without access to better information; if entanglements from fishing gear were used as a proxy during permitting or environmental review of offshore aquaculture farms, it will likely significantly overstate the potential risk and may result in denial of projects. VPD respectfully requests that NOAA reconsider this statement.

2. The DPEIS states "Aquaculture projects sited in Alternative 2 may have potential impacts on habitat connectivity for the Southern California Distinct Population Segment (DPS) of steelhead. Critical habitat for the Southern California DPS of steelhead includes the Ventura River, Coyote Creek, and the Santa Clara River. The close proximity of the North Study Areas AOA options to the mouths of those rivers could impact the steelhead's abilities to return to the river to spawn (PFMC 2022a)." DPEIS, at 119. VPD disagrees with this statement. As noted in the DPEIS, the closest proposed AOA in Alternative 2 is 10 km offshore and not in "close proximity" to the mouths of any river. Further, steelhead would be able to easily swim around aquaculture vessels and installed aquaculture gear; therefore, it is unclear how aquaculture projects would impact habitat connectivity for steelhead. VPD respectfully requests that this paragraph be deleted.

3. The DPEIS states that "Escaped/dispersed organisms and reproductive material are considered biological material and a pollutant that must be considered in the NPDES permitting process." DPEIS, at 156. While VPD takes no position as to whether or not this is true for finfish projects, the Ninth Circuit has determined that it is not the case for shellfish (and likely seaweed) projects: "We are persuaded that Congress did not intend that living shellfish and the natural chemicals and particulate biological matter emitted from them, or the occasional shells that separate from them, be considered pollutants." *Association to Protect Hammersley, Eld & Totten Inlets v. Taylor Resources, Inc.,* 299 F.3d 1007, 1016 {9th Cir. 2002). VPD respectfully requests that this sentence be deleted to avoid the implication that shellfish and seaweed operations would be required to obtain a NPDES permit.

C. Mitigation Measures

The DPEIS includes an Appendix 1, which discusses potential mitigation measures for offshore aquaculture projects. VPD is supportive of many of those included; however, there are some that would appear problematic if accepted as proposed. As a preliminary matter, VPD recommends that mitigation measures for shellfish and seaweed be segregated, where appropriate, from those suitable for finfish projects. As an example, there are some mitigation examples requiring monitoring of sediment chemicals and discharges that may be suitable for finfish projects {particularly in the context of a NPDES permit) but would not be suitable for shellfish and seaweed projects.

Another concern is the cost of the recommended mitigation and monitoring. VPD supports robust monitoring efforts; indeed, it sought to establish significant monitoring efforts as part of the VSE. However, a significant category of costs for aquaculture companies are those associated with monitoring efforts. The DPEIS notes that the high initial costs for development of aquaculture projects acts as a barrier for many companies to enter the market, potentially resulting in the predominance of larger aquaculture companies within the California aquaculture industry. More data is always appreciated, but aquaculture companies must be able to operate and run a business, and we believe that certain regulatory agencies have often required monitoring plans without considering the cost to the applicant. Significant monitoring, which can often cost hundreds of thousands of dollars, may continue to frustrate one of the primary goals of the PEIS, which is to help facilitate expansion and diversification of the California aquaculture industry. Therefore, we encourage both NOAA and the regulatory agencies that will rely upon the DPEIS to take cost into account when evaluating monitoring efforts and continue to seek public funding to address the critical outstanding unanswered environmental considerations involved in offshore aquaculture. If there are opportunities for NOAA or other regulatory agencies to partner with aquaculture applicants to collect monitoring data where needed, we would encourage exploring those efforts. As noted elsewhere in the DPEIS, one option would be to allow phasing and adaptive management, where these issues can be addressed over time, ideally without significant monitoring costs.

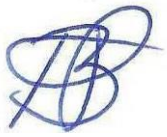
There are other specific mitigation measures which, based upon VPD's years of discussions with the aquaculture industry, are highly unlikely to be accepted. For example, the DPEIS recommends two years of baseline data monitoring. DPEIS, at 386. Not only is this likely to delay installation and development of an aquaculture operation for an additional year beyond what is already a multi-year permitting process, it will also significantly increase the monitoring costs discussed above. Such a recommendation is not standard practice in the industry, not required in other locations in the United States where aquaculture is prevalent, and unlikely to facilitate development of an offshore aquaculture industry in California. The same is true of the suggestion that aquaculture companies report "the details of production, including species, weight, product form (frozen, fresh, fileted, round, etc.), and to the extent possible, the destination markets of aquacultured products during the application process and operations." DPEIS, at 392. The majority of this information is confidential business information that the aquaculture industry guards closely, similar to traditional fishing companies. The public disclosure of such information is highly unlikely.

Finally, the DPEIS provides suggestions to address fisheries impacts that do not appear to align with its impact analysis. While the DPEIS notes that there could be both positive and negative impacts to commercial and recreational fishing, it suggests examples of potential compensatory mitigation associated with nuclear reactors and oil spills. DPEIS, at 390. These examples are not comparable. The examples provided involve very significant environmental impacts and energy companies with deep pockets to pay for compensatory mitigation (SCE and British Petroleum). VPD strongly supports its fisheries and believes that the best possible solution is to work together to minimize impacts to commercial fishing from aquaculture rather than recommend unrealistic compensatory mitigation regimes.[2]

D. Conclusion

Thank you for this opportunity to comment on this important matter. We currently import 90% of our seafood from other countries and California is far behind some other states in development of an aquaculture industry to provide local and sustainable seafood. California has an opportunity to be a leader in this area and NOAA's AOA process is a critical part of that potential. VPD strongly supports Alternative 2.a, and specifically the establishment of AOA locations in Sites N2-D and N2-E. This will provide the ability to diversify our existing fishery and support Port tenants, restaurants, and other suppliers throughout Ventura County. Thank you for your hard work and continued consideration of this critical project.

Sincerely,



Brian D. Pendleton, CSDM
General Manager

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[2] VPD also has concerns regarding the Lost/Damaged Fishing Gear Compensation Plan agreed upon between the previous (now defunct) applicant associated with the California Sea Ranch project and the California Coastal Commission. *See* DPEIS, at 396. Those conditions of approval are one of many reasons that project was not successful, and we encourage NOAA to not cite to it as precedent given the very unique, and unfortunate, circumstances involved with that project.

Submitted Via: Email **Submitter Name/Organization:** Ava Schulenberg - Assistant Director, Chris Voss - President, Commercial Fishermen of Santa Barbara

Commercial Fishermen of Santa Barbara
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ava@cfsb.info
(805) 403-4811
February 17, 2025

Celia Barroso
RAC-CA, NMFS West
501 W. Ocean Blvd., Ste. 4200
Long Beach, CA 90802

Subject: Opposition to the Southern California Aquaculture Opportunity Areas

Dear Ms. Barroso,

As a small-scale commercial fishing fleet deeply invested in the health of our fisheries and coastal economies, we strongly oppose the designation of Aquaculture Opportunity Areas (AOAs) in Southern California, particularly any alternatives that include offshore finfish aquaculture. These industrial-scale operations threaten the sustainability of our wild-capture fisheries, jeopardize marine ecosystems, and endanger the livelihoods of independent fishermen who have responsibly harvested seafood for generations.

Lack of Meaningful Consultation with Fishermen and Data Errors

The process used to designate AOAs has failed to adequately engage with the fishermen who have relied on these waters for decades. The National Oceanic and Atmospheric Administration (NOAA) Aquaculture Atlas, which informed the AOA site selection, contains documented errors, including misinterpretation of fisheries data. The Pacific Fishery Management Council (PFMC) has noted serious concerns about these inaccuracies, stating that without direct consultation with local fishermen, the analysis lacks credibility. Some of the fisheries that will be most impacted by the siting chosen by NOAA are ones that are favored by seafood buyers, available year round and/or bring good prices, including halibut, white sea bass, rockfish, ridgeback shrimp, and rock crab. These impacts were never sufficiently considered in the AOA siting process. In particular, ridgeback shrimp and rock crab are entirely missing from the AOA fishing layers and the halibut layer used is highly inaccurate due to missing state level data and a reliance on vessel tracking data, which only a fraction of halibut boats have.

It is unacceptable that NOAA has not engaged with the very people who understand the ocean best—those who work on it daily. Before moving forward with any site selection, NOAA must work with regional fishermen to ground-truth proposed locations and reassess potential conflicts.

Finfish Aquaculture: A Threat to Fisheries and Coastal Communities

Offshore finfish aquaculture has no place in California's federal waters due to its well-documented environmental and socio-economic risks, including:

- **Harm to Wild Fish Stocks:** Fish escapes, disease transmission, and genetic pollution pose direct threats to wild populations. Industrial-scale aquaculture operations often rely on high-density pens, increasing the risk of spreading parasites and illnesses to wild fish.
- **Pollution and Habitat Damage:** Waste discharge, uneaten feed, and chemical treatments such as antibiotics can degrade water quality and disrupt sensitive marine ecosystems.
- **Displacement of Fishermen and Increased Competition:** Aquaculture sites will exclude commercial fishermen from productive fishing grounds while also flooding the market with farmed seafood that competes with wild-caught products. This will drive down prices and undermine the economic viability of independent fishing operations.
- **Undermining Domestic Fisheries Management:** Rather than promoting offshore finfish farming, NOAA should prioritize policies that support our existing fisheries, which leave millions of pounds of fish unharvested due to restrictive regulations. It is illogical for the government to encourage industrial fish farming while wild fish stocks remain underutilized.

Mariculture and Compensation Considerations

While shellfish and seaweed aquaculture may be more environmentally acceptable under strict regulations, there has been no meaningful consultation with local fishermen to determine appropriate locations for these operations. Any mariculture projects requiring bottom anchoring should avoid Essential Fish Habitat (EFH) Conservation Areas and other sensitive marine environments.

If aquaculture operations displace fishermen from productive fishing grounds, those companies must be required to provide compensation. The California Coastal Commission is currently working to address similar displacement issues caused by offshore wind energy development. NOAA should look to this process as a model for ensuring fair compensation to affected fishermen through a "fisheries resiliency fund." The Draft Programmatic Environmental Impact Statement (DPEIS) is silent on this critical issue, which must be addressed before any AOA designation moves forward.

