HAWAII-CALIFORNIA TRAINING AND TESTING

DRAFT ENVIRONMENTAL IMPACT STATEMENT/ OVERSEAS ENVIRONMENTAL IMPACT STATEMENT

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Hawaii-California Training and Testing

Draft Environmental Impact Statement/ Overseas Environmental Impact Statement

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Lead Agency:	United States Department of the Navy
Joint Lead Agencies:	United States Coast Guard, United States Army, United States Air Force
Cooperating Agency:	National Marine Fisheries Service
Title of the Proposed Action:	Hawaii-California Training and Testing
Designation:	Draft Environmental Impact Statement/Overseas Environmental Impact Statement

Abstract

The United States Department of the Navy (Navy) (including both the U.S. Navy and the U.S. Marine Corps) jointly with the U.S. Coast Guard, U.S. Army, and U.S. Air Force (collectively referred to as the Action Proponents), prepared this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) to comply with the National Environmental Policy Act and Executive Order 12114. This EIS/OEIS evaluates the potential environmental impacts of conducting training activities, testing activities, and range sustainment and modernization activities (referred to as military readiness activities) after December 2025 in the Hawaii-California Training and Testing Study Area (Study Area). The Study Area is made up of air and sea space off California, around the Hawaiian Islands, and a transit corridor connecting them. Three alternatives were analyzed in this EIS/OEIS:

- Under the No Action Alternative, the Action Proponents would not conduct the military readiness activities associated with the Proposed Action within the Study Area.
- Alternative 1 (Preferred Alternative and Environmentally Preferable Action Alternative) reflects a representative level of training and testing to account for the natural fluctuation of training and testing cycles and deployment schedules that would not have the maximum level of activities occurring year after year in any seven-year period. Using a representative level of activities rather than maximum level reduces the amount of ship hull-mounted, mid-frequency active sonar estimated to meet requirements. Under Alternative 1, the Action Proponents assume that some unit-level training and testing would be conducted using synthetic means (e.g., simulators) and some unit-level active sonar training would be completed through other training exercises. Alternative 1 also includes modernization and sustainment of ranges and would allow the Action Proponents to meet their statutory requirements and would maintain military readiness needed to deter aggression and conduct operations to defeat enemies.
- Under Alternative 2, the Action Proponents would be enabled to meet the highest levels of military readiness in order to deter aggression and conduct operations to defeat enemies. Alternative 2 reflects the maximum number of training and testing activities that could occur within a given year and assumes that the maximum level of activity would occur every year over a seven-year period. This allows for the greatest flexibility for the Action Proponents to maintain readiness when considering potential changes in the national security environment, fluctuations in schedules, and anticipated in-theater demands. Alternative 2 also includes modernization and sustainment of ranges.

The resources evaluated include air quality, sediments and water quality, vegetation, invertebrates, habitats, fishes, marine mammals, reptiles, birds, cultural resources, socioeconomics and environmental justice, and public health and safety.

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ES Executive Summary

ES.1 Introduction

The United States (U.S.) Department of the Navy (Navy) (including both the U.S. Navy and the U.S. Marine Corps) jointly with the U.S. Coast Guard (USCG), U.S. Army, and U.S. Air Force, has prepared this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) pursuant to the National Environmental Policy Act (NEPA) and Navy NEPA regulations (32 Code of Federal Regulations (CFR) 775) and consistent with 40 CFR section 1502.9(b). For this EIS/OEIS, Action Proponents within the Navy include Commander U.S. Pacific Fleet, the U.S. Marine Corps, Naval Air Systems Command, Naval Facilities Engineering and Expeditionary Warfare Center, Naval Sea Systems Command, Naval Information Warfare Systems Command, and Office of Naval Research. In addition to the Navy action proponents, the following joint lead agencies are participating due to the inclusion of limited training similar to Navy training covered in this EIS/OEIS: USCG, U.S. Army, and U.S. Air Force. As the lead federal agency, the Navy has coordinated closely with the joint lead agencies, and any commitments relative to the joint lead agency's proposed actions made in this EIS/OEIS are applicable to the joint lead agencies.

ES.1.1 Proposed Action

The Proposed Action is to conduct military readiness activities in the Hawaii-California Training and Testing (HCTT) Study Area, as represented in Figure ES-1. The National Marine Fisheries Service's (NMFS') Proposed Action is to promulgate regulations and issue Letters of Authorization (LOAs) under the Marine Mammal Protection Act (MMPA) authorizing take of marine mammals incidental to proposed military readiness activities.

ES.1.2 Purpose and Need

The purpose of the Proposed Action is to conduct training and testing activities, and modernization and sustainment of ranges in the HCTT Study Area to ensure the U.S. military services are able to organize, train, and equip service members and personnel, needed to meet their respective national defense missions in accordance with their Congressionally mandated requirements.[1]

The purpose of the National Marine Fisheries Service's (NMFS') action is to evaluate the Navy's requests for authorizations to take marine mammals, pursuant to specific requirements of the MMPA and its implementing regulations administered by NMFS, and to decide whether to issue the authorization. NMFS needs to render a decision regarding the requests for authorizations due to NMFS' responsibilities under the MMPA and its implementing regulations.

ES.2 Scope And Content of the Environmental Impact Statement/Overseas Environmental Impact Statement

This EIS/OEIS analyzes military readiness activities that could potentially affect human (e.g., socioeconomic) and natural resources, especially marine mammals, sea turtles, and fishes, and other marine and human resources. The range of alternatives includes the No Action Alternative and two action alternatives. In this EIS/OEIS, the Action Proponents analyzed direct, indirect, and cumulative effects. The Navy is the lead agency for the Proposed Action and, in coordination with the other Action Proponents and Joint Lead Agencies, is responsible for the scope and content of this EIS/OEIS.

[1] See Title 10, Sections 8062 (Navy), 8063 (U.S. Marine Corps), 7062 (U.S. Army), United States Code (U.S.C.) and Title 14, Sections 101 and 102 U.S.C. (USCG) for each service's specific language. The U.S. Army is included only for its activities at Pacific Missile Range Facility with potential in-water effects.

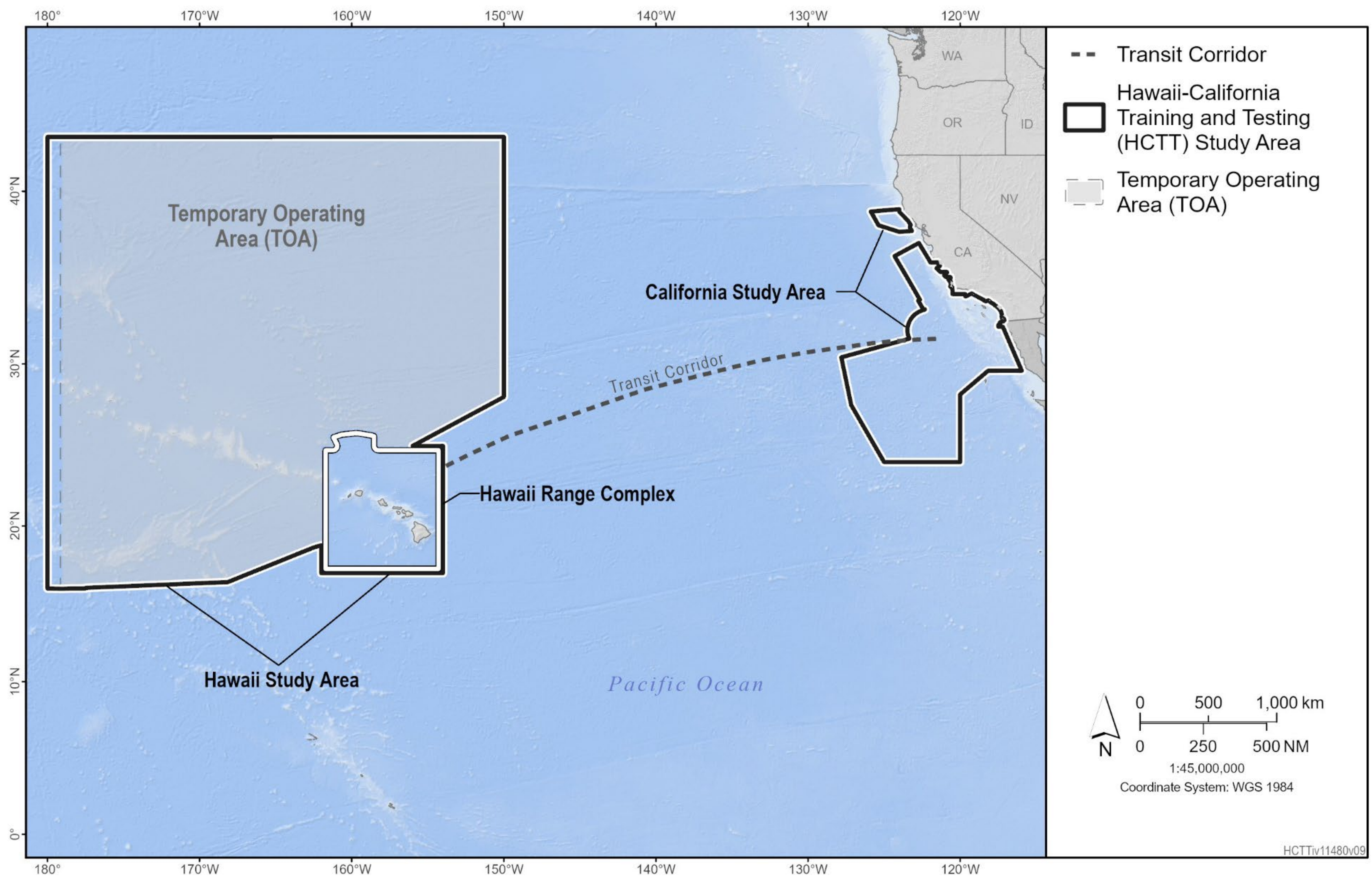

Figure ES-1: Hawaii-California Training and Testing Study Area

Notes: HCTT = Hawaii-California Training and Testing, TOA = Temporary Operating Area

NMFS is a cooperating agency because the scope of the Proposed Action and alternatives involves activities that have the potential to affect protected resources under the agency's jurisdiction and for which they have special expertise, including marine mammals, threatened and endangered species, essential fish habitat, and national marine sanctuaries.

Consistent with the Council on Environmental Quality (CEQ) Regulations, 40 CFR section 1505.2, the Navy, USCG, Army, and USAF will each issue a Record of Decision that provides the rationale for choosing one of the alternatives.

This EIS/OEIS has been prepared in accordance with the National Environmental Policy Act (NEPA) to examine the environmental effects of their proposed actions within the United States and its territories, and in accordance with Executive Order 12114 (44 *Federal Register* 1957) to examine effects of their proposed actions on the environment outside the United States, its territories, and possessions.

ES.3 Proposed Action and Alternatives

The Navy, as the lead agency, proposes to conduct training activities (hereinafter referred to as "training"); research, development, testing, and evaluation activities (hereinafter referred to as "testing"); and modernization and sustainment of ranges in the HCTT Study Area. The Study Area includes the waters of the Pacific Ocean along the coast of California and the waters around the Hawaiian Islands; the high seas west of California and surrounding Hawaii; pierside locations at Navy installations, within port transit channels and near civilian ports; and inshore waterways (e.g., San Diego Bay, Port Hueneme, Seal Beach, and Pearl Harbor). Training and testing activities prepare the Action Proponents to fulfill their missions to protect and defend the United States and its allies but have the potential to affect the environment.

These proposed activities are generally consistent with those analyzed in two separate NEPA planning documents, the 2018 Hawaii-Southern California Training and Testing (HSTT) EIS/OEIS (U.S. Department of the Navy, 2018) and the at-sea activities in the 2022 Point Mugu Sea Range (PMSR) EIS/OEIS (U.S. Department of the Navy, 2022), and are representative of the military readiness activities that the Action Proponents have been conducting off Hawaii and California for decades. This HCTT Study Area (Phase IV) differs from the HSTT Study Area (Phase III) in that HCTT includes a proposed expanded Southern California Range Complex (Warning Area 293 [W-293] and W-294) and two existing at-sea range areas (Point Mugu Sea Range and the Northern California Range Complex), as represented in Figure ES-2.

ES.3.1 No Action Alternative

Under the No Action Alternative, the Action Proponents would not conduct the proposed training and testing activities or the modernization and sustainment of ranges in the HCTT Study Area. Consequently, the No Action Alternative of not conducting the proposed live, at-sea training and testing in the Study Area is inherently unreasonable in that it does not meet the purpose and need (Section 1.5). However, the analysis associated with the No Action Alternative is carried forward in order to compare the magnitude of the potential environmental effects of the Proposed Action with the conditions that would exist if the Proposed Action did not occur (Section 3.0).

For NMFS, denial of the Navy's application for incidental take authorizations constitutes the NMFS No Action Alternative, which is consistent with NMFS' statutory obligation under the MMPA to grant or deny requests for takes incidental to specified activities.

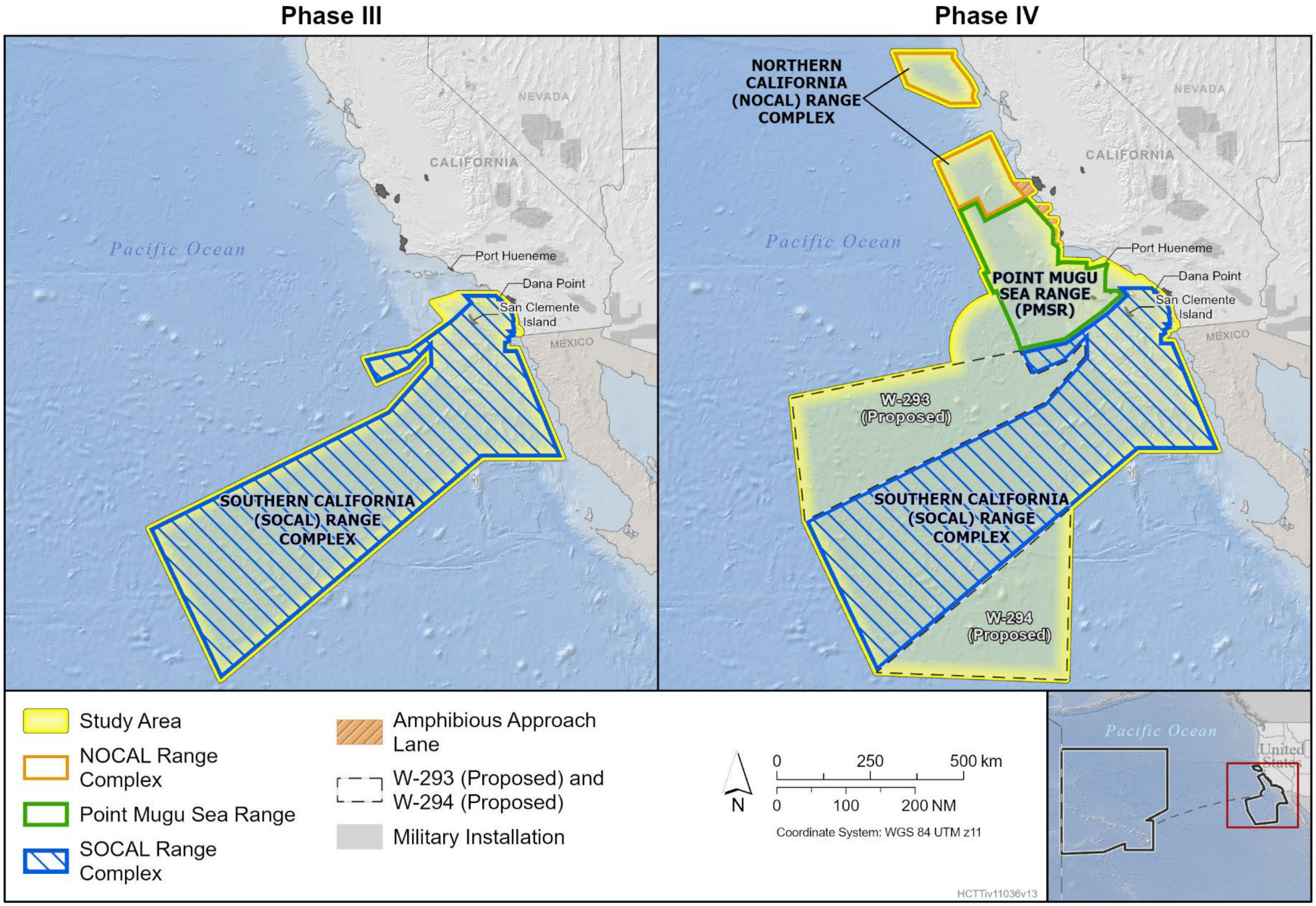

Figure ES-2: Changes to the California Portion of the Hawaii-California Training and Testing Study Area

ES.3.2 Alternative 1

Alternative 1 is the Preferred Alternative and the Environmentally Preferable Action Alternative and presumes a representative level of readiness requirements.

ES.3.2.1 Training

Under this alternative, the Action Proponents propose to conduct training activities in the expanded HCTT Study Area into the reasonably foreseeable future, as necessary to meet current and future readiness requirements. These training activities include new activities as well as activities subject to previous analysis that are currently ongoing and have historically occurred in the Study Area. The requirements for the types of activities to be conducted, as well as the intensity at which they need to occur, have been validated by senior military leadership. Specifically, Navy training activities are based on the requirements of the Optimized Fleet Response Plan and on changing world events, advances in technology, and Navy tactical and strategic priorities. These activities account for force structure changes and include training with new aircraft, vessels, unmanned/autonomous systems, and weapon systems that will be introduced to the fleets after December 2025. Under Alternative 1, the Action Proponents assume that some unit-level anti-submarine warfare training would be conducted using synthetic means (e.g., simulators). Additionally, this alternative assumes that some unit-level active sonar training would be completed during integration with other larger training exercises.

ES.3.2.2 Testing

Under Alternative 1, the Action Proponents proposes an annual level of testing that reflects the fluctuations in testing programs by recognizing that the maximum level of testing would not be conducted each year. The majority of testing activities that would be conducted under this alternative are the same as, or similar to, those conducted currently or in the past. This alternative also includes the testing of new technologies and considers the inherent uncertainties in this type of testing after December 2025.

ES.3.2.3 Range Modernization and Sustainment

This alternative includes the establishment of new special use airspace, modernization of the existing Southern California Offshore Anti-Submarine Warfare Range (SOAR) underwater tracking and communication range, the installation, use, and maintenance of two Shallow Water Training Ranges as extensions to the SOAR, deployment of seafloor cables and instrumentation, installation and maintenance of mine warfare and other training areas; and installation and maintenance of underwater platforms, as described in Section 2.3.4.

ES.3.3 Alternative 2

ES.3.3.1 Training

As under Alternative 1, this alternative includes new and ongoing activities. Under this alternative, the Action Proponents would be enabled to meet the highest levels of military readiness by conducting the majority of training live at sea, and by meeting unit-level training requirements using dedicated, discrete training events, instead of combining them with other training activities as described in Alternative 1.

Alternative 2 reflects the maximum number of training activities that could occur within a given year and assumes that the maximum level of activity would occur every year over any 7-year period. This allows for the greatest flexibility for the Navy to maintain readiness when considering potential changes in the national security environment, fluctuations in training and deployment schedules, and anticipated in-theater demands. Both unit-level training and major training exercises are assumed to occur at a maximum level every year.

ES.3.3.2 Testing

As under Alternative 1, this alternative includes new and ongoing activities. Under this alternative, the Action Proponents would be enabled to meet the highest levels of military readiness by conducting the majority of testing at sea.

Alternative 2 would include the testing of some new systems using new technologies, considering the potential for delayed or accelerated testing schedules, variations in funding availability, and innovations in technology development. To account for these inherent uncertainties in testing, this alternative assumes a greater level of testing efforts predicted for each individual system or program could occur in any given year. This alternative also includes the contingency for augmenting some weapon systems tests in response to potential increased world conflicts and changing military leadership priorities as the result of a direct challenge from an opponent that possesses near-peer capabilities. Therefore, this alternative includes the provision for higher levels of annual testing of certain systems to support expedited delivery of these systems to the fleet.

ES.3.3.3 Range Modernization and Sustainment

Under Alternative 2, Range Modernization and Sustainment is unchanged from Alternative 1.

ES.4 Summary of Environmental Effects

Environmental effects which might result from implementing the Proposed Action or alternatives have been analyzed in this EIS/OEIS. Resource areas analyzed include air quality, sediments and water quality, vegetation, invertebrates, habitats, fishes, marine mammals, reptiles, birds, cultural resources, socioeconomics and environmental justice, and public health and safety. Consistent with the revised NEPA regulations promulgated by the CEQ on May 1, 2024, Action Proponents must determine the environmental consequences of the Proposed Action and reasonable alternatives. Per 40 CFR section 1502.16(a), a comparison of the proposed action and reasonable alternatives is based on the reasonably foreseeable effects of their activities and the significance of those effects under the criteria presented in 40 CFR section 1501.3. A significance determination under 1501.3(d) considers the context of the action and the intensity of the effect to determine the significance of reasonably foreseeable adverse effects of activities under the proposed action. A significance determination is only required for activities that have reasonably foreseeable adverse effects on the human environment based on the eight listed factors in 1501.3(d)(2). To this end, the significance determination analysis reaches a significant/less than significant conclusion only for activities with reasonably foreseeable adverse effects on any of the listed factors.

Table ES-1 provides a comparison of the potential environmental effects of the No Action Alternative, Alternative 1 (Preferred Alternative), and Alternative 2.

Table ES-1: Summary of Environmental Effects for the No Action Alternative, Alternative 1, and Alternative 2

Stressor	No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 2
Section 3.1 Air Quality and Climate Change			
Criteria air pollutants	Unchanged or slightly improved from baseline conditions	**Less than significant effects** The emission of criteria pollutants resulting from activities in the Study Area would not cause a violation or contribute to an ongoing violation of the National Ambient Air Quality Standards.	**Less than significant effects**
Hazardous air pollutants	Unchanged or slightly improved from baseline conditions	**Less than significant effects** Emissions from the action alternatives would produce ambient hazardous air pollutant effects that are not expected to contribute to human health risks from HAP exposure in areas where public presence is expected.	**Less than significant effects**
Greenhouse gases	Unchanged or slightly improved from baseline conditions	**Less than significant effects** In combination with past and future emissions from all other sources, greenhouse gas emissions would contribute incrementally to the global warming that produces the adverse effects of climate change.	**Less than significant effects**
Section 3.2 Sediments and Water Quality			
Explosives and explosives byproducts	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects** Effects on sediment and water quality from unconsumed explosives and constituent chemical compounds would be localized to an area immediately adjacent to the munition. Chemical and physical changes to sediments, as measured by the concentrations of explosives byproduct compounds, may be detectable within a limited radius of the munition but would not result in harmful effects on biological resources or habitats.	**No reasonably foreseeable adverse effects**
Metals	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects** The effects of releases from expended materials with metal components or munitions on sediment and water quality may be measurable within the area adjacent to the metal object, but concentrations would be below applicable regulatory standards or guidelines for adverse effects on biological resources and habitats.	**No reasonably foreseeable adverse effects**
Chemicals and other materials not associated with explosives	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects** Effects would be localized to the immediate area of the source of the chemicals/materials. Chemical and physical changes to sediment and water quality, as measured by the concentrations of contaminants associated with the expended material, would likely be indistinguishable from conditions at reference locations.	**No reasonably foreseeable adverse effects**

Table ES-1: Summary of Environmental Effects for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Stressor	No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 2
Section 3.3 Vegetation			
Explosives	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Explosives could affect vegetation by destroying individuals or damaging parts of individuals; however, there would be no persistent or large-scale effects on the growth, survival, distribution, or structure of vegetation, primarily due to the avoidance of sensitive habitats and recovery of relatively small areas of disturbed vegetation.	
Physical Disturbance and Strike	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Physical disturbance and strike could affect vegetation by destroying individuals or damaging parts of individuals; however, there would be no persistent or large-scale effects on the growth, survival, distribution, or structure of vegetation.	
Secondary	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Project secondary effects on marine vegetation from suspended sediments and turbidity would be minor, temporary, and localized. In addition, no persistent or large-scale effects on the growth, survival, distribution, or structure of marine vegetation is expected.	
Section 3.4 Invertebrates			
Acoustics	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Available information indicates that invertebrate sound detection is primarily limited to low frequency (less than 1 kilohertz) particle motion and water movement that diminishes rapidly with distance from a sound source. The expected effect of noise on invertebrates is correspondingly diminished and mostly limited to offshore surface layers of the water column where only zooplankton, squid, and jellyfish are prevalent mostly at night when military readiness activities occur less frequently.	
Explosives	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Explosives produce pressure waves that can harm invertebrates in the vicinity of where they typically occur; mostly offshore surface waters where zooplankton, squid, and jellyfish are prevalent mostly at night when military readiness activities with explosives do not typically occur. Invertebrate populations are generally smaller offshore than inshore due to the scarcity of habitat structure and comparatively lower nutrient levels.	