A Call to Protect Our Fisheries

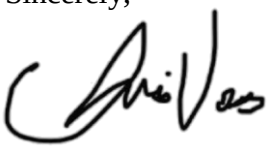
COMMERCIAL FISHERMEN OF SANTA BARBARA

We urge NOAA to:

1. **Reject any alternatives that include finfish aquaculture** and instead focus on policies that strengthen wild-capture fisheries.
2. **Correct the flawed data in the AOA site selection process** and properly consult with local fishermen before proceeding.
3. **Ensure that any mariculture development does not displace fishermen** or disrupt sensitive marine habitats.
4. **Establish a compensation mechanism** for any loss of fishing grounds due to aquaculture expansion.

For generations, small-scale commercial fishermen have responsibly harvested seafood while supporting coastal economies and preserving marine ecosystems. We cannot allow industrial aquaculture to erode the foundation of our fishing heritage. We strongly urge NOAA to reject any AOA designations that threaten wild fisheries and to prioritize the sustainability of our existing seafood industry.

Sincerely,



Chris Voss

President, Commercial Fishermen of Santa Barbara



Ava Schulenberg

Assistant Director, Commercial Fishermen of Santa Barbara

February 20, 2025

Attn: Celia Barroso
Regional Aquaculture Coordinator, California
National Marine Fisheries Service, West Coast Region
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Long Beach, CA 90802

Submitted electronically: Socalaoa.wcr@noaa.gov.

RE: IDENTIFICATION OF AQUACULTURE OPPORTUNITY AREAS IN UNITED STATES FEDERAL WATERS OFF OF SOUTHERN CALIFORNIA DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

Dear Ms. Barroso:

The California Ocean Protection Council, the California Coastal Commission, the California State Lands Commission, and the California Department of Fish and Wildlife, (collectively, the Agencies) received the Draft Programmatic Environmental Impact Statement (DPEIS) for Identification of Aquaculture Opportunity Areas in United States Federal Waters off of Southern California (Project) from the National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA).

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Project that may affect California marine and coastal resources. We additionally appreciate the opportunity to provide comments regarding those aspects of the Project that the Agencies, by law, may be required to carry out or approve through the exercise of their own regulatory authority.

BACKGROUND ON THE ROLE OF SIGNATORY AGENCIES

California Ocean Protection Council

The California Ocean Protection Council (OPC or Council) is a Cabinet-level state policy body within the California Natural Resources Agency that advances the Governor's priorities for coastal and ocean policy and works broadly to protect healthy coastal and ocean ecosystems for current and future generations. The Council was established by

the California Ocean Protection Act, and its actions are guided by OPC's Strategic Plan to Protect California's Coast and Ocean 2020-2025.[1]

The Strategic Plan includes "promoting sustainable aquaculture" as an explicit objective; protecting the health of California's coastal and marine ecosystems is paramount. In 2021, OPC convened leadership from state resource management, public health, and food and agriculture agencies to develop the Guiding Principles for Marine Aquaculture in California[2] designed to increase coordination and transparent decision-making for sustainable aquaculture. These principles highlight California's commitment to 1) develop and utilize best available science, 2) ensure aquaculture sustainability, 3) build governance and management partnerships, 4) ensure effective aquaculture planning, 5) develop and implement effective aquaculture oversight, and 6) protect public health and food safety. These Guiding Principles are providing essential near-term guidance and informing the development of a more comprehensive statewide Aquaculture Action Plan. The Action Plan will create a consistent, science-based framework and policy for marine aquaculture in California that protects habitats, biodiversity and public health while supporting the state's sustainable blue economy. The Plan will focus on marine algae and shellfish in state marine waters and land-based/recirculating tank operations for marine algae, shellfish, and finfish.

California Department of Fish and Wildlife

The California Department of Fish and Wildlife (CDFW or the Department) is California's Trustee Agency for fish and wildlife resources and holds those resources in trust by statute for all the people of the state (Fish & G. Code, section 711.7, subd. [a] & 1802; Public Resources Code, section 21070; CEQA Guidelines section 15386, subd. [a]). The Department, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically sustainable populations of those species (Id., section 1802). Similarly for purposes of the National Environmental Policy Act, the Department, under its Trustee authority, provides, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources. The Department is also responsible for marine biodiversity protection under the Marine Life Protection Act in coastal marine waters of California and ensuring fisheries are sustainably managed under the Marine Life Management Act. Pursuant to our jurisdiction, the Department has the following comments and recommendations regarding the Project.

[1] https://www.opc.ca.gov/webmaster/_media_library/2020/01/OPC-Strategic-Plan_for-Council-consideration_v.2.26.2020_v2.pdf.

[2] https://www.opc.ca.gov/webmaster/_media_library/2021/06/Aquaculture-Principles-Public-20210604.pdf.

California Coastal Commission

The California Coastal Commission (CCC) plans and regulates the use of land and water in the coastal zone. Development activities, which are broadly defined by the California Coastal Act of 1976[3] to include (among others) construction of buildings, divisions of land, and activities that change the intensity of use of land or public access to coastal waters, generally require a coastal development permit from either the CCC or the local government. The Coastal Act includes specific policies (see Division 20 of the Public Resources Code) that address issues such as shoreline public access and recreation, lower cost visitor accommodations, terrestrial and marine habitat protection, visual resources, landform alteration, agricultural lands, commercial fisheries, industrial uses, water quality, offshore oil and gas development, transportation, development design, power plants, ports, and public works. The policies of the Coastal Act constitute the statutory standards applied to planning and regulatory decisions made by the CCC and by local governments, pursuant to the Coastal Act.

In addition, the CCC implements California's Coastal Management Program under the federal Coastal Zone Management Act (CZMA) of 1972 as it applies to federal activities, development projects, permits and licenses, and support to state and local governments. Under the CZMA, federal and state government agencies work in partnership to bring all federal agency activities (including federal development projects, permits and licenses, and assistance to state and local governments) affecting the coastal zone into consistency with the enforceable policies of the state's certified program (i.e., Chapter 3 policies of the California Coastal Act). The CCC's federal consistency review process identifies activities with reasonably foreseeable direct and indirect effects on coastal uses or resources and aquaculture projects in federal waters have been recognized as development projects that would have coastal effects and thus would be reviewed by the CCC under the CZMA.

California State Lands Commission

The California State Lands Commission (SLC) manages sovereign lands including the submerged lands stretching from the ordinary high-water mark (as measured by the mean high tide line) along tidal waters to 3 miles offshore and issues leases of this sovereign land for use or development. In doing so, the Commission safeguards and balances competing Public Trust values, principles, and uses, including commerce, navigation and safety, fisheries, recreation.

[3] https://www.coastal.ca.gov/coastact.pdf.

PROJECT DESCRIPTION SUMMARY

Proponent: NMFS

Objective: The objective of the Project is to support long-term planning for offshore aquaculture by identifying one or more Aquaculture Opportunity Areas (AOAs) in federal waters off the Southern California coast that may be suitable for future offshore aquaculture projects and to evaluate the impacts of siting aquaculture in those locations. This proposed action was required by the Executive Order on Promoting American Seafood Competitiveness and Economic Growth (E.O. 13921) on May 7, 2020. AOAs are specific geographic areas that have been evaluated and determined to be suitable for commercial aquaculture development, including finfish, shellfish, macroalgae, and multi-species aquaculture. The AOA selected site options currently being considered by NMFS are the result of a complex spatial analysis conducted by NOAA's National Centers for Coastal Ocean Science, presented in the Aquaculture Opportunity Area Atlas for the Southern California Bight (Atlas). The analysis included data relevant to administrative boundaries, national security, navigation and transportation, energy and industry infrastructure, commercial and recreational fishing, natural and cultural resources, and oceanography. The Project is a long-term planning initiative; no aquaculture facilities are currently being proposed in AOAs off the Southern California coast. Future aquaculture development within the Southern California AOAs would go through separate, project-level environmental review and permitting.

Location: The ten selected site options currently being considered for the identification of one or more AOAs are located within the Southern California Bight, including eight site options between 5.41 and 10.65 nautical miles offshore of Santa Barbara and Ventura Counties in the Santa Barbara Channel, and two site options between 4.35 and 4.76 nautical miles offshore of Los Angeles County in Santa Monica Bay.

Timeframe: The Project timeframe is not discussed in the DPEIS. However, it is the Agencies' understanding that the AOAs will exist permanently once established.

BIOLOGICAL SIGNIFICANCE

The marine ecosystems of the Southern California Bight host diverse habitats and thousands of species of marine plants, fish, invertebrates, seabirds, turtles, and mammals, some of which are unique to Southern California. This biological complexity stems from the region's dynamic ocean environment, where upwelling provides nutrient-rich water to the coast and complicated current patterns mix cold- and warm-water communities. Southern California's variety of marine habitats, such as hard (cobbles, boulders or rocky reef) and soft (sand or mud) substrate, kelp forests, and seagrass beds, provide marine organisms with nursery grounds, shelter, and areas to forage and reproduce. These habitats and species contribute to the state's economy by supporting

numerous commercial and recreational fisheries, ecotourism, commerce, and recreation, and hold cultural significance to California Native American tribes.

COMMENTS AND RECOMMENDATIONS

The Agencies offer the comments and recommendations below to assist NMFS in adequately identifying and/or mitigating the Project's significant, or potentially significant, direct, and indirect impacts on California marine and coastal resources.

I. Possible Mitigation and Monitoring for Offshore Aquaculture Facilities

Comments: The Agencies acknowledge that the purpose of the DPEIS is to analyze the impacts of siting aquaculture facilities in AOAs. The DPEIS does not propose any avoidance, minimization, mitigation, and monitoring measures that address the impacts of siting aquaculture facilities in AOAs, however, the Agencies appreciate that Appendix 1 of the DPEIS discusses potential mitigation that could be considered for aquaculture facility development. Avoidance, minimization, mitigation, and monitoring measures for each proposed aquaculture operation in AOAs will need to be determined on a case-by-case basis depending on the individual facility characteristics and local conditions. Additionally, a strong monitoring program with well-designed and required adaptive management measures and triggers is key to the success of any marine aquaculture project and the preservation of marine resources.

Recommendations: The Agencies recommend that subsequent analyses are needed for each proposed aquaculture operation in AOAs to identify the most appropriate avoidance, minimization, mitigation, and monitoring measures.

The Agencies recognize the significant challenges regarding oversight, compliance, and accountability presented by commercial aquaculture operations in federal waters. To address this, the Agencies recommend that comprehensive monitoring and reporting plans be established for each aquaculture facility in AOAs. The plans should include, but not be limited to, regular independent third-party monitoring to assess: (1) proper gear functioning and required maintenance; (2) impacts to fisheries and marine wildlife; (3) water quality impacts; (4) changes to hydrodynamics and sediment deposition; (5) benthic and substrate impacts; and (5) introduction/transport of pathogens and invasive species. The plans should also include procedures for marine debris management (with unique marking/branding of all aquaculture gear with contact information) and rapid reporting of entanglement events. The Agencies recommend working with state and federal resource agencies to include in the plan detailed adaptive management strategies to determine trigger points that, when reached, require consultation and corrective actions to avoid negative impacts. Plans addressing mitigation (e.g., lost/damaged fishing gear

compensation) and facility decommissioning and debris clean-up may also be necessary.

II. Suitable Species

Comments: The DPEIS notes that the AOAs identified for the Project could be considered potentially suitable for finfish, shellfish, macroalgae, or multi-species aquaculture. The Agencies note that the Sustainable Oceans Act (SB 201) prohibits finfish aquaculture in state waters until an environmental impact report is prepared to evaluate the numerous environmental and health concerns associated with finfish aquaculture[4] and a framework is developed for managing marine finfish aquaculture in an environmentally sustainable manner.
I is within the Department's authority to prohibit an aquaculture operation or the culturing of any species where it is determined it would be detrimental to adjacent wildlife (Fish & G. Code, § 15102 et seq.). Within waters of the Pacific Ocean that are regulated by the state, it is unlawful to spawn, incubate, or cultivate any species of finfish belonging to the family Salmonidae, transgenic fish species, or any exotic species of finfish (Fish & G. Code, §15007). As stated in the Guiding Principles (see footnote 2), state agencies are focused on developing best practices for sustainable low-trophic seaweed and shellfish aquaculture before addressing the more complex issues associated with open coast finfish aquaculture. The Agencies are committed to continue working with NMFS to align our approaches and priorities for aquaculture.

Recommendations: The Agencies recommend that NMFS coordinates with the Agencies regarding the potential inconsistency between aquaculture priorities for state and federal waters. Should finfish operations be proposed in the AOAs, the Agencies stress the importance of carefully and thoroughly addressing all concerns raised by tribal representatives, state agencies, scientists and other interested parties prior to authorization.

III. CESA and ESA-Listed Fish Species

Comments: Several fish species listed under the California Endangered Species Act (CESA) and the Endangered Species Act (ESA) are present in the Project area and may be impacted by aquaculture development. As such, the Department may need to exercise its regulatory authority as provided by the Fish and Game Code. Construction and operation of future aquaculture facilities within the AOAs may result in "take," as defined by state law, of species

[4] For example, use of chemical and biological products and pollutants and nutrient waste on human health and the marine environment; the ability of the marine environment to support finfish aquaculture projects and ecologically significant flora and fauna; effects of feed, fish meal, and fish oil on marine ecosystems; and effects of escaped fish on wild fish stocks and the marine environment.

protected under CESA (Fish and G. Code § 2050 et seq.), and related authorization as provided by the Fish and Game Code may be required.

The DPEIS mentions that the Southern California steelhead (*Oncorhynchus mykiss*) is listed as an endangered species under ESA, and notes that potential aquaculture projects sited in the Santa Barbara Channel may have potential impacts on habitat and connectivity for the Southern California Distinct Population Segment of steelhead. NMFS acknowledged that site-specific NEPA analyses may need to consider the condition of the steelhead stock at the time of permitting decisions to better analyze if this impact could affect steelhead at an individual or population level. In addition to the ESA federal designation, the Southern California steelhead is a species that was recently listed under CESA in April 2024, and the DPEIS does not address the state's designation for steelhead.

Recommendations: The Agencies recommend that the Project should not disrupt CESA and ESA-listed species, including the Southern California steelhead and Green Sturgeon. Site-specific analyses to determine the condition of the steelhead stocks at the time of permitting decisions should be conducted at the state and federal levels.

IV. Offshore Energy and Public Servies

Recommendations: Under Alternative Energy, the Agencies recommend, including reference to California Senate Bill No. 605 (SB 605), passed in 2023, which requires the California Energy Commission (CEC), in consultation with other state agencies, to evaluate the potential use of wave and tidal energy in California and tasks the CEC with the identification of suitable sea space for wave and tidal technologies, identification of mitigation measures, and monitoring and adaptive management strategies. SB 605 requires submittal of reports to the Governor and Legislature and more detail can be found on the CEC's website.[5] Additionally, under Submarine Utilities, the Agencies suggest including a reference to the SoCal Cable and Commercial Fishing Committee (SCCFC), which issues an annual Cable Awareness Flyer. The most recent of these, from September 2024, can be found on the South Bay Cable/Fisheries Liaison Committee (SBC/FLC) website.[6]

[5] https://www.energy.ca.gov/programs-and-topics/topics/renewable-energy/offshore-renewable-energy/sb-605-wave-and-tidal.

[6] https://sbcflc.com/wp-content/uploads/2024/09/SBCFLC_CA-2024_Flyer-opt.pdf.

V. Other Ocean Uses and Current Events in the Southern California Bight

Recommendations: Under Military Readiness Activities, the Agencies recommend noting that in addition to the Final Environmental Impact Statement/ Overseas Environmental Impact Statement for Hawaii-Southern California Training and Testing Activities (U.S. Navy 2018), the Navy has also recently released a Draft Environmental Impact Statement/ Overseas Environmental Impact Statement[7] for the next period of Hawaii-California Training and Testing, with an expanded study area and scope of activities.

VI. Administrative Environment

Comment: Unlike aquaculture projects occurring in California state waters, projects located in federal waters are not required to secure a lease, raising question about the ongoing oversight of aquaculture projects in federal waters.

Recommendations: The Agencies recommend that the final PEIS note the absence of federal aquaculture leasing, provide a clear description of the existing regulatory framework, and indicate which federal agencies have the authority to regulate on-going operations, including maintenance, to ensure that any necessary impact avoidance, minimization and mitigation measures are implemented and all necessary monitoring is carried out. Additionally, the Agencies suggest the final PEIS provide a more detailed accounting of state agencies' roles and responsibilities in the regulation of aquaculture in federal and state waters, including state federal consistency review of activities that take place within the proposed AOAs. Additional information on the CCC's regulatory authority (described in background on the role of signatory agencies) should be included within the Administrative Environment section.

VII. Other Recommendations

Comment: The DPEIS references the maps and figures included in Morris et al. (2021), however, those maps do not appear to include overlays for the proposed AOAs in relation to potential conflicts or resource areas.

Recommendations: The Agencies recommend including figures that clearly show the coastal uses and resources in the vicinity of the proposed AOAs, including bathymetry, shipping lanes, commercial/recreational fishing activity, hard bottom habitat, submarine infrastructure, cultural resources, sensitive marine mammal zones, and other potential conflicts.

[7] https://www.nepa.navy.mil/hctteis/.

CONCLUSION

The Agencies appreciate the opportunity to comment on the DPEIS to assist NMFS in identifying and mitigating Project impacts on California's marine and coastal resources.

Respectfully submitted by staff of the following agencies:

California Department of Fish and Wildlife
California Ocean Protection Council
California Coastal Commission
California State Lands Commission

Submitted Via: Email **Submitter Name/Organization:** Ava Schulenberg - Executive Director, California Lobster & Trap Fishermen's Association

California Lobster & Trap Fishermen's Association
315 Meigs Rd
STE A 279
Santa Barbara, CA
93109

February 20, 2025

Celia Barroso
RAC-CA, NMFS West
501 W. Ocean Blvd., Ste. 4200
Long Beach, CA 90802

Subject: Opposition to the Southern California Aquaculture Opportunity Areas

Dear Ms. Barroso,

On behalf of the California Lobster & Trap Fishermen's Association (CLTFA), I am writing to express our strong opposition to NOAA's recently released Aquaculture Opportunity Areas (AOAs) for Southern California. CLTFA represents a vast network of experienced trap fishermen from Point Conception to San Diego and has been committed to the sustainable management of California's marine resources for over 25 years. We firmly believe that the establishment of AOAs in the proposed regions presents significant environmental, economic, and social threats to our industry and coastal communities.

Environmental Concerns

The introduction of large-scale commercial aquaculture within federal waters poses a significant risk to the health of marine ecosystems. The presence of aquaculture operations, particularly finfish farming, has been associated with disease transmission, water pollution, and habitat degradation. The Santa Barbara Channel, which is identified in the Draft Programmatic Environmental Impact Statement (PEIS), serves as a critical habitat for native marine species, including the California Spiny Lobster, which many of our members rely on for their livelihoods. Santa Monica Bay being closed to commercial fishing makes those proposed AOA areas less impactful on our fleet specifically, however there should still be more extensive research

conducted that provides further details on the implications of aquaculture practices on those existing habitats.

Economic Implications for Commercial Fishermen

The Southern California commercial fishing industry at large is an essential contributor to the local economy, supporting jobs and small businesses that depend on sustainable wild harvest fisheries. The placement of AOAs within our traditional fishing grounds would create direct conflicts with existing fisheries, displacing fishermen and undermining their ability to operate. The proposed AOAs have the potential to disrupt our carefully managed fisheries, which have been sustainably maintained for decades through collaborative efforts between fishermen and regulatory agencies.

Lack of Meaningful Stakeholder Engagement

While NOAA has emphasized public engagement in the AOA process, we believe that the concerns of commercial fishermen have not been adequately addressed. The Draft PEIS fails to provide sufficient assurances that wild fisheries will not be negatively impacted. Furthermore, the lack of regulatory clarity regarding future permitting and the expansion of aquaculture operations raises serious concerns about the long-term consequences of this initiative.

Conclusion

CLTFA urges NOAA to, at the very least, amend their plans to designate AOAs in the Southern California region by co-managing their concepts in a way that more thoroughly takes all commercial fishermen's input, as well as all other degradation effects on marine life and habitats, into consideration. We strongly advocate for alternative approaches to seafood sustainability that do not compromise the livelihoods of hardworking fishermen or the health of our marine ecosystems.

The Santa Barbara Channel specifically is a commons that ought to remain just that; Commercial fishermen do not fish anywhere that is exclusive to commercial fishing. We are an example of a group that uses the ocean for wild seafood harvesting without hindering the capability of anyone else from using the ocean for other recreational or commercial purposes. Aquaculture would introduce *more* exclusionary grounds to our small-scale fleet(s) in a world where we are already being phased out at every turn. Therefore, we again ask that NOAA please more seriously take into consideration the adverse effects these aquaculture sites would have on all commercial

fishermen, their commercial beneficiaries, the end consumer, and all surrounding natural marine environments and their inhabitants.

We appreciate the opportunity to provide our comments and strongly encourage NOAA to reconsider the proposed AOAs. Please feel free to contact us for further discussion, thank you.