Table ES-1: Summary of Environmental Effects for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Stressor	No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 2
Physical Disturbance and Strike	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Most risk exists offshore where invertebrates are less abundant and near the surface during the day when actions are typically occurring, there is more interaction risk, but to smaller populations of invertebrates. Invertebrate communities in affected soft bottom areas are naturally resilient to occasional disturbances. Accordingly, population-level effects are unlikely.	
Entanglement	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Most entanglement risk occurs in offshore areas where invertebrates are relatively less abundant. The risk of entangling invertebrates is minimized by the typically linear nature of the expended structures (e.g., wires, cables), although decelerators/parachutes have mesh that could pose a risk to those invertebrates that are large and slow enough to be entangled. Deep-water coral could also be entangled by drifting decelerators/parachutes, but co-occurrence is highly unlikely given the extremely sparse coverage of corals in the deep ocean.	
Ingestion	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Most MEM are too large to be ingested, and many invertebrate species are unlikely to consume an item that does not visually or chemically resemble its natural food. Exceptions occur for materials fragmented by explosive charges or weathering, which could be ingested by filter- or deposit-feeding invertebrates. Ingestion of such materials would likely occur infrequently.	
Secondary	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Effects on invertebrate prey availability from military readiness activities would likely be insignificant overall based on the analysis conclusions for the direct stressors on their food resources (e.g., vegetation, other invertebrates, fish, other animal carcasses).	
Section 3.5 Habitats			
Explosives	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Most of the high-explosive MEM would detonate at or near the water surface. The surface area of bottom substrate affected would be an extremely small fraction of the total Study Area.	
Physical Disturbance and Strike	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Most seafloor devices, including training mine shapes and anchors, seafloor cables, and underwater platforms, would be placed in areas that would result in minor and temporary bottom substrate effects. Once on the seafloor and over time, MEM, anchors, and seafloor devices would be buried by sediment, corroded from exposure to the marine environment, or colonized by benthic organisms. The surface area of bottom substrate affected over the short-term would be a tiny fraction of the total Study Area.	

Table ES-1: Summary of Environmental Effects for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Stressor	No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 2
Section 3.6 Fishes			
Acoustics	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Some sonars, vessel and weapons noise could result in masking, physiological responses, or behavioral reactions. Aircraft noise would not likely result in effects other than brief, mild behavioral responses in fishes that are close to the surface. Air guns and pile driving have the potential to result in mortality, injury, or hearing loss at very short ranges (tens of meters) in addition to the effects listed above. Most effects are expected to be temporary and infrequent as most activities involving acoustic stressors would be temporary, localized, and infrequent resulting in short-term and mild to moderate effects. More severe effects (e.g., mortality) could lead to permanent effects for individuals but, overall, long-term consequences for fish populations are not expected.	
Explosives	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Sound and energy from explosions can cause mortality, injury, hearing loss, masking, physiological stress, or behavioral responses. The time scale of individual explosions is very limited and repeated exposure of individuals is unlikely. Most effects such as hearing loss or behavioral responses are expected to be short term and localized. More severe effects (e.g., mortality) could lead to permanent effects for individuals but, overall, long-term consequences for fish populations are not expected.	
Energy	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Effects from the use of in-water electromagnetic devices are expected to be temporary and minor. Similar to regular vessel traffic that is continuously moving and covers only a small spatial area during use, in-water electromagnetic fields would be continuously moving and cover only a small spatial area during use; thus, population-level effects are unlikely. Exposure to high-energy lasers could occur only if the laser misses the target and a fish is at or near the surface at the precise location and time.	
Physical Disturbance and Strike	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		The use of vessels, in-water devices, MEM, and seafloor devices pose a risk for collision, stress response, or effects caused by sediment disturbance, particularly near coastal areas and bathymetric features where fish densities are higher. Most fishes are mobile and have sensory capabilities that enable them to detect and avoid vessels and other items.	

Table ES-1: Summary of Environmental Effects for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Stressor	No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 2
Entanglement	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Physical characteristics of wires and cables, decelerators/parachutes, and nets, combined with the sparse distribution of these items throughout the Study Area, indicates a very low potential for fishes to encounter and become entangled in them. Because of the low numbers of fishes potentially affected by entanglement stressors, population-level effects are unlikely.	
Ingestion	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		The likelihood that expended items would be ingested and cause an adverse effect would depend on the size and feeding habits of a fish, the rate at which a fish would encounter items, and the composition and physical characteristics of the item. Because of the low numbers of fish potentially affected by ingestion stressors, population-level effects are unlikely and effects would be less than significant.	
Secondary	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Effects on habitat and prey availability would be negligible, and not have secondary effects on fishes.	
Section 3.7 Marine Mammals			
Acoustics	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		The potential for exposure to noise varies for each marine mammal population present in the Study Area. Exposures to sound-producing activities may cause auditory masking, physiological stress, or minor behavioral responses. Exposure to some sonars, air guns, and pile driving may also affect hearing and cause a range of behavioral reactions. Although individual marine mammals would be affected, no adverse effects to marine mammal populations are anticipated.	
Explosives	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		The potential for exposure to explosives (in the water or near the water's surface) varies for each marine mammal population present in the Study Area. The impulsive, broadband sounds from explosions introduced into the marine environment may cause auditory effects, auditory masking, physiological stress, and behavioral responses. Explosions in the water or near the water's surface present a risk to marine mammals located near the explosion, because the resulting shock waves can result in the injury or mortality of an animal. The number of auditory, non-auditory injury and mortality, and behavioral effects are estimated for each stock.	

Table ES-1: Summary of Environmental Effects for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Stressor	No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 2
Energy	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		A marine mammal would have to be in close proximity to an electromagnetic source for there to be any effect. Potential adverse effects from high-energy lasers are not expected due to the automatic shut-off feature of the system. Adverse effects from high-power microwave devices would only be possible for marine mammals directly struck by the microwave beam. Statistical probability analyses demonstrate with a high level of certainty that no marine mammals would be struck by a high-power microwave device.	
Physical Disturbance and Strike	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		The probability of whale strikes by Navy and USCG vessels was calculated based on an analysis of past strike data and anticipated future training and testing vessel use at-sea. Since vessel use would remain similar to vessel use over the past decade, the potential for striking a marine mammal remains similarly low. The results of the analysis indicate a very low probability of strike that could result in injury or mortality to large whale species. The use of vessels and in-water devices and MEM during military readiness activities would have less than significant adverse effects on marine mammals. A vessel strike on an individual marine mammal would be considered a significant adverse effect on the individual even if the strike does not result in mortality. Nevertheless, the probability of a vessel strike remains low.	
Entanglement	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Physical characteristics of wires and cables, decelerators/parachutes, and nets and other obstacles, combined with the sparse distribution of these items throughout the Study Area, indicate a very low potential for marine mammals to encounter and become entangled in them.	
Ingestion	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		The likelihood that a marine mammal would encounter and subsequently ingest a military expended item residing in deep water on the seafloor is considered low. Large buoyant MEM (e.g., parachutes) that remain at the surface or in the water column before sinking to the seafloor have a greater potential to be encountered; however, ingestion of MEM that is dissimilar to prey is unlikely.	

Table ES-1: Summary of Environmental Effects for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Stressor	No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 2
Secondary	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Secondary stressors from military readiness activities are not expected to have short-term effects on individual marine mammals or long-term effects on marine mammal populations. Secondary stressors may affect main Hawaiian Islands insular false killer whale and Hawaiian monk seal critical habitats.	
Section 3.8 Reptiles			
Acoustics	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Reptiles could be affected by only a limited portion of acoustic stressors because reptiles have limited hearing abilities. Exposures to sound-producing activities present risks that could include hearing loss, auditory masking, physiological stress, and changes in behavior, while non-auditory injury and mortality are unlikely to occur under realistic conditions.	
Explosives	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Explosions close to a reptile present a risk because the shock waves produced by explosives could cause injury or result in the death. If further away from the explosion, impulsive, broadband sounds introduced into the marine environment may cause hearing loss, masking, physiological stress, or changes in behavior.	
Energy	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		The magnetic fields generated by electromagnetic devices used in military readiness activities are of relatively minute strength. Fields and electrical pulses may include no reaction, avoidance, habituation, changes in activity level, or attraction, but the range of effects would be small and only occur near the source. High-energy lasers and microwaves are directed at surface targets and would only affect reptiles very near the surface if the laser missed its target, and the potential for exposure to these energy weapons is negligible.	
Physical Disturbance and Strike	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Vessels, in-water devices, and seafloor devices present a risk for collision with sea turtles, particularly in coastal areas where densities are higher. Strike potential by expended materials is statistically small. Because of the low numbers of sea turtles potentially affected by activities that may cause a physical disturbance and strike, population-level effects are unlikely. Sea snakes considered in this analysis rarely occur in the Study Area, and few, if any, effects are anticipated.	

Table ES-1: Summary of Environmental Effects for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Stressor	No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 2
Entanglement	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		The potential for effects to sea turtles is dependent on the physical properties of the expended materials and the likelihood that a sea turtle would encounter a potential entanglement stressor and then become entangled in it. Physical characteristics of wires and cables and decelerators/parachutes combined with the sparse distribution of these items throughout the Study Area indicates a very low potential for sea turtles to encounter and become entangled in them. Long-term effects on individual sea turtles and sea turtle populations from entanglement stressors are not anticipated.	
Ingestion	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Adverse effects from ingestion of MEM would be limited to the unlikely event that a sea turtle would be harmed by ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system. The likelihood that a sea turtle or sea snake would encounter and subsequently ingest a military expended item is considered low. Long-term consequences to sea turtle populations from ingestion stressors are not anticipated.	
Secondary	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Secondary stressors are not expected to have short-term effects on individual sea turtles or long-term effects on sea turtle populations.	
Section 3.9 Birds			
Acoustics	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Unless very close to an intense sound source, responses by birds to acoustic stressors would likely be limited to short-term behavioral responses. Some birds may be temporarily displaced, and there may be temporary increases in stress levels. Although individual birds may be affected, population-level effects would not occur.	
Explosives	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Birds could be exposed to in-air explosions. Sounds generated by most small underwater explosions are unlikely to disturb birds above the water surface. However, if a detonation is sufficiently large or is near the water surface, birds above the water surface could be injured or killed. Detonations in air could injure birds while either in flight or at the water surface. An explosive detonation would likely cause a startle reaction, as the exposure would be brief, and any reactions are expected to be short term. Although a few individuals may experience long-term effects and potential mortality, population-level effects would not occur.	

Table ES-1: Summary of Environmental Effects for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Stressor	No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 2
Energy	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		The effect of energy stressors on birds is expected to be negligible based on (1) the limited geographic area in which they are used, (2) the rare chance that an individual bird would be exposed to these devices while in use, and (3) the tendency of birds to temporarily avoid areas of activity when and where the devices are in use.	
Physical Disturbance and Strike	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		There is a potential for individual birds to be injured or killed by physical disturbance and strikes during training and testing. However, there would not be long-term species or population-level effects due to the vast area over which training and testing activities occur, and the small size of birds and their ability to flee disturbance.	
Ingestion	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		It is possible that persistent expended materials could be accidentally ingested by birds while they were foraging for natural prey items, though the probability of this event is low as (1) foraging depths of diving birds is generally restricted to the surface of the water or shallow depths, (2) the material is unlikely to be mistaken for prey, and (3) most of the material remains at or near the sea surface for a short length of time.	
Secondary	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Implementation of the Proposed Action would not adversely affect populations of invertebrate or fish prey resources of birds and therefore would not indirectly affect birds.	
Section 3.10 Cultural Resources			
Explosives	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Explosive stressors resulting from underwater explosions creating shock waves and cratering of the seafloor occur at the surface or, if underwater, in specific detonation areas where no known cultural resources are present. Additionally, the Navy military routinely avoids known obstructions, including cultural resources.	
Physical Disturbance and Strike	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Vessels and in-water devices are operated in a manner to avoid known obstructions, including submerged historic and cultural resources; and the Navy's seafloor devices are placed to avoid underwater obstructions, including submerged cultural resources. Physical disturbance and strike stressors resulting from in-water devices, MEM, seafloor devices, and pile driving activities would not result in adverse effects on known or unknown submerged cultural resources.	

Table ES-1: Summary of Environmental Effects for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Stressor	No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 2
Section 3.11 Socioeconomic Resources and Environmental Justice			
Accessibility	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Accessibility stressors are not expected to affect commercial transportation and shipping, commercial and recreational fishing, subsistence use, or tourism because inaccessibility to areas of co-use would be temporary and of short duration (hours).	
Airborne acoustics	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Airborne acoustic stressors are not expected to affect tourism or recreational activity because military readiness activities would occur well out to sea, far from tourism and recreation locations.	
Physical disturbance and strike	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Physical disturbance and strikes are not expected to affect commercial and recreational fishing, subsistence use, or tourism because of the large size of the Study Area, the limited areas of operations, and implementation of standard operating procedures.	
Subsistence fishing	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		If activities were to occur in areas where subsistence fishing takes place, closures would be temporary (lasting until the activity is complete). Communities would not be disproportionately affected by changes to accessibility of ocean areas when compared to others who fish in the Study Area.	
Air quality and climate change	Unchanged or slightly improved from baseline conditions	**Less than significant effects**	**Less than significant effects**
		Air pollutant emissions associated with military readiness activities would not be expected to measurably affect the air quality in nearshore communities with environmental justice concerns.	
Secondary	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		No secondary effects on socioeconomic resources would occur based on the results of analyses of invertebrates, fishes, and marine mammals. Therefore, indirect or secondary effects on commercial transportation, commercial or recreational fishing, subsistence fishing, and tourism are not anticipated.	