Sincerely,



Ava Schulenberg
Executive Director, California Lobster & Trap Fishermen's Association
P: (805) 403-4811
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Submitted Via: Email **Submitter Name/Organization:** Kerry Griffin - Staff Officer, Brad Pettinger - Council Chair, Pacific Fishery Management Council

Pacific Fishery Management Council

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Brad Pettinger, Chair | Merrick J. Burden, Executive Director

24 February 2025

Celia Barroso
Regional Aquaculture Coordinator, California
National Marine Fisheries Service
West Coast Region
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Long Beach, CA 90802

Re: **Draft Programmatic Environmental Impact Statement for the Identification of Aquaculture Opportunity Areas in U.S. Federal Waters off of Southern California (Docket No. NOAA-NMFS-2022-0051)**

Dear Ms. Barroso,

The Pacific Fishery Management Council (Council) appreciates the opportunity to offer the following comments on the Draft Programmatic Environmental Impact Statement (DPEIS) for the Identification of Aquaculture Opportunity Areas (AOAs) in U.S. Federal Waters off of Southern California. The Council manages West Coast commercial and recreational fishing under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), to ensure a sustainable seafood supply for the Nation. This includes responsibilities for protecting marine ecosystems, the habitats upon which healthy fisheries depend, and the wellbeing of coastal communities.

In our July 2022 comment letter[1] on the National Oceanic and Atmospheric Administration (NOAA) Notice of Intent to prepare a DPEIS, we provided detailed comments on potential impacts, mitigation measures and the Council's obligations under the MSA. Many of our comments have been incorporated into the DPEIS, and we request that that letter be incorporated by reference here. We specifically emphasize several statutory obligations and best practices, summarized below.

Council Authorities

Essential Fish Habitat

The MSA requires regional Fisheries Management Councils (RFMCs) to describe, identify, conserve, and enhance essential fish habitat (EFH) for species managed under a Council's fishery management plans (FMPs) (50 CFR 600.815). The Council has identified and described EFH throughout the Pacific Coast region for its four Fishery Management Plans (FMPs) (Pacific Coast groundfish, Pacific Coast salmon, coastal pelagic species (CPS), and highly migratory species

[1] https:/www.pcouncil.org/documents/2022/07/july-2022-letter-to-nmfs-on-noaa-aquaculture-opportunity-areas.pdf/

(HMS)). The MSA encourages the identification of special habitats within EFH as Habitat Areas of Particular Concern (HAPC) which may require additional protective measures during EFH Consultations (50 CFR 600.815(a)(8)). The Council has designated HAPCs for salmon and groundfish. Groundfish HAPCs include rocky reefs, estuaries, canopy kelp, seagrasses, and 'areas of interest' such as offshore seamounts and canyons. The Council has also designated many spatially discrete EFH Conservation Areas (EFHCAs) for groundfish to protect particularly sensitive or productive habitats from some types of bottom-contact fishing (50 CFR 600.815(a)(2)). Some EFHCAs were established based on the presence of groundfish HAPCs.

The MSA authorizes the National Marine Fisheries Service (NMFS)and RFMCs to provide comments and conservation recommendations on actions that may adversely affect the habitat, including EFH, of a fishery resource under its authority and requires comment on actions that are likely to substantially affect the habitat of an anadromous fishery resource under its authority (Section 305(b)(3)). Federal action agencies are required to provide detailed responses to conservation recommendations provided by NMFS. The Council requests the same detailed response to Council-provided conservation recommendations.

MSA National Standards

The MSA includes 10 National Standards (NS) that are principles to be followed in any FMP to ensure sustainable and responsible fishery management (50 CFR Part 600 Subpart D). The Council recommends that the analysis of impacts from offshore aquaculture activities on fishery resources consider three NS in particular:

- The effects of the proposed action on the ability of fisheries to continue to achieve optimum yield from managed wild fish stocks (NS1 – 50 CFR § 600.310)
- The effects of the proposed action on the sustained availability of fishery resources to fishing communities near any proposed or designated AOA, and on the sustained participation of those fishing communities in fisheries (NS8 – 50 CFR § 600.345)
- The effects of the proposed action on fishing vessel safety of navigation and safety of human life at sea (NS10 – 50 CFR § 600.355)

Alternatives and General Comments

Alternatives

A marine spatial modeling analysis conducted by NOAA's National Centers for Coastal Ocean Science (NCCOS) provided information to support siting decisions and the analysis of impacts. The NCCOS analysis is described in the Aquaculture Opportunity Area Atlas for the Southern California Bight (Atlas[2]). The analysis included data relevant to administrative boundaries, national security, navigation and transportation, energy and industry infrastructure, commercial and recreational fishing, natural and cultural resources, and oceanography.

[2] An Aquaculture Opportunity Area Atlas for the Southern CaliforniaBight. Morris, J.A., et al. 2021. National Centers For Coastal Ocean Science.

The DPEIS evaluates the No Action Alternative (Alternative 1) and three action alternatives with sub-alternatives. Sub-alternative 4b is identified as the Preferred Alternative.

- Alternative 2: Santa Barbara Channel: NMFS would identify at least one and up to eight AOAs within Federal waters in the Santa Barbara Channel. Each area ranges from 1,500 to 2,000 acres.
    - Sub-alternative 2a: shellfish and macroalgae aquaculture only
    - Sub-alternative 2b: all types of commercial aquaculture

- Alternative 3: Santa Monica Channel: NMFS would identify at least one and up to two AOAs within Federal waters off Santa Monica Bay. The two areas are 500 and 1,000 acres.
    - Sub-alternative 3a: shellfish and macroalgae aquaculture only
    - Sub-alternative 3b: all types of commercial aquaculture

- Alternative 4: Combination of Geographic Areas: NMFS would identify up to 10 AOA(s) from within the boundaries of either Alternative area, up to a maximum area to be determined by NMFS with input from the public.
    - Sub-alternative 4a: shellfish and macroalgae aquaculture only
    - Sub-alternative 4b: all types of commercial aquaculture (Preferred Alternative)

The Council commends NMFS on providing a well-structured document that is thorough, concise, and clear. The Council does not recommend a preferred Alternative at this point but provides comments about some of the specifics contained in the DPEIS.

General Comments

The DPEIS accurately describes the local, regional, national, and worldwide benefits for the expansion of a domestic aquaculture industry. Any such expansion should ensure there is minimal impact to domestic fisheries, dependent fishing communities, the marine environment, and marine resources. Domestic aquaculture development could produce positive effects by functioning synergistically with existing wild capture fisheries. But to achieve such positive effects, planning activities for aquaculture should necessarily include the fishing community. Existing commercial and recreational fishing sectors have established infrastructure, markets, and the ability to develop and tap into new domestic markets. Existing fisheries sectors can also coordinate the timing of aquaculture activities to minimize interference with commercial or recreational fishing, or with wild fish space utilization (i.e., breeding, nursery grounds), etc.

The Council is concerned about domestic finfish aquaculture for several reasons, including potential competition with wild capture fisheries. This highlights the importance of working cooperatively and synergistically with coastal communities and the existing commercial and recreational fishing sectors.

The DPEIS identifies many significant risks associated with aquaculture operations, including potential escapement, disease transmission to wild fish, increased presence of marine mammals and birds, and water quality impacts. If finfish aquaculture is included in the final AOA identification(s), only species native to Southern California should be permitted. The Council **does not support the use of naturalized species.** However, if naturalized species are considered, **the Council recommends they be evaluated on a species-specific basis and only permitted after**

thorough evaluation determines the species (and their interactions) is low risk to native species, habitats, and the environment.

The DPEIS should strongly encourage consultation with local members of fishing fleets, who have site-specific knowledge of seafloor features that may not be evident from existing mapping or survey data. For example, in some areas of potential AOAs, the seafloor sediments are unconsolidated and objects such as anchors can become buried and unretrievable. The commercial market squid fleet (light boats and purse seine vessels) are important sources for local knowledge that may be especially helpful in siting decisions.

Programmatic National Environmental Protection Act (NEPA) documents require a tiered (site-specific) NEPA analysis for projects that fall under the PEIS scope (such as any proposed AOAs). The Council presumes that a programmatic EIS would necessitate a site-specific EIS rather than an EA, especially given that open water marine aquaculture is largely untested on the U.S. West Coast.

Mitigation, Monitoring, and Baseline Assessments

Mitigation

The Council previously provided several recommendations for mitigation and monitoring requirements in our July 2022 comment letter, which we reiterate here.

The DPEIS analyzes the impacts of siting aquaculture facilities in AOAs and provides potential mitigation measures. However, the DPEIS does not require any mitigation measures to be implemented on a site-specific basis. The discussion of mitigation measures in Appendix 1 of the DPEIS describes only *potential* mitigation measures that *may or could be* implemented for individual aquaculture facilities or through other agency permitting authorities. The Council understands that project-specific measures to avoid, minimize, and mitigate impacts will need to be determined for individual projects based on the proposed aquaculture facility and local environmental conditions. However, there are several programmatic-level mitigation measures (such as avoiding sensitive benthic habitats and conducting baseline and long-term environmental monitoring) that are applicable to all aquaculture projects that should be included as a requirement in the DPEIS. **The Council recommends that the DPEIS include prescriptive mitigation measures in the DPEIS.** This should include monitoring, reporting and other measures as discussed by Chapter and Section below.

Monitoring and Reporting Requirements

Although the DPEIS is not intended to include project-level monitoring or reporting requirements for individual projects, it should nonetheless include general requirements for baseline assessments, monitoring, operations, maintenance, and adaptive management. Currently the DPEIS only provides a suite of potential monitoring and reporting practices that could be included in a plan. **The Council recommends the DPEIS require project applicants to develop detailed plans as described below**. These plans should be developed in coordination with the appropriate Federal and state permitting agencies and tribes as appropriate. Monitoring measures should be described with sufficient detail in the DPEIS to support the evaluation of monitoring plans proposed by project applicants.

- Baseline and Long-term Environmental Monitoring Plan: To assess the environmental impacts from the construction and operation of aquaculture facilities, substantial baseline information on water quality, ocean dynamics, species composition and abundances, habitat characterization, and other data must be compiled. A Baseline Environmental Study should be required in addition to a long-term Environmental Monitoring Plan to identify operational issues that could cause adverse effects to water quality, marine species, and benthic habitats. Both the baseline and long-term monitoring should be implemented by an independent third party and include spatial coverage beyond the proposed lease area to account for drift effects. The baseline information should be gathered seasonally and for a minimum of two years to account for natural variability. Similarly, post-project monitoring should also account for seasonal and annual variability for species and oceanographic conditions. Monitoring plans should also be designed to detect impacts on fisheries, wildlife, water quality, hydrodynamics, and benthic habitats, including accumulation and deposition of sediment or waste products. The monitoring plan should be used to assess whether the proposed setbacks from EFH HAPCs, deep sea coral and sponges, and hard bottom habitat are sufficient to avoid impacts to those sensitive habitats. **The Council recommends a Baseline Environmental Study should be required in addition to a long-term Environmental Monitoring Plan.**

- Finfish Aquaculture Monitoring Plan: **The Council recommends that a robust monitoring program should be part of any finfish aquaculture project to ensure any outbreaks of disease or parasites are contained and infected fish are immediately destroyed or removed, and cages containing finfish be made of materials and sited in such a way that the risk of escape is minimized to the greatest extent possible.** In the event of an escape, this should be communicated to local fishing fleets immediately and efforts to capture any escaped fish be undertaken. The monitoring and mitigation measures described in Appendix 1 of the DPEIS should be a requirement of any aquaculture. **The Council recommends complete sterilization of any finfish that are placed in open water cages, and that they be modified to make identification easy.** For example, some hatchery-raised salmon have their adipose fins removed for easy identification. **The Council also recommends any finfish aquaculture facilities only contain male fish or female fish so no spawning can occur.**

- Long-term Operations & Maintenance Plan: The DPEIS should require individual projects to develop a long-term Operations and Maintenance Plan for identifying operational issues that could cause adverse effects to water quality, marine species, and benthic habitat. As part of the Operation and Maintenance plan, project applicants should be required to immediately report any interactions or accidents such as interactions with non-project vessels and/or gear deployed by those vessels, marine wildlife, any loss of aquaculture gear or other infrastructure associated with the facility, high mortality or escapement of species being propagated, efforts to recover escaped species, accidental release of contaminants, excess feed or waste material, entanglement of objects or marine life with aquaculture gear, etc. **The Council recommends that the DPEIS require individual projects to develop a long-term Operations and Maintenance Plan for identifying operational issues that could cause adverse effects to water quality, marine species, and benthic habitat**.

- Adaptive Management Plan: The DPEIS should require a detailed mitigation and adaptive management plan that can be immediately implemented if impacts to water quality, marine species, or benthic habitats are observed. The marine environment presents significant uncertainty and natural variability, and unanticipated natural- or human-caused events can result in significant environmental harm. Appendix 1 of the DPEIS describes potential adaptive management approaches, which should be a required element of any aquaculture project. **The Council recommends the DPEIS include a detailed mitigation and adaptive management plan that can be immediately implemented if impacts to water quality, marine species, or benthic habitat are observed during monitoring**.

- Marine Debris Monitoring Plan: The Council is concerned that offshore aquaculture operations could introduce marine debris into the nearby ocean environment, potentially affecting benthic habitats, fish nursery grounds, or other important and sensitive habitat features. A marine debris monitoring and management plan, as described in DPEIS Appendix 1, should include measures to monitor marine debris (including unique marking or branding of all aquaculture gear with contact information), measures to prevent debris, actions to recover debris, and mitigation options for damage caused by marine debris. If consistent discoveries of certain gear types are found, the project should evaluate and implement use of alternative gear types or practices that would reduce these consistent sources of debris. NOAA should also consider insurance, bonding requirements, or other financial guarantees to ensure a project operator will have funds available for any necessary gear cleanup and/or any damage resulting from escape. The DPEIS should evaluate the appropriate amount of insurance, bonding, or financial guarantee. **The Council recommends the DPEIS include a requirement for project applicants to develop a Marine Debris Management and Monitoring Plan to minimize the risk of aquatic pollution**.

- Sediment Deposition, Accumulation, and Biofouling: Long-term Environmental Monitoring Plans (EMPs) should be required for aquaculture facilities, to monitor sediment deposition and accumulation, discharges, or solids that occur from aquaculture operations. Specific to macroalgae farming operations described in Alternatives 2a and 3a, EMPs should also monitor invertebrate and fish communities that are attracted to these facilities, including changes to benthic habitat, water quality, spread of non-native species, and the potential for facilities to function as fish aggregating devices. Adaptive management plans should include remediation options if there is evidence of deposition on the seafloor.

Section-Specific Comments

Chapter 1 – Introduction and Background

Section B ii - Status of Marine Aquaculture in the Southern California Bight Ecosystem
The DPEIS lists channel catfish and rainbow trout (both are freshwater species) in an overview of saltwater species that are grown in the state for food. This should be corrected for the Final PEIS.

Chapter 2 – Proposed Alternatives

Section A(ii)(a) – Shellfish and mariculture

The DPEIS implies the Alternatives provided are located in "deep, offshore waters." For many mariners, the waters in the locations of the proposed AOAs are neither deep nor offshore. For clarity, **the Council recommends using alternate language when characterizing the depth and location of the proposed locations**. For example, "moderately deep, coastal waters outside the State boundary line."

Section B - Alternatives Considered but Not Further Analyzed
Natural disasters and other "force majeure" events were deemed outside the scope for this DPEIS. Given the proximity of the Alternatives to earthquake faults, areas known to be subject to major wildfires, and prone to impacts from tsunamis from earthquake across the Pacific Rim**, the Council recommends that those be considered in the analysis.**

Chapter 3: Affected Environment and Environmental Consequences

Section B - Physical Environment and Potential Impacts

Subsection iii - Seafloor Characteristics
As noted in the DPEIS, the Atlas considers setbacks from certain habitats or management areas (rocky reef EFH HAPCs with a 152 m (500 ft) setback, deep-sea coral and sponge observations with a 500 m (1,640 ft) setback, and hard bottom habitat with a 152 m setback). However, the DPEIS does not specifically prescribe these setbacks as the minimum required setback distances, nor does the DPEIS clearly describe which activities, equipment or infrastructure these setbacks apply to. The DPEIS should clearly articulate the application (i.e., activities, equipment, infrastructure) of these setbacks and prescribe the minimum setback distances as a requirement for all aquaculture projects. Prescribed setbacks should account for the proximity to neighboring projects and those resulting cumulative effects on habitat resources. Furthermore, **the Council recommends project applicants be required to monitor and assess whether prescribed setbacks from EFH HAPCs, deep-sea coral and sponges, and hard bottom habitat are sufficient to avoid impacts to those sensitive habitats** (see *Baseline and Long-term Environmental Monitoring Plan* above).

The DPEIS states that "a more detailed and site-specific Baseline Environmental Survey (BES) may be needed for siting and permitting individual projects," but does not require a BES. **The Council recommends the DPEIS includes a mitigation measure that specifically requires individual projects to conduct site-specific BES's so that the highest resolution, site-specific information is being used to site these projects**.

Subsection iv – Water Quality
The DPEIS states that "projects sited in an AOA would *likely* have Best Management Practices or other permitting requirements that would be designed to manage water quality stressors; prevent spills, fires, or other sources of hazardous materials; conduct monitoring; and identify procedures to manage and clean up and report incidents," but this is not a stated requirement. **The Council recommends the DPEIS specifically require programmatic-level mitigation measures to avoid, minimize, or offset potential impacts from water quality stressors, potential spills of oils or hazardous materials, monitoring of impacts, and remediation efforts.** Additionally, **the Council recommends adding a water quality requirement that project applicants consider new technologies and propose alternatives that reduce or prevent discharge of uneaten feed**

and metabolic waste (as has been recently imposed by the Washington Department of Ecology).

The DPEIS also discusses the potential application of the Macroalgal Cultivation Modeling System (MACMODS) to be used in facility design and project level analysis, which can be used to assess potential impacts to hydrodynamic processes. Again, this is not a stated requirement. **The Council recommends the DPEIS specifically requires all project applicants to use MACMODS, or a similar modeling system, to analyze potential impacts of project siting and design on local hydrodynamic processes.**

The DPEIS references an environmental monitoring study of offshore finfish culture of mutton snapper and cobia in water off Puerto Rico which reported no evidence of anaerobic sediments beneath the fish cages, and inorganic nitrogen levels near the cages similar to background levels. However, the DPEIS fails to mention the depth of water those operations took place, nor does it mention prevailing currents, weather and oceanic conditions. Thus, it is not clear if that study would be applicable for informing potential finfish operations in any of the proposed AOAs. The other reports referenced in that section relating to a Pacific threadfin operation and an offshore aquaculture demonstration project off New Hampshire also do not describe the depth or prevailing conditions.

The DPEIS states on Page 84 that the Santa Monica AOAs options are within 5 km of inactive oil platforms. This appears to be an error as there are no oil platforms in marine waters within Santa Monica Bay.

Considering recent wildfires in Southern California, fire retardants such as Phos-Chek and other chemicals should be included as potential impacts to water quality. A recent study found wildfire retardant is laden with toxic metals.[3] How these metals may impact aquaculture operations, particularly whether those metals can be easily filtered or if they remain in the flesh of product, should be analyzed.

Section C. Biological Environment and Potential Impacts
Subsection i - Federally-Protected Species and Habitat

The Council agrees that recent updates to the methods and results for identifying cetacean Biologically Important Areas in marine waters of California published after the spatial modeling for the Atlas should be incorporated and reflected if and/or when NOAA publishes a Final DPEIS and during future site-specific environmental planning activities.

The DPEIS states "[d]ocumented entanglements of Federally protected species in shellfish aquaculture gear in other areas have included cetaceans and sea turtles." It also highlights risks to federally protected species and habitats are amplified given the uncertainty due to a lack of available information on aquaculture impacts to such species. The Council notes the great costs our fisheries and fishing communities are required to endure in order to minimize risks to federally

[3] https://www.firerescue1.com/wildfire-and-wildland-urban-interface/study-finds-wildfire-retardent-is-laden-with-toxic-metals

protected species.[4] Proposed aquaculture operations should be held to similar standards. For example, when whale migrations are occurring in or near the proposed locations of the AOAs lessees could be required to reduce the number of vertical lines in the water. The DPEIS correctly points out that marine aquaculture operations in the California EEZ are listed as a Category III fishery under the Marine Mammal Protection Act's list of fisheries. It should be noted the current List of Fisheries describes the Hawaiian offshore pen culture as a Category II fishery.

The DPEIS also states that it was rare to see gray whale cow-calf pairs more than 0.75 miles from shore. While this may be a true statement where water depths increase closer to shore, fishing industry participants operating in or near the areas identified under the Alternatives suggest, based on years of experience in these areas, that water depth is far more important in determining where cow-calf pairs are likely to be found, rather than distance from shore.