Table ES-1: Summary of Environmental Effects for the No Action Alternative, Alternative 1, and Alternative 2 (continued)

Stressor	No Action Alternative	Alternative 1 (Preferred Alternative)	Alternative 2
Section 3.12 Public Health and Safety			
Underwater energy	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Because of the military's SOPs, effects on public health and safety from underwater energy would be unlikely.	
In-air energy	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Because of the military's SOPs, effects on public health and safety from in-air energy would be unlikely.	
Physical interactions	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Because of the military's SOPs, effects on public health and safety from physical interactions would be unlikely.	
Secondary stressors	Unchanged or slightly improved from baseline conditions	**No reasonably foreseeable adverse effects**	**No reasonably foreseeable adverse effects**
		Previous analyses determined that any effects to water quality would be temporary and minimal. No state or federal standards or guidelines would be violated. Consequently, military readiness activities would result in no indirect effects on public health and safety associated with sediments and water quality.	

Notes: MEM = Military Expended Material, USCG = United States Coast Guard, SOP = Standard Operating Procedure

ES.5 Cumulative Effects

Cumulative effects were analyzed for each resource addressed in Chapter 3 for the No Action Alternative, Alternative 1, and Alternative 2 in combination with past, present, and reasonably foreseeable future actions. Analysis was not separated by alternative because the data available for the cumulative effects analysis was mostly qualitative in nature and, from a landscape-level perspective, these qualitative effects are expected to be generally similar.

Consistent with CEQ guidance, the cumulative effects analysis focused on effects that are "truly meaningful." The level of analysis for each resource was commensurate with the intensity of the effects identified in Chapter 3.

The Action Alternatives would contribute incremental effects on the ocean ecosystem, which is already experiencing and absorbing a multitude of stressors to a variety of receptors. In general, it is not anticipated that the implementation of the Proposed Action would meaningfully contribute to the ongoing stress or cause significant collapse of any particular marine resource, but it would further cause minute effects on resources that are already experiencing various degrees of interference and degradation. It is intended that the mitigation measures described in Chapter 5 will further reduce the potential effects of the Proposed Action in such a way that they are avoided to the maximum extent practicable and to ensure that effects do not become cumulatively significant to any marine resource.

Marine mammals and sea turtles are the primary resources of concern for cumulative effects analysis, but the Proposed Action is not anticipated to meaningfully contribute to the decline of these populations or affect the stabilization and recovery thereof. The Action Proponents propose to implement standard operating procedures that reduce the likelihood of overlap of stressors resulting from the Proposed Action in time and space with stressors from other sources, and mitigation measures as described in Chapter 5 reduce the risk of direct effects of the Proposed Action on individual animals.

The aggregate effects of past, present, and other reasonably foreseeable future actions have resulted in significant effects on some marine mammal and all sea turtle species in the Study Area; however, the decline of these species is chiefly attributable to other stressors in the environment, including the synergistic effect of bycatch, entanglement, commercial vessel traffic, ocean pollution, and coastal zone development. The incremental contribution of the Proposed Action to cumulative effects on air quality, sediments and water quality, vegetation, invertebrates, habitats, fishes, birds, cultural resources, socioeconomic resources and environmental justice, and public health and safety would not significantly contribute to cumulative stress on those resources.

Table ES-2: Summary of Cumulative Effects for the No Action Alternative, Alternative 1, and Alternative 2

Resource Category	Summary of Cumulative Effects
Air Quality	The incremental contribution of the Proposed Action within and beyond state waters, when added to the effects of all other past, present, and reasonably foreseeable future actions would not result in measurable additional effects to air quality in the Study Area or beyond.
Sediments and Water Quality	The incremental contribution of the Proposed Action when added to the effects of all other past, present, and reasonably foreseeable future actions would not result in measurable additional effects on water quality in the Study Area or beyond.
Vegetation	The incremental contribution of the Proposed Action, when added to the effects of all other past, present, and reasonably foreseeable future actions, would not result in measurable additional effects on vegetation in the Study Area or beyond.
Invertebrates	The incremental contribution of the Proposed Action, when added to the effects of all other past, present, and reasonably foreseeable future actions, would not result in measurable additional effects on invertebrates in the Study Area or beyond.
Habitats	The incremental contribution of the Proposed Action, when added to the effects of all other past, present, and reasonably foreseeable future actions, would not result in measurable additional effects on habitats, including National Marine Sanctuaries, in the Study Area or beyond.
Fishes	The incremental contribution of the Proposed Action, when added to the effects of all other past, present, and reasonably foreseeable future actions, would not result in measurable additional significant effects on fishes in the Study Area or beyond.
Marine Mammals	The Proposed Action could contribute incremental stressors to individuals, which would further compound effects on a given individual already experiencing stress. However, with the implementation of standard operating procedures reducing the likelihood of overlap in time and space with other stressors and the implementation of mitigation measures reducing the likelihood of effects, the incremental stressors anticipated from the Proposed Action are not anticipated to be significant.
Reptiles	The Proposed Action could contribute incremental stressors to individuals, which would further compound effects on a given individual already experiencing stress. However, with the implementation of standard operating procedures reducing the likelihood of overlap in time and space with other stressors, and the implementation of mitigation measures reducing the likelihood of effects, the incremental stressors anticipated from the Proposed Action are not anticipated to be significant.
Birds	The incremental contribution of the Proposed Action, when added to the effects of all other past, present, and reasonably foreseeable future actions, would not result in measurable additional effects on birds in the Study Area or beyond.
Cultural Resources	The Proposed Action is not expected to result in effects on cultural resources in the Study Area and likewise would not contribute incrementally to cumulative effects on cultural resources.
Socioeconomic Resources and Environmental Justice	Short-term effects, should they occur, would not contribute incrementally to cumulative effects on the socioeconomic resources or on communities with environmental justice concerns that engage in subsistence fishing practices in the Study Area.
Public Health and Safety	The Proposed Action is not expected to result in effects on public health and safety and thus would not contribute incrementally to or combine with other effects on health and safety within the Study Area.

ES.6 Mitigation

The Action Proponents have been mitigating effects from military readiness activities on environmental and cultural resources throughout areas where it trains and tests for more than two decades. In coordination with the appropriate regulatory agencies, mitigation measures for the Proposed Action were developed to effectively avoid or reduce potential effects and that were determined practical to implement.

Mitigation measures implemented under the Proposed Action are organized into two categories: activity-based mitigation and mitigation areas. Mitigation will be implemented whenever and wherever training or testing activities involving applicable acoustic, explosive, and physical disturbance and strike stressors occur within the Study Area.

ES.6.1 Activity-Based Mitigation

Visual observation procedures are fundamentally consistent across stressors; however, there are activity-specific variations to account for differences in platform configurations, event characteristics, and stressor types. Visual observations have a primary objective of reducing overlap of individual marine mammals and sea turtles (and in some instances, Endangered Species Act-listed fish and birds) in real time with stressors that have the potential to cause injury or mortality. Table ES-3 through Table ES-6 summarize the mitigation zones and other activity-based mitigation measures that will be implemented under the Proposed Action.

Table ES-3: Summary of Visual Observations for Acoustic Stressors

Stressor or Activity	Mitigation Zone Sizes and Other Requirements	Protection Focus
Active Sonar	LF ≥ 200 dB, hull-mounted MFA, or other > 200 dB: • 1,000 yd. (power down of 6 dB) • 500 yd. (power down of 10 dB) • 200 yd. (shut down)	Marine mammals, Sea turtles
	LF < 200 dB, non-hull-mounted MFA, HF, air guns, broadband and other < 200 dB: • 200 yd. (shut down)	
Pile Driving and Pile Removal	• 100 yd. (cease pile driving or removal)	Marine mammals, Sea turtles
Weapons Firing Noise	• 30° on either side of the firing line out to 70 yd. (cease fire)	Marine mammals, Sea turtles

Notes: LF = low-frequency active sonar; MFA = mid-frequency active sonar, dB = decibels, yd. = yards, HF = high-frequency active sonar

Table ES-4: Summary of Visual Observations for Explosives

Stressor or Activity	Mitigation Zone Sizes and Other Requirements	Protection Focus
Explosive Bombs	Any NEW: • 2,500 yd. (cease fire)	Marine mammals, Sea turtles
Explosive Gunnery	A-S medium caliber: • 200 yd. (cease fire)	Marine mammals, Sea turtles
	S-S medium caliber: • 600 yd. (cease fire)	
	S-S large caliber: • 1,000 yd. (cease fire)	
Explosive Underwater Demolition Multiple Charge – Mat Weave and Obstacle Loading	Any NEW: • 700 yd. (cease fire)	Marine mammals, Sea turtles
Explosive Mine Countermeasure and Neutralization (No Divers)	0.1–5 lb. NEW: • 600 yd. (cease fire)	Marine mammals, Sea turtles, Seabirds
	>5–650 lb. NEW: • 2,100 yd. (cease fire)	
Explosive Mine Countermeasure and Neutralization (With Divers)	0.1–20 lb. NEW, positive control: • 500 yd. (cease fire)	Marine mammals, Sea turtles, Seabirds, Hammerhead sharks
	>0.1–29 lb. NEW, time delay; or >20–60 lb., positive control: • 1,000 yd. (cease fire)	
Explosive Missiles and Rockets	0.6–20 lb. NEW, A-S: • 900 yd. (cease fire)	Marine mammals, Sea turtles
	20–500 lb. NEW, A-S • 2,000 yd. (cease fire)	
Explosive Sonobuoys and Research-Based Sub-Surface Explosives	Any NEW sonobuoy, 0.1–5 lb. NEW other sub-surface explosives: • 600 yd. (cease fire)	Marine mammals, Sea turtles
Explosive Torpedoes	Any NEW: • 2,100 yd. (cease fire)	Marine mammals, Sea turtles
Ship Shock Trials	Any NEW: • 3.5 NM (cease fire)	Marine mammals, Sea turtles, Jellyfish aggregations, Large school of fish, Flock of Seabirds
Sinking Exercise	Any NEW: • 2.5 NM (cease fire)	Marine mammals, Sea turtles, Jellyfish aggregations

Notes: NEW = Net Explosive Weight, yd. = yards, A-S = Air-to-Surface, S-S = Surface-to-Surface, lb. = pounds, NM = nautical miles

Table ES-5: Summary of Visual Observations for Non-Explosive Ordnance

Stressor or Activity	Mitigation Zone Sizes and Other Requirements	Protection Focus
Aerial-Deployed Mines and Non-Explosive Bombs	• 1,000 yd. (cease fire)	Marine mammals, Sea turtles
Non-Explosive Gunnery	• 200 yd. (cease fire)	Marine mammals, Sea turtles
Non-Explosive A-S Missiles and Rockets	• 900 yd. (cease fire)	Marine mammals, Sea turtles

Notes: A-S = Air-to-Surface, yd. = yards

Table ES-6: Summary of Visual Observations Vessels, Vehicles, Towed In-Water Devices, and Net Deployment

Stressor or Activity	Mitigation Zone Sizes and Other Requirements	Protection Focus
Manned Surface Vessels	Maintain following distances as circumstances allow: • 500 yd. from whales • 200 yd. from other marine mammals • Vicinity of sea turtles	Marine mammals, Sea turtles
Unmanned Vehicles	When under escort and positive control by a manned surface vessel: • 500 yd. from whales • 200 yd. from other marine mammals • Vicinity of sea turtles	Marine mammals, Sea turtles
Towed In-Water Devices	When towed by an aircraft, manned surface vessel, USV, or UUV escorted and operated under positive control by a manned surface vessel: • 250 yd. from marine mammals • Vicinity of sea turtles	Marine mammals, Sea turtles
Net Deployment	For 15 minutes prior to the deployment of nets and while nets are deployed: • 500 yd. from marine mammals	Marine mammals, Sea turtles

Notes: yd. = yards, USV = Unmanned Surface Vehicle, UUV = Unmanned Underwater Vehicle

ES.6.2 Geographic Mitigation

Mitigation areas are geographic locations within the Study Area where mitigation measures will be implemented to: (1) avoid or reduce effects on biological or cultural resources that are not observable by Lookouts from the water’s surface (i.e., resources for which activity-based mitigation cannot be implemented); (2) in combination with activity-based mitigation, to effect the least practicable adverse effect on marine mammal species or stocks and their habitat; or (3) in combination with activity-based mitigation, ensure that the Proposed Action does not jeopardize the continued existence of endangered or threatened species, or result in destruction or adverse modification of critical habitat. Table ES-7 summarizes mitigation areas that will be implemented under the Proposed Action.

Table ES-7: Summary of Mitigation to be Implemented Within Mitigation Areas

Summary of Mitigation Area Requirements
Geographic Mitigation for Shallow-Water Coral Reefs and Precious Coral Beds
• The Action Proponents will not detonate any in-water explosives (including underwater explosives and explosives deployed against surface targets) within a horizontal distance of 350 yards (yd.) from shallow-water coral reefs and precious coral beds (except in designated areas of the Hawaii and California Study Areas, such as the nearshore areas of San Clemente Island and in the Silver Strand Training Complex, where these features will be avoided to the maximum extent practical). • The Action Proponents will not set vessel anchors within the anchor swing circle radius from shallow-water coral reefs and precious coral beds (except in designated anchorages). • The Action Proponents will not place non-explosive seafloor devices or deploy non-explosive ordnance against surface targets (including aerial-deployed mine shapes) within a horizontal distance of 350 yd. from shallow-water coral reefs and precious coral beds (except in designated areas in the Hawaii and California Study Areas, such as the nearshore areas of San Clemente Island and in the Silver Strand Training Complex, where these features will be avoided to the maximum extent practical).
Geographic Mitigation for Artificial Reefs, Hard Bottom Substrate, and Shipwrecks
• The Action Proponents will not detonate explosives on or near the seafloor (e.g., explosive bottom-laid or moored mines) within a horizontal distance of 350 yd. from artificial reefs, hard bottom substrate, and shipwrecks (except in designated areas in the Hawaii California Study Areas, such as the nearshore areas of San Clemente Island and in the Silver Strand Training Complex, where these features will be avoided to the maximum extent practical). • The Action Proponents will not set vessel anchors within the anchor swing circle radius from artificial reefs, hard bottom substrate, and shipwrecks (except in designated anchorages). • The Action Proponents will not place non-explosive seafloor devices (that are not precisely placed) within a horizontal distance of 350 yd. from artificial reefs, hard bottom substrate, and shipwrecks (except as described in the bullet above for vessel anchors, the bullet below for precisely placed seafloor devices, and in designated areas of the Hawaii and California Study Areas, such as the nearshore areas of San Clemente Island and in the Silver Strand Training Complex, where these features will be avoided to the maximum extent practical). • The Action Proponents will not position precisely placed non-explosive seafloor devices directly on artificial reefs, hard bottom substrate, or shipwrecks. • The Action Proponents will avoid positioning precisely placed non-explosive seafloor devices near these resources by the largest distance that is practical to implement based on mission requirements.
Hawaii Island Marine Mammal Mitigation Area
• The Action Proponents will not use more than 300 hours of MF1 surface ship hull-mounted mid-frequency active sonar or 20 hours of helicopter dipping sonar (a mid-frequency active sonar source) annually within the mitigation area. • The Action Proponents will not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) within the mitigation area.
Hawaii 4-Islands Marine Mammal Mitigation Area
• From November 15– to April 15, the Action Proponents will not use MF1 surface ship hull-mounted mid-frequency active sonar within the mitigation area. • The Action Proponents will not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) within the mitigation area (year-round).
Hawaii Humpback Whale Special Reporting Mitigation Area
• The Action Proponents will report the total hours of MF1 surface ship hull-mounted mid-frequency active sonar used December 15–April 15 in the mitigation area in their training and testing activity reports submitted to NMFS.

Table ES-7: Summary of Mitigation to be Implemented Within Mitigation Areas (continued)

Summary of Mitigation Area Requirements
Hawaii Humpback Whale Awareness Message Mitigation Area
• The Action Proponents will broadcast awareness notification messages to alert applicable assets (and their Lookouts) transiting and training or testing in the Hawaii Range Complex to the possible presence of concentrations of humpback whales from November through April. • Lookouts will use that knowledge to help inform their visual observations during military readiness activities that involve vessel movements, active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or the deployment of non-explosive ordnance against surface targets in the mitigation area.
Northern California Large Whale Mitigation Area
• From June 1–October 31, the Action Proponents will not use more than 300 hours of MF1 surface ship hull-mounted mid-frequency active sonar (excluding normal maintenance and systems checks) total during training and testing within the combination of this mitigation area and the Southern California Blue Whale Mitigation Area, the Central California Large Whale Mitigation Area, and the Southern California Blue Whale Mitigation Area.
Central California Large Whale Mitigation Area
• From June 1 to October 31, the Action Proponents will not use more than 300 hours of MF1 surface ship hull-mounted mid-frequency active sonar (excluding normal maintenance and systems checks) total during training and testing within the combination of this mitigation area, the Northern California Large Whale Mitigation Area, and the Southern California Blue Whale Mitigation Area.
Southern California Blue Whale Mitigation Area
• From June 1 to October 31, the Action Proponents will not use more than 300 hours of MF1 surface ship hull-mounted mid-frequency active sonar (excluding normal maintenance and systems checks) total during training and testing within the combination of this mitigation area and the Central California Large Whale Mitigation Area. • From June 1 to October 31, the Action Proponents will not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) during large-caliber gunnery, torpedo, bombing, and missile (including 2.75-inch rockets) training and testing.
California Large Whale Awareness Message Mitigation Area

• The Action Proponents will broadcast awareness notification messages to alert applicable assets (and their Lookouts) transiting and training or testing off the U.S. West Coast to the possible presence of concentrations of large whales, including gray whales (November–March), fin whales (November–May), and mixed concentrations of blue, humpback, and fin whales that may occur based on predicted oceanographic conditions for a given year (e.g., May–November, April–November). Notification messages may provide the following types of information which could vary annually:
  o While blue whales tend to be more transitory, some fin whales are year-round residents that can be expected in nearshore waters within 10 nautical miles (NM) of the California mainland and offshore operating areas at any time.
  o Fin whales occur in groups of one to three individuals, 90 percent of the time, and in groups of four or more individuals, 10 percent of the time.
  o Unique to fin whales offshore southern California (including the Santa Barbara Channel and PMSR area), there could be multiple individuals and/or separate groups scattered within a relatively small area (1–2 NM) due to foraging or social interactions.
  o When a large whale is observed, this may be an indicator that additional marine mammals are present and nearby, and the vessel should take this into consideration when transiting.
  o Lookouts will use that knowledge to help inform their visual observations during military readiness activities that involve vessel movements, active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or the deployment of non-explosive ordnance against surface targets in the mitigation area.

Table ES-7: Summary of Mitigation to be Implemented Within Mitigation Areas (continued)

Summary of Mitigation Area Requirements
California Real-Time Large Whale Notification Area
• The Action Proponents will issue real-time notifications to alert Action Proponent vessels operating in the vicinity of large whale aggregations (four or more whales) sighted within 1 NM of an Action Proponent vessel within an area of the Southern California Range Complex (between 32–33 degrees North and 117.2–119.5 degrees West). o The four whales that make up a defined "aggregation" would not all need to be from the same species, and the aggregation could consist either of a single group of four (or more) whales, or any combination of smaller groups totaling four (e.g., two groups of two whales each or a group of three whales and a solitary whale) within the 1 NM zone. o Lookouts will use the information from the real-time notifications to inform their visual observations of applicable mitigation zones. If Lookouts observe a large whale aggregation within 1 NM of the event vicinity within the area between 32–33 degrees North and 117.2–119.5 degrees West, the watch station will initiate communication with the designated point of contact to contribute to the Navy's real-time sighting notification system.
San Nicolas Island Pinniped Haulout Mitigation Area
• Navy personnel shall not enter pinniped haulout or rookery areas. Personnel may be adjacent to pinniped haulouts and rookery prior to and following a launch for monitoring purposes. • Missiles shall not cross over pinniped haulout areas at altitudes less than 305 meters (1,000 feet). • The Navy may not conduct more than 10 launch events at night annually. • Launch events shall be scheduled to avoid the peak pinniped pupping seasons from January through July, to the maximum extent practicable. • The Navy shall implement a monitoring plan using video and acoustic monitoring of up to three pinniped haulout areas and rookeries during launch events that include missiles or targets that have not been previously monitored for at least three launch events.
California Large Whale Awareness Notification Message Area (seasonal according to species)
• The Navy will issue awareness notification messages to alert ships and aircraft to the possible presence of humpback whales (November–April), blue whales (June–October), gray whales (November–March), or fin whales (November–May).

ES.7 Other Considerations

ES.7.1 Consistency with Other Federal, State, and Local Regulations, and Executive Orders

Based on an evaluation of consistency with statutory obligations, the proposed military readiness activities would not conflict with the objectives or requirements of federal, state, regional, or local plans, policies, or legal requirements. Consultations with regulatory agencies are underway and will be completed prior to implementation of the Proposed Action to ensure all legal requirements are met.

ES.7.2 Relationship Between Short-term Use of the Environment and Maintenance and Enhancement of Long-term Productivity

In accordance with NEPA, this EIS/OEIS provides an analysis of the relationship between a project's short-term effects on the environment and the effects that these effects may have on the maintenance and enhancement of the long-term productivity of the affected environment. The Proposed Action may result in both short- and long-term environmental effects. However, the Proposed Action would not be expected to result in any effects that would reduce environmental productivity, permanently narrow the range of beneficial uses of the environment, or pose long-term risks to health, safety, or the general welfare of the public.

ES.7.3 Irreversible or Irretrievable Commitment of Resources

For both Alternative 1 and Alternative 2, most resource commitments are neither irreversible nor irretrievable. Most effects are short term and temporary or, if long lasting, are negligible. No habitat associated with threatened or endangered species would be lost as result of implementation of the Proposed Action.

The modernization of the existing SOAR, the installation of two Shallow Water Training Ranges, and the deployment of seafloor cables would result in the permanent consumption of various metals, plastics, and other materials. Energy consumed by those activities and with all activities involving the use of vessels, aircraft, and munitions/explosives would be expended and irreversibly lost.

ES.7.4 Energy Requirements and Conservation Potential of Alternatives and Efficiency Initiatives

Resources that will be permanently and continually consumed by project implementation include water, electricity, natural gas, and fossil fuels; however, the amount and rate of consumption of these resources would not result in significant environmental effects or the unnecessary, inefficient, or wasteful use of resources. Prevention of the introduction of potential contaminants is an important component of standard procedures followed by the military services. To the extent practicable, considerations in the prevention of introduction of potential contaminants are included.

Sustainable range management practices are in place that protect and conserve natural and cultural resources and preserve access to training areas for current and future training requirements while addressing potential encroachments that threaten to affect range and training area capabilities.

ES.8 Public Involvement

ES.8.1 Scoping Process

The first step in the NEPA process for an EIS is to prepare a Notice of Intent to develop an EIS. The Navy published a Notice of Intent for this EIS/OEIS in the *Federal Register* and in 10 local and regional newspapers on December 15, 2023. A project website (https://www.nepa.navy.mil/hctteis/) was established to provide the public with project information and includes public notices; project fact sheet; maps; EIS/OEIS schedule; virtual open house scoping presentation; NEPA and National Historic Preservation Act Section 106 processes, including a National Historic Preservation Act Section 106 consulting party informational request form; links to completed projects and additional Navy resources; and project video. The public was able to submit comments via the website using the online comment form and subscribe to receive future notifications via email. A news release was distributed to local, regional, and national print media; social media posts were made; and email notifications were distributed to existing and new website subscribers. Stakeholder letters and fact sheets were mailed to 1,382 federal, state, and local elected officials and agencies; non-federally recognized Tribes and Tribal groups; and Native Hawaiian Organizations. The Notice of Intent provided an overview of the Proposed Action and the scope of the EIS/OEIS and initiated the scoping process.

ES.8.2 Scoping Comments

Scoping participants submitted comments in two ways:

- Written letters (received any time during the public comment period via postal mail or email)
- Comments submitted directly on the project website (received any time during the public comment period)

The Navy received written and electronic comments from federal agencies, state agencies, federally recognized tribes, Native Hawaiian Organizations, nongovernmental organizations, individuals, and community groups. A total of 22 website comments were submitted using the electronic comment form on the project website. A total of nine comments were emailed, and a total of five written comments were mailed. A sampling of specific concerns includes the following:

- military training around the Hawaiian Islands
- activities that may kill, injure, disorient, or have long-lasting effects on marine species and marine habitat
- effects from training with explosives
- unexploded ordnance and other debris as a result of military activities
- potential effects on submerged maritime heritage resources, such as aircrafts, shipwrecks, and archaeological sites
- noise effects on people, local communities, marine mammals, fishes, and seabirds in the Study Area, including the expanded airspace.
- the effectiveness of the Navy's mitigation measures, including Navy Lookouts

REFERENCES

U.S. Department of the Navy. (2018). *Hawaii-Southern California Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement*. Pearl Harbor, HI: Naval Facilities Engineering Command, Pacific.

U.S. Department of the Navy. (2022). *Point Mugu Sea Range Final Environmental Impact Statement/Overseas Environmental Impact Statement*. Point Mugu, CA: United States Department of the Navy.