It is very likely that pinnipeds will frequent any developed aquaculture facilities. It will be important to ensure any disease found in any aquaculture facility be contained and not spread to any protected species and other wild populations.

Fishermen operating in or near the areas identified under the Alternatives are reporting significant increases in the presence of dolphin and porpoise. The DPEIS references a report from the Mediterranean which showed site-fidelity, changed hunting tactics, and exhibited different social structures in dolphin species around finfish facilities. This could have profound impacts on the commercial fishery for market squid which has historic dependence on areas identified under the alternatives. The presence of dolphin and/or porpoise changes the behavior of market squid and makes them much less catchable and also will keep squid fishermen from deploying their nets to avoid potential interactions.

Subsection ii – Wild Fish stocks

The DPEIS notes that waters in the Southern California Bight (SCB) are potential nursery for juvenile great white sharks. Fishermen with experience fishing in the areas near or within Alternative 1 believe that to be an important nursery area for thresher sharks and an area with historic presence of basking sharks.

Page 131 lists various international forums and agreements related to highly migratory species management. The treaty between the governments of Canada and the United States on Pacific Albacore Tuna Vessels and Port Privileges should be included in that list, as it impacts U.S. North Pacific albacore fishery participants.

The DPEIS cites data on fish and larval dispersal from the California Cooperative Oceanic Fisheries Investigations (CalCOFI) surveys but does not mention the nearshore surveys conducted by the California Wetfish Producers Association (CWPA). The CWPA surveys are conducted as cooperative research with CDFW and should be included as a potential source of information on wild fish presence and abundance.

[4] The California Dungeness Crab fishery is managed to minimize the risk of interactions with specified protected species (humpback whales, blue whales and leatherback sea turtles). This is accomplished by managing effort in the fishery during times when the risk is elevated.

The high likelihood of escapes from aquaculture facilities, particularly from finfish operations, remains a significant concern. As noted above, measures intended to ensure that any escapes will have no impacts on wild fish stocks should be required. While the NOAA Marine Aquaculture Policy (2011) supports the use of only native or naturalized species in Federal waters unless best available science demonstrates use of non-native or other species in Federal waters would not cause undue harm to wild species, **the Council strongly recommends that native species be prioritized.** The risk to wild fish that support commercial and recreational fishing communities should be minimized to the maximum extent possible.

Subsection iv - Potentially-Farmed Species

As noted above, the Council has serious concerns about the potential introduction of non-native species (fish, shellfish, and macroalgae), including risk of disease/parasite transmission, competition for resources, interbreeding, and impacts to habitat. The DPEIS states that AOAs are considered potentially suitable for finfish, shellfish, macroalgae, or multi-species aquaculture, and that, "This DPEIS assumes no non-native species would be grown in an AOA, thereby eliminating the risk of introducing non-native species to the environment, other than via contaminated broodstock." And yet the DPEIS identifies three non-native species as potentially suitable for finfish aquaculture in the AOAs (longfin yellowtail, olive flounder, and striped bass). Neither longfin yellowtail nor olive flounder are present in the SCB and there are only rare instances of recreational catch of striped bass within the SCB. The Council agrees that native species should be prioritized for aquaculture. **The Council does not support the use of non-native species and does not support the use of naturalized species without additional scrutiny**, as these species can be highly problematic for native species and habitats, particularly if they can out-compete native species for important resources. Given the high likelihood of escapes, any release of non-native species (even naturalized species) could have serious impacts on wild fish populations in the SCB.

The Council recommends against identifying longfin yellowtail, olive flounder. and striped bass as "suitable" in the DPEIS. The Council recommends close coordination with state and Federal agencies, stakeholders, researchers, and tribes, regarding species proposed for aquaculture prior to authorization.

The DPEIS includes discussion on regulatory frameworks that prevent contaminated broodstock; however, broodstock sourcing is outside the scope of the DPEIS which creates additional risk that should be addressed at project-level NEPA analyses.

The DPEIS states that "In New Zealand, in the past, mussel aquaculture was thought to accelerate the spread of harmful algal blooms, by harboring the phytoplankton and also stimulated by increased release of ammonium and other micronutrients." This is a significant concern for local commercial fisheries. Domoic acid is linked to harmful algal blooms and can close commercial fisheries in the interest of Public Health. As the DPEIS notes, the commercial fishery for spiny lobster is very important to ports and harbors near the AOA locations in Alternative 2. **The Council recommends additional studies be undertaken to better understand the link between industrial mussel aquaculture and domoic acid and appropriate mitigation measures be developed to minimize the risk of negative impacts on important commercial fisheries in the SCB**.

As noted above, it is very likely that seabirds and marine mammals will be present around any finfish aquaculture facilities. The DPEIS notes this will cause stress in the farmed species which could worsen a disease outbreak. Ensuring that any disease outbreak is contained should be required to avoid negative impacts to native fish stocks in the SCB.

Section D. Socioeconomic Environment and Potential Impacts
Subsection i – Commercial Fishing

Many potential impacts to the commercial fishing community are outlined above. The DPEIS is correct to acknowledge distinctions when considering impacts to fisheries, fishing fleets, and individual vessels. This important consideration should be further analyzed if and/or when any facilities are proposed.

The DPEIS discusses short-term adverse impacts on "benthic fish, urchin, and sea cucumber presence" during baseline surveys and construction. Squid eggs can be deposited during spawning activities and should be considered as a potential impact. Prior to conducting baseline surveys or construction, lessees should engage with the local commercial market squid fishery to determine if there is a potential impact to squid eggs.

The DPEIS identifies the trawl-based sea cucumber fishery as one which would not be able to take advantage of any ecological benefit from anchoring systems due to incompatibility of trawl operations and fixed aquaculture gear. This is equally true for purse seine fisheries and the set net fishery operating outside state waters.

"[T]he highest-ranked fishing transits in and around Alternative 2 are sea cucumber and California halibut trawl, prawn and Dungeness crab pot/trap, and gillnet." **The Council recommends including the market squid purse seine fishery which is active in those areas**. The DPEIS cites the EA for a past aquaculture facility near the San Pedro Shelf to support the proposition that "the majority of fishing effort for squid occurs within one mile from shore." While that may be a true statement when considering the full extent of squid effort in the SCB, that is untrue as it relates to areas in and around those described in Alternative 2. The squid fishery typically operates around depth contours ranging from 15 – 25 fathoms. There are many locations within the SCB where those depths are well outside one mile from shore. The Council reiterates a comment included in our letter on the Notice of Intent that there is no Dungeness crab fishery which operates in the SCB.

The DPEIS states that: "It is likely that projects within an AOA would be sited with some distance between them; so commercial fishing vessels could take advantage of this effect." However, this does not apply to most commercial fishing vessels. Commercial fishing vessels using trawl gear, purse seine gear, or set nets would likely be unable to take advantage of any fish aggregating benefits associated with aquaculture operations. A more accurate statement would be: "It is likely that projects within an AOA would be sited with sufficient distance between them; so that *some* commercial fishing vessels deploying certain gear types could take advantage of this effect."

The Ocean Rainforest's demonstration seaweed aquaculture facility on an 86-acre site in Federal waters approximately 4.4 nautical miles offshore of Santa Barbara contains a significant number

of buoys on the surface of the area. While not easily visible from the shore, they are quite visible to vessels transiting near the facility. The differing sizes of the buoys create confusion for mariners new to the area or who are unaware of the project. To minimize confusion and risk of navigation problems, **the Council recommends requiring standardized buoy design and set ups, depending on the type of aquaculture facility being proposed.**

Subsection ii – Recreational Fishing

The DPEIS should be updated to reflect the closure of the salmon fishery off California in 2024.

Recreational fishing activities based out of ports and harbors are dependent upon access to live bait. **The Council recommends the DPEIS analyze potential impacts on availability of live bait that support recreational fishing activities.**

Catalina Sea Ranch operated an aquaculture facility near the San Pedro Shelf. In 2019, an accident occurred where a 25-foot private recreational vessel capsized after a broken line from the facility wrapped the propellor of the vessel. The incident resulted in the death of a passenger onboard the vessel.[5] Any aquaculture developments in the heavily trafficked areas identified in the alternatives need to be mindful of ensuring their equipment is properly maintained and do not pose an undue risk to recreational or commercial fishermen who fish near the facility.[6]

Subsection iii – Markets and Regional Food Systems

The Council agrees that responsibly sited and managed aquaculture facilities can provide numerous benefits. Every effort must be made to ensure that those benefits do not come at the cost or expense of our local fishing communities. For example, if finfish aquaculture is allowed, lessees should engage with local fishing communities to consider harvests of farmed fish outside the time the commercial fishery is active. This would reduce competition in the marketplace while allowing buyers to have more confidence in a steady year-round supply. Assuming that local buyers/processors are utilized for offloading or other services, this would strengthen the business of those buyers and processors by ensuring a steady supply of product hitting the floor, likely increasing employment opportunities.

Future site-specific NEPA analyses must consider additional economic considerations. Of particular interest to the Council will be any potential negative impacts to local fishing communities. The Council fully supports the following statement from the DPEIS, "[m]ore precise, localized data from these fishing communities would be needed to ground-truth the high-level predictions in this DPEIS." It is our hope that any potential lessees do just that.

Subsection vi - Transportation and Navigation

Placement of aquaculture facilities in any of the locations identified in Alternatives 2 and 3 will result in the creation of hazards to navigation. Commercial and recreational vessel transit or fishing activities in and around these locations could be impacted. During the Consistency Review process undertaken by the State for the Catalina Sea Ranch project, one of the conditions required a lost

[5] https://www.latimes.com/socal/daily-pilot/news/story/2019-12-11/underwater-mussel-farm-reason-fishing-boat-capsized

[6] https://calmatters.org/environment/2020/05/california-shellfish-farming-aquaculture/

fishing gear and mitigation program. **The Council recommends any leases issued within the AOAs be required to have similar programs that compensate fishermen for lost gear.**

Subsection vii - Offshore Energy and Public Services

California Senate Bill 605 (Padilla) was signed into law in October of 2023. Among other things, this Bill required the California Energy Commission (CEC) to study the feasibility of wave and tidal energy projects in state and Federal waters off the California coast. It also required the CEC, in coordination and consultation with the California Coastal Commission, the Department of Fish and Wildlife, the Ocean Protection Council, and the State Lands Commission to "identify suitable sea space for offshore wave energy and tidal energy projects in state and federal waters." A draft of a report identifying suitable sea space is expected during the first quarter of this year. It is possible that areas identified within Alternative 2 or 3 will also be deemed suitable for wave or tidal energy facilities. **The Council recommends the DPEIS not be finalized until the CEC's Report on suitable sea space is finalized.** If there is overlap, that could change the analysis of potential cumulative impacts to fisheries and fishing communities.