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APPENDICES

Acronyms and Abbreviations

Acronym	Definition
$\mu g/m^3$	Micrograms per cubic meter
AAQS	Ambient Air Quality Standards
AAV	Amphibious Assault Vehicle
ac.	Acre(s)
ACHP	Advisory Council on Historic Preservation
AGL	Above Ground Level
AINJ	Auditory Injury
APPS	Act to Prevent Pollution
Army	U.S. Army
ARPA	Advanced Research Projects Agency
AS	Submarine Tenders
ASBS	Area of Special Biological Significance
ASW	Anti-submarine warfare
BEH	Significant Behavioral Response
BIA	Biologically Important Areas
BOEM	Bureau of Ocean Energy Management
CA	California
CAA	Clean Air Act
CBSFA	Community-Based Subsistence Fishing Areas
CBUAS	Carrier-Based Unmanned Aircraft System
CEQ	Council on Environmental Quality
CERP	Community Emissions Reduction Plan
CFR	Code of Federal Regulations
CG	Cruiser
CH_4	Methane
CHNMS	Chumash Heritage National Marine Sanctuary
cm	Centimeter(s)
CNA	Center for Naval Analyses
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CRRC	Combat Rubber Raiding Craft
CV	Coefficient of variation
CVN	Aircraft Carrier (Nuclear)
CZMA	Coastal Zone Management Act
dB	Decibel(s)
dB re 1 µPa	decibels referenced to one micropascal
dB re 1 µPa	decibels referenced to 1 micropascal re 1 µPa
dB re 1 μPa^2-sec	decibels referenced to 1 micropascal squared per second
dBA	A-weighted decibels
DDG	Guided Missile Destroyer
DDT	dichlorodiphenyltrichloroethane
Diesel PM	Diesel Particulate Matter
DO	Dissolved Oxygen
DoD	Department of Defense
DPS	Distinct Population Segment
EEZ	Exclusive Economic Zone
EIS	Environmental Impact Statement
EMF	Electromagnetic Force
EO	Executive Order
EPF	Expeditionary Fast Transport
ERCA	Extended Range Cannon Artillery
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
EXWC	Naval Facilities Engineering & Expeditionary Warfare Center
FAA	Federal Aviation Administration
FACSFAC	Fleet Area Control and Surveillance Facility
FFG	Frigate
FLS	Forward Looking Sonar
FR	Federal Register
ft.	foot (feet)
GHG	Greenhouse Gas
GWP	Global Warming Potential
H	Hydrogen
HAP	Hazardous Air Pollutant
HCTT	Hawaii-California Training and Testing
HF	High Frequency
HI	Hawaii
HSTT	Hawaii-Southern California Training and Testing
Hz	hertz
IMO	International Maritime Organization
in.	Inch(es)

Acronym	Definition
ITA	Incidental Take Authorization
kHz	kilohertz
km^2	Square kilometer(s)
lb.	Pound(s)
LCAC	Landing Craft, Air Cushion
LCM	Landing Craft, Mechanized
LCS	Littoral Combat Ship
LCU	Landing Craft, Utility
LF	Low Frequency
LHA	Amphibious Assault Ship
LHD	Amphibious Transport Dock
LNM	Notice to Mariners
LOA	Letter of Authorization
LSD	Dock Landing Ship
m	meter(s)
MARPOL	International Convention for the Prevention of Pollution from Ships
MBTA	Migratory Bird Treaty Act
MCB	Marine Corps Base
MCM	Mine Countermeasures
MCTAB	Marine Corps Training Area Bellows
MEM	Military Expended Material
MF	Mid Frequency
MHI	Main Hawaiian Islands
MLCD	Marine Life Conservation District
MMPA	Marine Mammal Protection Act
MORT	Mortality
MPA	Marine Protected Area
N	Nitrogen
N_2O	Nitrous Oxide
NA	Not Applicable
NAAQS	National Ambient Air Quality Standards
NAS	Naval Air Station
NAVAIR	Naval Air Systems Command
NAVSEA	Naval Sea Systems Command
NAVWAR	Naval Information Warfare Systems Command
Navy	U.S. Department of the Navy
NAWCWD	Naval Air Warfare Center Weapons Division
NBVC	Naval Base Ventura County
NCCAB	North Central Coast Air Basin
NCCR	National Coastal Condition Report
NEPA	National Environmental Policy Act

Acronym	Definition
NEW	Net Explosive Weight
NHPA	National Historic Preservation Act
NM	Nautical Miles
NM^2	Square Nautical Mile(s)
NMFS	National Marine Fisheries Service
NO_2	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOCAL	Northern California
NOTAM	Notice to Airmen
NO_x	Nitrogen Oxides
NRHP	National Register of Historic Places
NSWUE	Naval Special Warfare Undersea Enterprise
O_3	Ozone
OEIS	Overseas Environmental Impact Statement
ONMS	Office of National Marine Sanctuaries
ONR	Office of Naval Research
OPAREA	Operating Area
Pb	Lead
PC	Patrol Combatants
PCBs	polychlorinated biphenyls
PM_{10}	Particulate matter (with an aerodynamic size less than or equal to 10 microns
$PM_{2.5}$	Particulate matter (with an aerodynamic size less than or equal to 2.5 microns
PMAP	Protective Measures Assessment Protocol
PMRF	Pacific Missile Range Facility
PMSR	Point Mugu Sea Range
ppm	Parts per million
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RDT&E	Research, Development, Testing, and Evaluation
RHIB	Rigid Hull Inflatable Boat
rms	Root Mean Squared
ROV	Remotely Operated Vehicle
SAR	Stock assessment report
SCAB	South Coast Air Basin

Acronym	Definition
SC-GHG	Social Cost of Greenhouse Gases
SCI	San Clemente Island
SDAB	San Diego Air Basin
SEL	Sound Exposure Level
SHPO	State Historic Preservation Office
SINKEX	Sinking Exercise
SIP	System(s) Integration Plan
SLV	Stern Landing Vessel
SNI	San Nicolas Island
SO_2	Sulfur Dioxide
SOAR	Southern California Offshore Anti-Submarine Warfare Range
SOCAL	Southern California
SOP	Standard Operating Procedure
SO_x	Sulfur Oxides
SPL	Sound Pressure Level
SPL Peak	Peak Pressure (Sound)
SSBN	Fleet Ballistic Missile Submarine
SSGN	Guided Missile Submarines
SSN	Attack Submarine
SSTC	Silver Strand Training Complex
SUA	Special Use Airspace
SURTASS	Surveillance Towed Array Sensor System
SWTR	Shallow Water Training Range
TA	Training Area
T-AKE	Dry Cargo/Ammunition Ship
T-AO	Fleet Replenishment Oilers
T-AOE	Fast Combat Support Ship
TNT	trinitrotoluene
tpy	Tons per year
TTS	Temporary Threshold Shift
U.S.	United States
U.S.C.	United States Code
UAS	Unmanned Aircraft System
UAV	Unmanned Aerial Vehicle
USAF	U.S. Air Force
USCG	U.S. Coast Guard
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USMC	U.S. Marine Corps
USS	United States Ship
UUV	Unmanned Underwater Vehicle
VCAPCD	Ventura County Air Pollution Control District

Acronym	Definition
VHF	Very High Frequency
VLF	Very Low Frequency
VOC	Volatile Organic Compounds
VpCI	Vapor Phase Corrosion Inhibitor
W-	Warning Area
WETS	Wave Energy Test Site
XLUUV	Extra Large Unmanned Underwater Vehicle
yd.	Yard(s)
YP	Yard Patrol Craft

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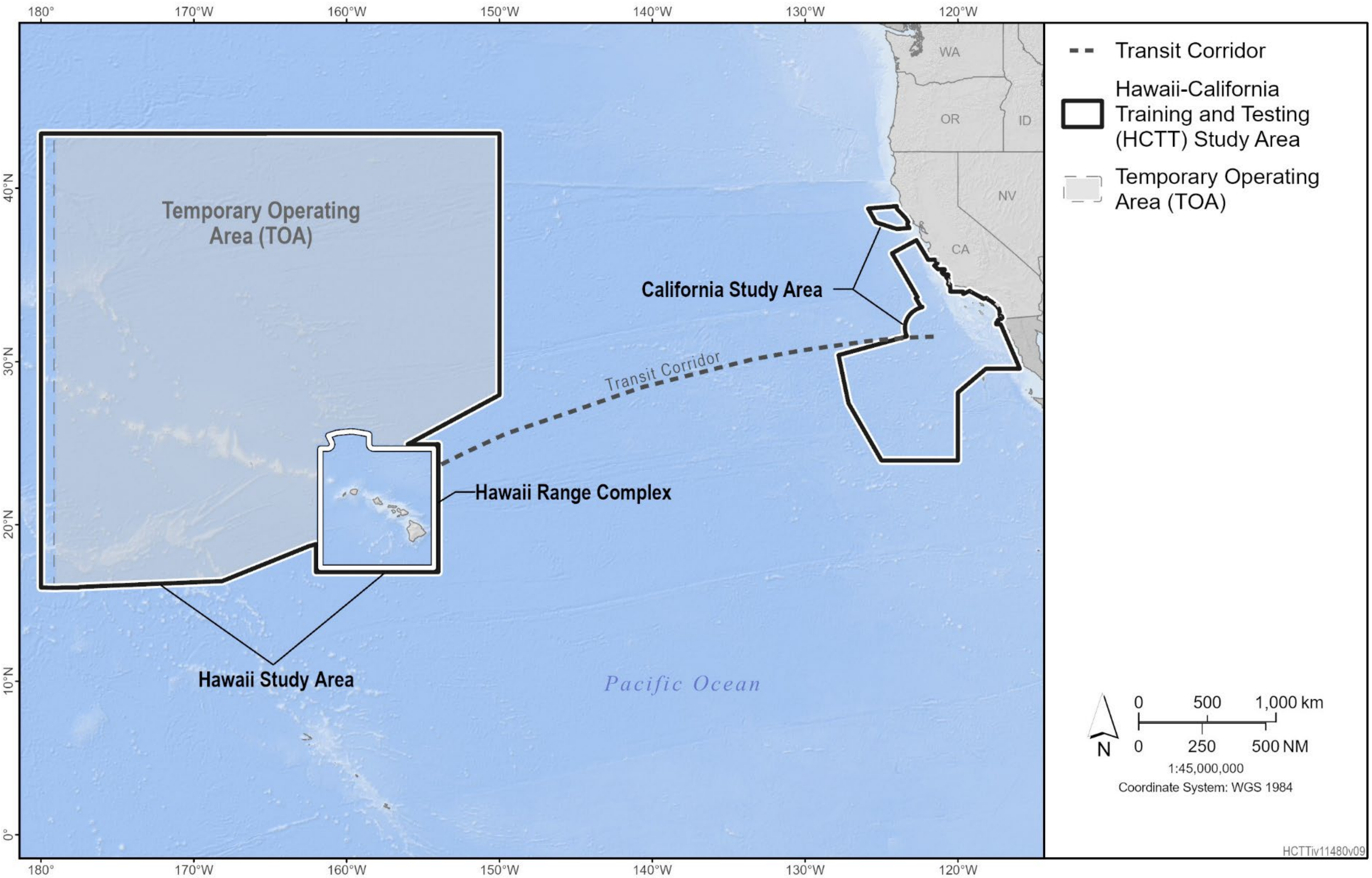
1 Purpose and Need for the Proposed Action

1.1 Introduction

The United States (U.S.) Department of the Navy (Navy) (including both the U.S. Navy and the U.S. Marine Corps [USMC]) jointly with the U.S. Coast Guard (USCG), U.S. Army (Army), and U.S. Air Force (USAF), has prepared this Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) consistent with 40 Code of Federal Regulations (CFR) section 1502.9 and pursuant to 32 CFR 775. The Navy is the lead agency for the Proposed Action and is responsible for the scope and content of this EIS/OEIS. For this EIS/OEIS, Action Proponents within the Navy include Commander U.S. Pacific Fleet, the USMC, Naval Air Systems Command (NAVAIR), Naval Facilities Engineering and Expeditionary Warfare Center (EXWC), Naval Sea Systems Command (NAVSEA), Naval Information Warfare Systems Command (NAVWAR), and Office of Naval Research (ONR). In addition to the Navy Action Proponents, USCG, Army, and USAF are participating as Joint Lead Agencies due to the inclusion of their training activities, which are similar to Navy training covered in this EIS/OEIS. The lead and joint agencies are collectively referred to as the Action Proponents. As the lead federal agency, the Navy has coordinated closely with the joint lead agencies, and any commitments relative to the joint lead agency's proposed actions made in this EIS/OEIS are applicable to the joint lead agencies. The National Marine Fisheries Service (NMFS) is a cooperating agency.