Subsection viii - Public Health and Safety

Our comments above address potential public health concerns related to domoic acid and safety concerns related to proper maintenance of any future facilities.

Chapter 4: Cumulative Impacts and Climate Change

The DPEIS lists baseline conditions and trends in the SCB that should be considered for potential cumulative impacts. The DPEIS also lists current events and trends in the SCB and states that these are considered beyond the temporal and spatial scope of the DPEIS. The cumulative impact assessment does not include reasonably foreseeable aquaculture projects in southern California (e.g., Pacific Ocean Aquafarms, Ocean Rainforest, and Avalon Ocean Farm) or the Pier Wind Project in the Port of Long Beach. **The Council recommends potential impacts to marine resources from these reasonably foreseeable projects be included in the cumulative impact assessment**. Additionally, the cumulative impacts assessment should consider the potential environmental impacts to sensitive habitats and species from concentrating fishing effort that has been displaced outside of AOAs.

Section A. Past, Present, and Foreseeable Actions

Subsection ii - Other Ocean Uses and Current Events in the Southern California Bight

For the reasons identified above under the discussion of wave and tidal energy, **the Council** recommends including "Renewable Energy" under the list of topics which contribute to the baseline conditions and trends in the SCB and should be considered for potential cumulative impacts associated with aquaculture, should an AOA be identified.

Subsection iv - Marine Conservation Efforts

In October 2020, Governor Newsom issued Executive Order N-82-20[7] which establishes a state goal of conserving 30 percent of California's lands and coastal waters by 2030. It is unclear how implementation of the Executive Order may affect the California Marine Protected Area network,

[7] https://www.gov.ca.gov/wp-content/uploads/2020/10/10.07.2020-EO-N-82-20-.pdf

which could potentially be expanded to meet this goal. The Executive Order could potentially be considered as a marine conservation effort.

Thank you for consideration of these comments. Please contact Kerry Griffin (Kerry.Griffin@noaa.gov) on Council Staff with any questions or concerns.

Sincerely,



Brad Pettinger
Council Chair

KFG:kma

Cc: Council Members

Submitted Via: Email **Submitter Name/Organization:** Jean Prijatel - Manager, Policy and Operations Branch, Environmental Protection Agency

REGION 9
SAN FRANCISCO, CA 94105

March 20, 2025

Celia Barroso
Regional Aquaculture Coordinator, California
NOAA Fisheries West Coast Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802

Subject: Draft Programmatic Environmental Impact Statement for Aquaculture Opportunity Areas (AOAs) in Federal Waters Off the Coast of Southern California (EIS No. 20240219)

Dear Celia Barroso:

The U.S. Environmental Protection Agency has reviewed the above-referenced document pursuant to our NEPA review authority under Section 309 of the Clean Air Act. The CAA Section 309 role is unique to EPA. It requires EPA to review and comment on the environmental impact of any proposed federal action subject to NEPA's environmental impact statement requirements and to make its comments public.

The action proposed in the PEIS is to identify one or more locations (referred to as Aquaculture Opportunity Areas, or AOAs) that may be suitable for future offshore aquaculture projects in federal waters off Southern California, in furtherance of the May 2020 E.O. 13921 *Promoting American Seafood Competitiveness and Economic Growth*. AOAs identified through this process would be considered potentially suitable for finfish, shellfish, macroalgae, or multispecies aquaculture. The Draft PEIS evaluates the beneficial and adverse impacts of siting aquaculture in those locations. We acknowledge that the proposed action is a long-term planning effort and not a regulatory or permitting action. The analysis may be used to inform such processes for individual projects proposed in the future.

Review Summary
EPA did not identify significant public health, welfare, or environmental quality concerns to be addressed in the Final EIS and is providing recommendations to improve the assessment and environmental outcomes of the proposed action.

Future NEPA Reviews

NEPA Tiering

The Draft PEIS states that project-specific NEPA analyses may be needed in the future and that future proposed aquaculture projects may tier from the PEIS (pg. 15). Tiering refers to an approach where federal agencies first consider the broad, general impacts of a proposed program, plan, policy, or large scope project and then conduct subsequent, narrower, decision focused reviews. The EPA recommends that the Final PEIS discuss the prospects and "triggers" for developing additional NEPA documentation, including site-specific Environmental Assessments (EAs) or EISs for individualprojects, and when a proposed aquaculture project could rely on the PEIS for a tiered NEPA analysis.

Siting and Design Criteria

The Draft PEIS acknowledges some impacts (e.g., harmful algal blooms) that may be minimized with siting and design criteria. To assist the permitting process for subsequent project proposals, we recommend the Final PEIS establish siting, design, operational, or other relevant implementation criteria that can be implemented by future proposed projects to address potentially significant impacts. For example, reasonably foreseeable impacts for project specific proposals include catastrophic failure of aquaculture facilities. We recommend addressing siting and design criteria that can be adopted in project proposals to minimize environmental risks and impacts.

Engagement with Relevant Industries and Communities

The Draft PEIS describes how commercial fishing, recreational fishing, ports and working waterfronts, and tourism industries may be impacted by the identification of AOAs and future siting and development of aquaculture facilitieswithin the AOAs. The Draft PEIS does not describe any outreach or engagement opportunities that were provided to relevant industry and/or communities, including the aquaculture industry. We recommend that the Final PEIS document actions taken to provide opportunities for meaningful engagement with potentially affected communities and industry and disclose any concerns expressed during engagement. We also recommend including a description of how feedback and preferences are reflected in the NEPA decision-making process, including alternatives development, identification of the AOAs, analysis of beneficial and adverse impacts, and identification of the agency's preferred alternative.

Tribal Coordination

The Draft PEIS describes historic and present-day ocean use, harvest, and traditional practices by Tribes in the identified AOAs and acknowledges that aquaculture sited within AOAs may create areas that are not accessible for traditional practices (pg. 240). The Draft PEIS states that Tribal consultation will be done when individual aquaculture projects are proposed, and that NOAA has not conducted outreach or engagement with affected Tribes to inform the identification of the AOAs. We recommend coordinating with Tribes to identify issues and opportunities for minimization and mitigation of impacts. In the Final EIS, describe engagement with Tribes, identify the main concerns expressed by Tribes, and how those concerns were addressed in the selection of the preferred alternative.

The EPA appreciates the opportunity to review this Draft PEIS. If you have any questions, please contact me at (415) 947-4167, or contact Annelise Hill, the lead reviewer for this project, at (415) 972-3576 or hill.annelise@epa.gov.

Sincerely,

JEAN PRIJATEL

Digitally signed by JEAN PRIJATEL
Date: 2025.03.20 14:27:06 -07'00'

Jean Prijatel
Manager
Policy and Operations Branch

Comment ID Number: O-20250123-01

Submitted Via: Oral Comment **Submitter Name/Organization:** Nate Irwin, Santa Barbara Channelkeeper

Oral Comment:

Great, yeah, thank you so much. My name is Nate Irwin. I'm the policy associate with the Santa Barbara Channel Keeper, and, I just wanted to comment on, on the site, it says on your NCCOS site, where it talks about when these public quote unquote public listening sessions are going to be. It says that they're public listening sessions, so, it says that you can submit public comments up above, but, and then when you're on your presentation it says that this is the public comment period and that's the purpose of this meeting and I was just a little bit, I guess misled by the public listening session portion. I thought it was just a way for, you know, community members to get a better understanding of what's included in the DPEIS and what this process is like moving forward, just basically what Celia did such a great job of portraying. So I, I think that it might be great just to maybe change the verbiage on underneath, you know, Southern California attend a public listening session to comment on NOAA's aquaculture program or something like that because it's just a little bit confusing as far as what the purpose of this meeting was today, if that makes sense.

Comment ID Number: O-20250123-06

Submitted Via: Oral Comment **Submitter Name/Organization:** Nate Irwin, Santa Barbara Channelkeeper

Oral Comment:

Thank you so much. So, we've been able to review the DPEIS and our organization we're Santa Barbara Channel Keeper and we're a nonprofit dedicated to protecting restoring the Santa Barbara Channel, and its watersheds through science based advocacy, education, field work, and enforcement, and we're committed to ensuring that any aquaculture development is environmentally sustainable and appropriately managed to protect public trust resources.

Our comments specifically address alternative two in the Santa Barbara Channel, which is proposing multiple AOAs ranging from 1500 to 2000 acres each. covering a total of 15,000 acres. Our, our biggest concerns at this point after our initial review of the DPEIS are the size and the siting of the AOAs. They're, these large-scale operations increase the risk of cumulative environmental impacts like habitat disruption, water quality degradation, and user conflicts. They're near sensitive MPAs marine protected areas, essential fish habitat, and critical habitats for endangered species and they are risks of being negatively impacted by aquaculture activities.

And the DPEIS highlights the proximity of the Santa Barbara Channel to existing infrastructure and suggests that it may provide favorable conditions for aquaculture development. This characterization of the Santa Barbara Channel does not consider the high energy dynamics of the Channel. It's, it's subject to significant wave activity, strong currents, and frequent high winds, particularly during winter storms in Santa Ana events, these need to be addressed with more clarity and give an accurate description of the channel and its volatile environment.

Comment ID Number: O-20250123-06

We're concerned about inadequate regulatory safeguards of, aquaculture activities in federal waters. There's not a centralized federal Agency that's responsible for managing aquaculture in federal waters and there needs to be a more clear regulatory oversight environment overseeing these operations in federal waters. We're concerned about the environmental and ecological risks posed by offshore industrial aquaculture. Finfish operations can cause harmful alga blooms, oxygen depletion, and benthic habitat degradation. Escaped fish can outcompete native populations and spread disease, and the cumulative impacts are definitely a concern of ours as well. The DPEIS does not adequately assess the cumulative effects of multiple AOAs in the channel, and these could have impacts on water quality, fisheries, biodiversity, as well as spatial conflicts.

So, at this point, those are the comments that we have. We're looking forward to providing more detailed comments. Like I said before, we were unclear that this is going to be a comment period for this meeting. So, we look forward to providing more detailed comments in writing. Thank you so much.