The Action Proponents propose to conduct at-sea military readiness activities in the Hawaii-California Training and Testing (HCTT) Study Area, as represented in Figure 1-1. Military readiness activities are comprised of training and testing activities and can include the use of active sonar and other acoustic sources, as well as the use of explosives. Military readiness activities also include modernization and sustainment of ranges necessary to support these training and testing activities. The Study Area includes the waters of the Pacific Ocean along the coast of California, the waters around the Hawaiian Islands, and a transit corridor between these areas; the high seas west of California and surrounding Hawaii; pierside locations at Navy installations, within port transit channels and near civilian ports; and inshore waterways (e.g., San Diego Bay, Port Hueneme, Pearl Harbor). Training and testing activities prepare the Action Proponents to fulfill their missions to protect and defend the United States and its allies but have the potential to affect the environment. In compliance with the National Environmental Policy Act (NEPA) and Executive Order (EO) 12114, this EIS/OEIS assesses the potential environmental effects associated with the proposed at-sea military readiness activities to be conducted within the Study Area. These proposed activities are generally consistent with those analyzed in two separate NEPA planning documents, the 2018 Hawaii-Southern California Training and Testing (HSTT) EIS/OEIS completed in December 2018 (U.S. Department of the Navy, 2018) and the 2022 Point Mugu Sea Range (PMSR) EIS/OEIS (U.S. Department of the Navy, 2022), and are representative of the military readiness activities that the Action Proponents have been conducting off Hawaii and California for decades. This HCTT Study Area (Phase IV) differs from the HSTT Study Area (Phase III) in that HCTT includes an expanded Southern California (SOCAL) Range Complex (Warning Area 293 [W-293] and W-294 and the sea space beneath), new testing sea space between W-293 and PMSR, the inclusion of two existing training and testing at-sea range areas (PMSR and the Northern California [NOCAL] Range Complex), inclusion of ocean areas along the Southern California coastline from approximately Dana Point to Port Hueneme, and four amphibious approach lanes providing California land access from NOCAL and PMSR (Figure 1-2). This EIS/OEIS covers only the at-sea portion of the amphibious approach lanes.



Note: The Hawaii Study Area is approximately 2,000 nautical miles from the California Study Area. Typical Navy ship transit time between the Study Areas is five to seven days.

Figure 1-1: Hawaii-California Training and Testing Study Area

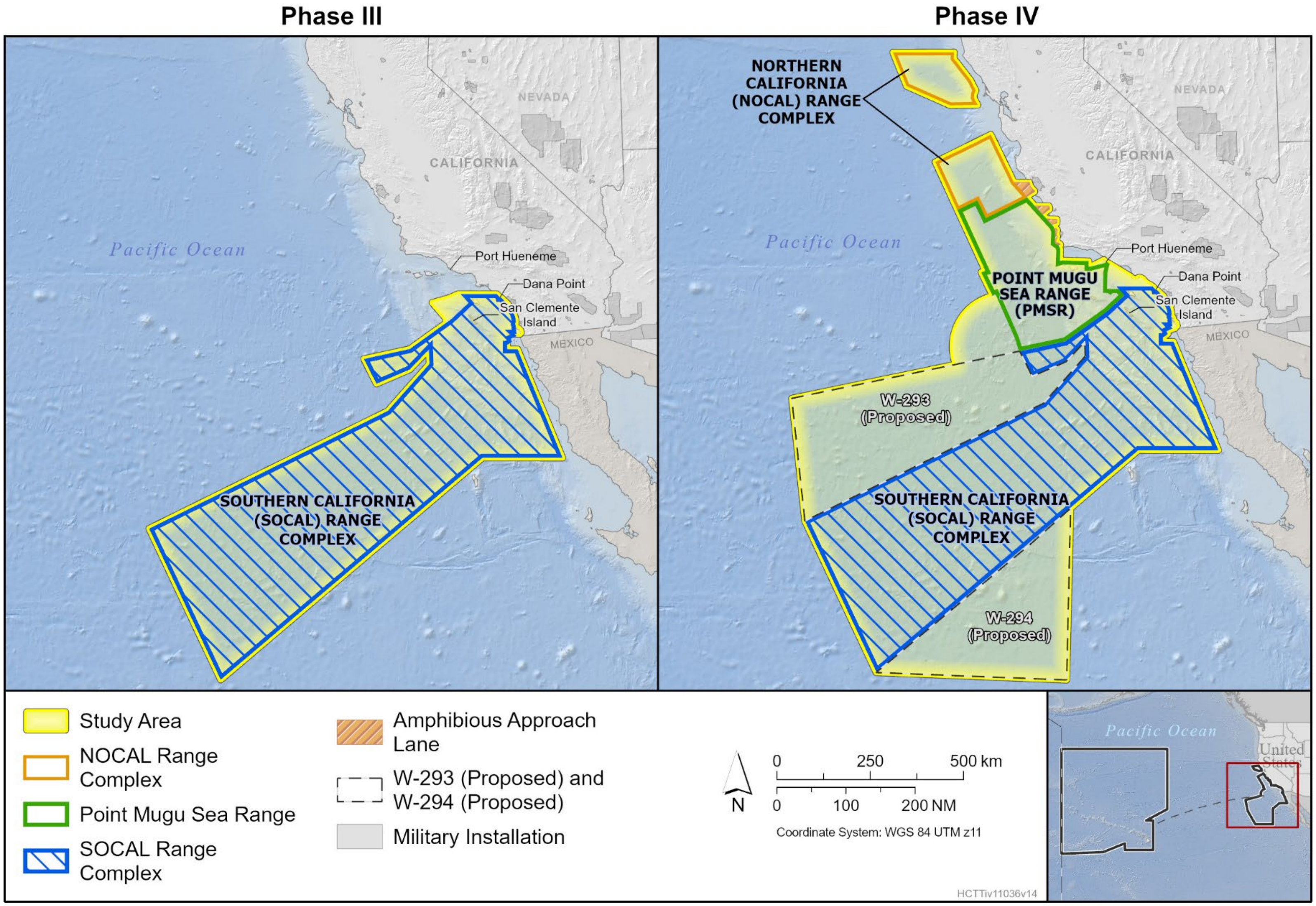


Figure 1-2: Changes to the California Portion of the Hawaii-California Training and Testing Study Area

1.2 The Navy's Environmental Compliance and At-Sea Policy

The Navy instituted the "At-Sea Policy" in 2000 to ensure compliance with applicable environmental regulations and policies and preserve the flexibility necessary for the Navy and Marine Corps to train and test at sea. This policy directed, in part, that Fleet Commanders develop a programmatic approach to environmental compliance at sea for ranges and Operating Areas within their respective geographic areas of responsibility (U.S. Department of the Navy, 2000).

The Navy is currently in the fourth phase of implementing this programmatic approach, which covers similar types of military readiness activities in the HSTT Study Area, PMSR Study Area, and the NOCAL Range Complex (collectively referred to as the HCTT Study Area). For further discussion of the first three phases, please see Section 1.2 of the 2018 HSTT EIS/OEIS.

1.3 Overview and Strategic Importance of Existing Range Complexes

The ranges analyzed in this EIS/OEIS have each existed for many decades, dating back to the 1930s. Range use and infrastructure have developed over time as military readiness requirements in support of modern warfare have evolved.

Through each phase of environmental planning, the Navy has combined ranges for the purposes of NEPA analysis where similar training and testing is conducted, shown in Table 1-1.

Table 1-1: History of NEPA/EO 12114 Coverage of the HCTT Study Area

<table>
<tr><th>Phase</th><th>Hawaii Range Complex</th><th>Southern California Range Complex</th><th>Silver Strand Training Complex</th><th>Point Mugu Sea Range</th><th>Northern California Range Complex</th></tr>
<tr><td>I</td><td>2008 Hawaii Range Complex EIS/OEIS</td><td>2008 Southern California Range Complex EIS/OEIS</td><td>2011 Silver Strand Training Complex EIS</td><td rowspan="2">2002 Naval Air Warfare Center Weapons Division (NAWCWD) Point Mugu Sea Range (PMSR) EIS/OEIS</td><td rowspan="3">Note 1</td></tr>
<tr><td>II</td><td colspan="3">2013 Hawaii-Southern California Training and Testing EIS/OEIS</td></tr>
<tr><td>III</td><td colspan="3">2018 Hawaii-Southern California Training and Testing EIS/OEIS</td><td>2022 PMSR EIS/OEIS</td></tr>
<tr><td>IV</td><td colspan="5">Hawaii-California Training and Testing EIS/OEIS</td></tr>
</table>

Note 1: The 2014 U.S. Navy F-35C West Coast Homebasing EIS analyzed aircraft activities in airspace within the HCTT Study Area (W-283, W-285, W-532).

The proximity of the ranges to Navy, USMC, USCG, Army, and USAF installations creates efficiency in the utilization of government resources as well as safe conditions in which forces may train and test. The Action Proponents' homeports and air stations are equipped with robust search and rescue capabilities, medical facilities, and alternate airfields, all of which are necessary components of safety for training and testing events. Proximity of ranges to homeports also provides fuel savings; exposes equipment to less wear and tear; and ensures that Navy, USMC, and USCG personnel do not spend unnecessary time away from their families during the training cycle. Less time away from home is an important factor in military readiness, morale, and retention.

The Navy's research, development, test, and evaluation organizations also require access to a realistic environment to conduct testing. The Study Area must provide the flexibility to meet diverse testing requirements to enable the testing community action proponent (systems commands) and ONR to certify advanced platforms and systems for utilization by the fleets in wide-ranging conditions at sea. This is important because testing in controlled conditions, similar to those in which the technology could be employed, enhances combat readiness.

1.4 Proposed Action

The Proposed Action is to conduct military readiness activities, comprised of training, testing, and modernization and sustainment of ranges in the HCTT Study Area. NMFS' Proposed Action is to promulgate regulations and issue Letters of Authorization (LOAs) under the Marine Mammal Protection Act (MMPA) of 1972, as amended (16 United States Code [U.S.C.] 1361 et seq.) and would be a direct outcome of responding to the Navy's request for an incidental take authorizations.[1] A detailed description of the Proposed Action is provided in Chapter 2 (Description of Proposed Action and Alternatives).

1.5 Purpose and Need

The purpose of the Proposed Action is to conduct military readiness activities in the HCTT Study Area to ensure the U.S. military services are able to organize, train, and equip service members and personnel, needed to meet their respective national defense missions in accordance with their Congressionally mandated requirements.[2]

The purpose of NMFS' action is to evaluate the Action Proponents' request for authorizations to take marine mammals, pursuant to specific requirements of the MMPA and its implementing regulations administered by NMFS, and to decide whether to issue the authorizations.

> To issue an incidental take authorization[1] (ITA), NMFS must evaluate the best available scientific information and find that the take will have a negligible impact on the affected marine mammal species or stocks and will not have an unmitigable impact on their availability for taking for subsistence uses (the latter finding is not relevant for this Proposed Action). NMFS must also prescribe permissible methods of taking and other "means of effecting the least practicable adverse impact" on the affected species or stocks and their habitat, and monitoring and reporting requirements. NMFS cannot issue an ITA unless it can make the required findings that the take would have a negligible impact on the affected species or stock.

NMFS needs to render a decision regarding the request for authorizations due to NMFS' responsibilities under the MMPA (16 U.S.C. 1371(a)(5)(A)) and its implementing regulations. This Draft EIS/OEIS analyzes the environmental effects associated with proposed military readiness activities within the Study Area,

[1] NMFS' issuance of MMPA ITAs (i.e., Letters of Authorization) is a major federal action (NMFS' Proposed Action) and is considered a connected action under NEPA (40 CFR 1501.9), with a discrete purpose and need relative to NMFS' statutory and regulatory obligations. Consequently, NMFS has an independent responsibility to comply with NEPA. If NMFS makes the findings necessary to issue the requested LOAs, it will rely on the information and analyses in this document. NMFS intends to adopt this EIS/OEIS to fulfill its NEPA obligations and issue its own Record of Decision, if appropriate.