Comment ID Number: O-20250123-02

Submitted Via: Oral Comment **Submitter Name/Organization:** Gary Burke – Board Member, Commercial Fishermen of Santa Barbara

Oral Comment:

Thanks. I'm Gary Burke here. I'm a member of the commercial Fishman of Santa Barbara and fish in the channel here and one of the things I didn't really look in the draft, this is a huge area for thresher sharks, especially pupping. And I didn't see kind of any note in the draft about that, I've done studies on them and it really a place where even the large ones congregate, number one. And number two also that it isn't noted is that it's an area for basking sharks, of which I hunted back in the days and anyway, I don't see any of that in the draft, and also I draft fishing for seabass, I didn't see that mentioned as I recall. So those are just my comments, thanks.

Comment ID Number: O-20250123-03

Submitted Via: Oral Comment **Submitter Name/Organization:** Steve Scheiblauer– Alliance of Communities for Sustainable Fisheries

Oral Comment:

Thank you. Yeah, I'm Steve Scheiblauer. I'm representing today the Alliance of Communities for Sustainable Fisheries. That's a regional central coast-based association of seven port associations for commercial fishing primarily, and it goes from Santa Barbara north to Half Moon Bay. And my comment really goes back to the Atlas project and, there it was a memorandum, so there was really no opportunity to provide public comments while it was being developed. And, and yet when it came out, it seemed to be extremely shortcoming on actually working with local commercial and recreational fishing folks about where these things should be located. I stress the where part of it. So there was this apparent lack of local outreach during that time and it seems like it's carried over largely into the new, you know, the new AOA

Comment ID Number: O-20250123-03

and the and the Programmatic EIS, and so it seems like NOAA needs to really go back and do some homework about the location of these. And then secondly, I will just observe that there's likely to be very strong objections to the finfish part of the aquaculture, no matter where it is. Thank you.

Comment ID Number: O-20250123-04

Submitted Via: Oral Comment **Submitter Name/Organization:** Mike Okoniewski– Coastal Pelagic Species Advisory Subpanel

Oral Comment:

I haven't studied this nearly enough. I have talked to some of our CPS people in the subpanel I represent. But I'm curious in Oregon and Washington, they send out, they usually find a permit holders that fish in the areas usually specific to one fishery, but nonetheless, I'm just wondering if you send out any kind of email notification to just permit holders or boat owners or anything like that or utilize the State of California to reach out to the fisherman. And if you do, I, I guess I didn't see any mention of it, but, it's just a yes or no question I guess. Thank you.

Comment ID Number: O-20250123-05

Submitted Via: Oral Comment **Submitter Name/Organization:** Emily Parker – Coastal and Marine Scientist, Heal the Bay

Oral Comment:

Okay, I'm going to assume that you can. So my name is Emily Parker. I'm a staff coastal and marine scientist with the nonprofit Heal the Bay. We are a, environmental nonprofit organization based in the Santa Monica area. We've been there for about four decades and we're, you know, dedicated to Coastal and Watershed health. And I just wanted to take a brief moment to 2nd the very first comment that we heard this afternoon. I think one of the reasons you may not be getting a lot of comments right now is that this was advertised as a listening session. I myself would have taken some time to prepare a more formal comment if, I think if it had been advertised as such that this was an opportunity to provide comments, so just wanted to just second that and thank you all for giving the presentation earlier today to talk a little bit more about the PEIS. Our Heal the Bay staff will take some time to read that PEIS as the, one of the, well, multiple of the alternatives do site aquaculture opportunity areas right in the bay where we do work in the Santa Monica Bay. But at this time we didn't have anything prepared because we weren't didn't know that this was going to be a time for public comment, so just want to just take a moment to second that and provide some explanation as to why you might not be getting a lot of raised hands right now. So thank you so much again and thanks for the opportunity to comment.

Index of Comment Letters Received

Comment ID Number: O-20250128-01

Submitted Via: Oral Comment **Submitter Name/Organization:** Nam Nguyen

Oral Comment:

Yeah yes, in the in the document, where can I find the information that decided or determined that San Diego region was not a suitable, not a suitable place for aquaculture? Did I come in? Checking. Can, can folks hear me?

(MODERATOR RESPONSE): Yes, I'm sorry. We can hear you. Thank you for chiming in today. Unfortunately, this is not a question and answer session. But if you would like to get in touch with our Regional aquaculture Coordinator via the contact information that was provided during this presentation, we're happy to answer questions that way.

Comment ID Number: O-20250128-02

Submitted Via: Oral Comment **Submitter Name/Organization:** Jeff Maassen – Santa Barbara based sea urchin diver, DOD contractor

Oral Comment:

I tuned in a little bit late. I was under the impression the meeting was postponed, and I got an email from one of our advisors. I am a Santa Barbara based sea urchin dive harvester for the past 40 years, and I also work for the DoD in contracting in a variety of operations here in the range in Point Mugu. During my tenure, of being a sea urchin dive harvester, I've noticed with the El Ninos and the warm water blob, we've had diminished kelp, in the near shore ecosystems, particularly at the Northern Channel Islands. We are seeing some, it's bouncing back a little bit, but, it's over the last 40 years since I started, it's progressively diminishing the amount of kelp availability, which directly relates to the vitality of nearshore fisheries and biodiversity.

So aside from that, what I did, four or five years ago is I diversified I was able to access two oil platforms, Houchin and Hogan, off of Carpinteria, Ventura, area, and I was harvesting mussels, and selling and hopefully I wanted to have them tested for human consumption. but I got no help from NOAA in Long Beach and I wanted to, I had in $50,000 of my own money to put into it to explore the palatability and feasibility of, of these muscles in terms of, how healthy they are and whether there are any contaminants that are emanating from the floor. sea floor up to the, the legs. So, in the process of developing that, I was selling them to commercial fishermen trappers, lobster and crab trappers, and they were using them as bait, keeping them whole and they were going in and scratching the lobsters and crabs and so that would attract more. So I, I developed a, a harvest plan based on supplying those, not that I expected it to be profitable, but, I, did my landings, paid my taxes on them and tried to develop it.

So, in, in my tenure of being able to dive, the platform legs and harvest, it became obvious that, we could plant scallops, abalone on the cross members, harvest the perpetually growing mussels and that there are some possibilities for aquaculture on, and around those oil platforms especially since, you know, it's a habitat that comes up, you know, to the intertidal. So, I wanted to make a suggestion and a request if perhaps the platforms as they're being decommissioned, that we keep those platforms into the intertidal, which is surface, keep them to the surface, maybe they need to be buoyed and lit, as hazards to navigation for maritime purposes. But, as an urchin diver I have an urchin vessel, a slip in the harbor, and there's

Comment ID Number: O-20250128-02

1520 other boats here in the harbor that would be interested in participating in growing, doing aquaculture experiments on the oil platform legs especially as more and more come, are becoming, shut in and decommissioned.

So I just wanted to plant that seed hopefully that we can make some forward traction on exploring and expanding the possibility of using those existing infrastructures to grow food for the community. And those are my comments. Thank you.

Comment ID Number: O-20250128-04

Submitted Via: Oral Comment **Submitter Name/Organization:** Jeff Maassen – Santa Barbara based sea urchin diver, DOD contractor

Oral Comment:

Okay, so I just wanted to, since this meeting isn't ringing off the hook, if I could just make a couple more comments. Would that be ok?

Awesome. Yeah, cause I noticed the 3 minute thing and I'm unfortunately I'm not very well prepared. I just got back into the country and I'm I have a cold, so I'm not a hundred percent. But, I did want to touch base that I did work with Diane Windham some five years ago when I was harvesting mussels off of Hauchin and Hogan and as I said, I was selling those to commercial fishermen, lobster and crab trappers to use as bait. My goal was, is to get to develop a testing protocol to determine suitability for human consumption. So at, at that point that I was doing the harvest, I was getting, paying landing taxes. I was doing it legitimately through the California Department Fish and Wildlife. I was posting I was weighing the mussels and posting and reporting the weight, to fish and wildlife paying the tax and fulfilling my obligations as a commercial harvester. The, the oil platforms are highly productive as they're in offshore waters and, the bio accumulation. has to be scraped off anyway and it typically falls to the sea floor where it's wasted. As a commercial fishing, commercial fishermen and many other commercial fishermen within my community were suffering, high, higher frequencies of El ninos and situations that are making it difficult to continue commercial fishing, so diversification is, is a, is in order.

And with that being said, I would like to strongly suggest that we explore including those oil platforms within the AAOs and, for, the technology of manual harvest and planting and as well as other attached potential of aquaculture ideas that may come up or prove to be feasible and lucrative. As an active commercial fisherman, it's not a big deal to, to tie off to an oil platform and dive down and harvest those mussels. There's a potential for abalone there's a potential for scallops, and other echinoderms, maybe even sea urchins on some of the, the cross members to be able to feed those out or feed lot them for harvest. So I'd like to formally request that you consider working with me and other commercial fishermen to develop, the use of oil platforms for aquaculture possibly even supporting us in that for pilot projects, in the form of a grant to be able to go out there, do the harvest, and submit those for testing to determine suitability for human consumption. I am working with local Chumash on a couple other projects.

Comment ID Number: O-20250128-03

Submitted Via: Oral Comment **Submitter Name/Organization:** Barbara Holzman – Professor Emeritus, San Francisco State University

Oral Comment:

Okay, thank you. My name's Barbara Holzman. I'm a Professor Emeritus from San Francisco State that I am a resident with Santa Barbara area, and I just wanted to comment on a couple of issues that I hope will be considered in your evaluation of the impacts. One is that this has, this Santa Barbara Channel has just been recently designated as a world whale heritage site and I am very interested in the potential impacts to our marine mammals in the Channel. We are currently seeing an increase in humpback whales in the area and some staying year round for our food. The channel is very productive as it is with our sanctuaries in place and the sanctuary people doing a great job of doing that. I really fear that adding some man-made aquaculture to the area may be very negatively impacting the marine mammal population.

The other impact is Santa Barbara Channel and I know your oceanographers will probably know this already, the winds in that are rather strong at times and the potential for pollution from these areas of aquaculture to the larger food web are very possible.

And the third impact that I want someone to pop to investigate is there's a lot of DDT contamination, a lot of professors down in Southern California have been looking at that and the impact of such aquaculture with anchoring and disturbing the potential DDT pollution and bringing it back up into the food web, which has been a hazard for a lot of marine animals in the past and finally seems to have settled down into the deeper areas of the Channels in Santa Monica as well. So I'm just leaving those three comments as hopefully will be considered in the impacts and I would urge a no action on this item. Thank you.



U.S. Secretary of Commerce
Howard Lutnick

Acting Under Secretary of Commerce
for Oceans and Atmosphere
Laura Grimm

Assistant Administrator for Fisheries
Eugenio Piñeiro Soler

September 2025

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