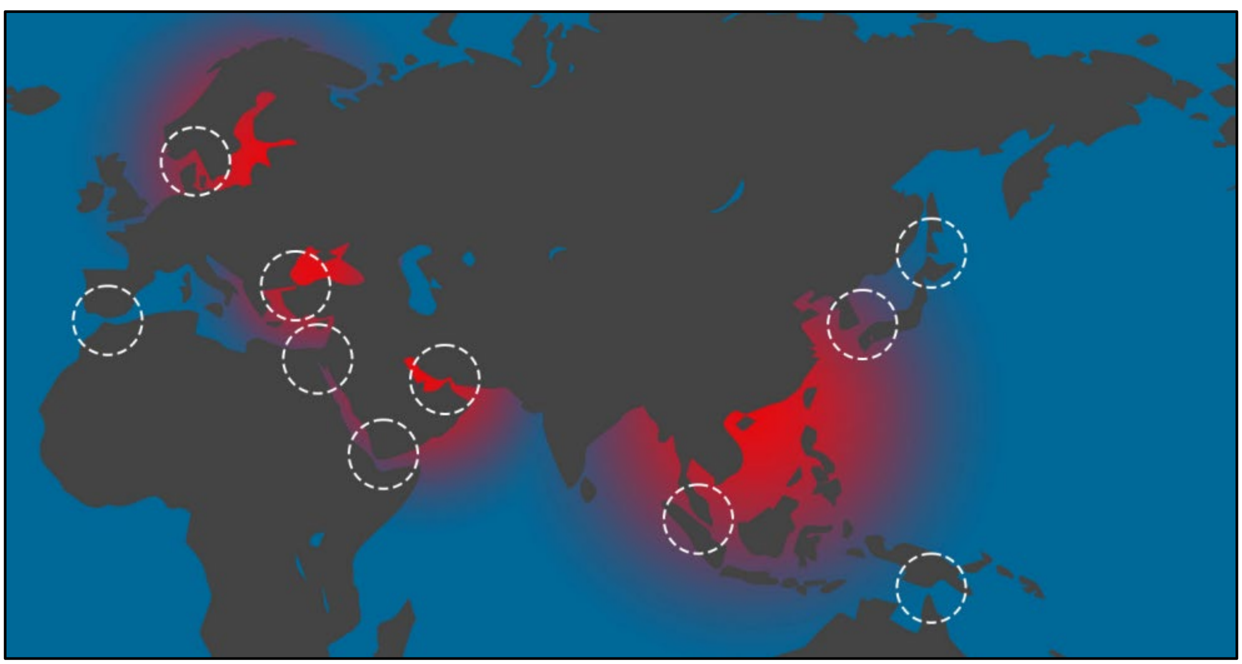
[2] See Title 10, Sections 8062 (Navy), 8063 (USMC), 7062 (Army), 9062 (USAF) U.S.C. and Title 14, Sections 101 and 102 U.S.C. (USCG) for each service's specific language. Army and USAF are included only for their activities in Hawaii with potential in-water effects.

for which the Action Proponents are seeking authorization to take marine mammals. The analysis of mitigation measures includes the requirements for protection and management of marine resources. The analysis of mitigation measures considers benefits to species or stocks and their habitat, and analyzes the practicability and efficacy of each measure. This analysis of mitigation measures was used to support requirements pertaining to mitigation, monitoring, and reporting that would be specified in the ITA, if issued.

1.5.1 Why the Navy and Coast Guard Train

The Chief of Naval Operations 2024 Navigation Plan states, "To prevail in war, naval forces need an integrated and distributed training capability to master high-end tactics, raise operator proficiency baseline, and generate readiness." The Navy is statutorily mandated to protect U.S. national security by being ready, at all times, to effectively prosecute war and defend the nation by conducting operations at sea. Operations at sea are essential to protecting U.S. national interests, considering that 70 percent of the earth is covered in water, 80 percent of the planet's population lives within close proximity to coastal areas, and 90 percent of global commerce is conducted by sea.

Through its continuous presence on the world's oceans, the Navy can respond to a wide range of situations because, on any given day, over one-third of its ships, submarines, and aircraft are deployed to overseas locations such as those illustrated in Figure 1-3. Before deploying, Sailors and Marines train to develop a broad range of capabilities to respond to threats, from full-scale armed conflict in a variety of different geographic areas and environmental conditions to humanitarian assistance and disaster relief efforts. Training prepares Navy and USMC personnel to be proficient in operating and maintaining the equipment, weapons, and systems they will use to conduct their assigned missions. Refer to Chapter 1, Section 1.4.1 and Section 1.4.2 in the 2018 HSTT EIS/OEIS for additional information on Navy Training.



Source: U.S. Department of Defense (2022)

Figure 1-3: Key Maritime Regions Under Increased Threat

The USCG enjoys a unique relationship with the Navy. By statute, the USCG is an armed force that trains and operates in the joint military arena at any time and functions as a specialized service under the Navy in time of war or when directed by the President. The USCG has national defense and statutory missions. The four major national defense missions are maritime intercept operations, deployed port operations/security and defense, peacetime engagement, and environmental defense operations. These missions are essential military tasks assigned to the USCG as a component of joint and combined forces in peacetime, crisis, and war. To effectively carry out these missions, the USCG's air and surface units train using realistic scenarios that support all of its statutory missions, to include training with the Navy and the other armed services. The statutory missions are ports and waterway security, drug interdiction, aids to navigation, search and rescue, living marine resources, marine safety, defense readiness, migrant interdiction, marine environmental protection, ice operations, and other law enforcement. The required training for each of these missions is very similar to the training the USCG conducts in support of the Department of Defense, because all USCG units are required to perform each mission at any given moment. The USCG has broad, multifaceted, jurisdictional authority for management of activities over all waters subject to jurisdiction of the United States. The USCG's law enforcement and national defense mission authority is based in 14 U.S.C. section 102, requiring the USCG to "maintain a state of readiness to assist in the defense of the United States, including when functioning as a specialized service in the Navy pursuant to section 103." The USCG successfully achieves the missions listed above in part by conducting training within the Study Area to develop, sharpen, and maintain tactics, coordination, and personnel readiness. The USCG activities are discussed in detail at Appendix A.

1.5.2 Why the Army and Air Force Train

The Army and USAF are increasingly required to operate in a marine environment and with naval forces, and therefore have an increased requirement to train in the maritime environment.

1.5.3 Why the Navy Tests

The Navy's research and acquisition community, which is described in Table 1-2, provides weapons, systems, and platforms to the Navy to support its missions and give it a technological advantage over the United States' potential adversaries. This community is at the forefront of researching, developing, testing, evaluating, acquiring, and delivering modern platforms, combat systems, and related equipment to meet Fleet capability and readiness requirements. The Navy's research organizations and laboratories concentrate primarily on the development of new science and technology and include the initial testing of concepts that are relevant to the Navy of the future, including ship, aircraft, and weapons systems that support all Naval platforms throughout their life cycles, from acquisition through sustainment to end of life. Testing new weapons, systems, and platforms is a required step in the implementation process.

Table 1-2: Navy Research, Testing, and Acquisition Community

Command	Description
Naval Air Systems Command (NAVAIR)	NAVAIR develops, acquires, delivers, and sustains manned and unmanned naval aviation aircraft, weapons, and systems with proven capability and reliability to ensure Sailors and Marines achieve mission success.
Naval Sea Systems Command (NAVSEA)	NAVSEA develops, acquires, delivers, and maintains surface ships, submarines, unmanned vehicles, and weapon systems platforms that provide the right capability to the Naval Service.
Naval Information Warfare Systems Command (NAVWAR)	NAVWAR (previously Space and Naval Warfare Systems Command) identifies, develops, delivers, and sustains information warfare capabilities and services that enable naval, joint, coalition, and other national missions operating in warfighting domains from seabed to space, and performs such other functions and tasks as directed.
Office of Naval Research (ONR)	ONR, a research funding organization, which plans, fosters, encourages, and conducts a broad program of scientific research (e.g., in collaboration with universities, industry, small businesses) that promotes future naval sea power, enhances national security, and meets the complex technological challenges of today's world.
Naval Facilities Engineering and Expeditionary Warfare Center (EXWC)	EXWC provides research, development, testing, and evaluation (RDT&E), and in-service engineering and life-cycle management for the shore, oceans, and expeditionary domains. EXWC supports the Fleet by developing and delivering specialized waterfront, littoral, and undersea facilities; RDT&E, engineering, and sustainment expertise in marine and offshore structures; seafloor surveys; ocean construction; and underwater cables. EXWC testing activities involve the deployment and operation of technologies that advance the knowledge and tactical applications of marine energy, autonomous systems, and cable systems.

1.6 The Environmental Planning Process

NEPA requires federal agencies to examine the environmental effects of their proposed actions within the United States and its territories. An EIS/OEIS is a detailed public document that assesses the potential effects that a major federal action might have on the human environment (including the natural and biological environment). Since NEPA does not apply globally, President Carter issued EO 12114 in 1979, furthering the purpose of NEPA by creating similar procedures for federal agency activities affecting the environment of the global commons outside U.S. jurisdiction.

This EIS/OEIS considers future activities conducted at sea, updated training and testing requirements in an updated Study Area, and range modernization and sustainment. It also incorporates current best available science to include an updated Navy Acoustic Effects Model; updated marine species density estimates developed by the Navy in cooperation with NMFS; and updated *Criteria and Thresholds for Acoustic and Explosive Effects Analysis* developed by the Navy in cooperation with NMFS. In addition, this EIS/OEIS also supports the reissuance of federal regulatory authorizations (upon the expiration of the current HSTT authorization and consultations in 2025), under the MMPA and the Endangered Species Act (ESA), using the best available science and analytical methods to assess potential environmental effects.

This EIS/OEIS is designed to comply with the requirements of both NEPA and EO 12114 and support additional legal compliance requirements, as further described in Chapter 6.

1.7 Scope and Content

This EIS/OEIS analyzes military readiness activities that could potentially affect human (e.g., socioeconomic) and natural resources, especially marine mammals, sea turtles, and fishes, as well as other marine resources. The range of alternatives includes the No Action Alternative and two action alternatives. In this EIS/OEIS, the Action Proponents analyzed direct, indirect, and cumulative effects.

NMFS is a cooperating agency because the scope of the Proposed Action and alternatives involves activities that have the potential to affect protected resources under the agency's jurisdiction and for which they have special expertise, including marine mammals, threatened and endangered species, essential fish habitat, and national marine sanctuaries. NMFS' special expertise and authority are based on its statutory responsibilities under the MMPA, as amended (16 U.S.C. section 1361 et seq.), the ESA (16 U.S.C. section 1531 et seq.), and the Magnuson-Stevens Fishery Conservation and Management Act. The Navy, as lead agency, has requested ITAs under the MMPA, as amended, to take marine mammals incidental to proposed USMC, USCG, and Army training and testing activities. The request was combined for efficiency purposes due to similar effects of similar activities, but separate authorizations would be the responsibility of separate U.S. military services to ensure compliance. NMFS is required to evaluate the applicant's request pursuant to the specific requirements of the MMPA and, if appropriate, issue an ITA under the MMPA. In addition, NMFS has an independent responsibility to comply with NEPA and may adopt the Navy's Final EIS/OEIS after independent review to fulfill its NEPA obligations. Consistent with 40 CFR sections 1506.3 and 1505.2, NMFS may adopt this EIS/OEIS and issue a separate Record of Decision associated with its decision to grant or deny the Navy's request for an ITA pursuant to section 101(a)(5)(A) of the MMPA.

Consistent with the Council on Environmental Quality (CEQ) Regulations, 40 CFR section 1505.2, the Navy, USCG, Army, and USAF will each issue a Record of Decision that provides the rationale for choosing one of the alternatives.

1.8 Incorporation by Reference

The authors of this EIS/OEIS refer to other environmental documents that provide related information and analyses, which help keep this EIS/OEIS more concise. Cited references may provide additional information in support of this document's analysis. Therefore, documents listed in Table 1-3 are incorporated by reference.

Table 1-3: Documents Incorporated by Reference

Reference	Description
U.S. Department of the Navy (2014)	Wave Energy Test Site (WETS) Environmental Assessment (EA)
U.S. Department of the Navy (2018)	Hawaii-Southern California Training and Testing (HSTT) EIS/OEIS
U.S. Department of the Navy (2022)	Point Mugu Sea Range (PMSR) EIS/OEIS

1.9 Organization of this Environmental Impact Statement/Overseas Environmental Impact Statement

This EIS/OEIS is organized as shown in Table 1-4.

Table 1-4: Organization of this Environmental Impact Statement/Overseas Environmental Impact Statement

Chapter/ Appendix	Title	Description
Chapter 1	Purpose and Need for the Proposed Action	Purpose of and need for the Proposed Action
Chapter 2	Description of the Proposed Action and Alternatives	Proposed Action, alternatives considered but eliminated in the EIS/OEIS, and alternatives to be carried forward for analysis in the EIS/OEIS
Chapter 3	Affected Environment and Environmental Consequences	Existing conditions of the affected environment and analysis of the potential effects of the proposed training and testing activities for each alternative
Chapter 4	Cumulative Impacts	Analysis of effects of the Proposed Action when added to past, present, and reasonably foreseeable future actions
Chapter 5	Mitigation	Mitigation measures that will be implemented to avoid or reduce potential effects
Chapter 6	Regulatory Considerations	Considerations required under National Environmental Policy Act and description of how the Action Proponents comply with other federal, state, and local plans, policies, and regulations
Appendix A	Activity Descriptions	A description of the proposed training and testing activities
Appendix B	Activity Stressor Matrices	Relationship between stressors associated with the proposed training and testing activities and the environmental resources analyzed
Appendix C	Biological Resources Supplemental Information	Background and affected environment information on the biological resources found in the Study Area
Appendix D	Acoustic and Explosive Effects Supporting Information	Background information on the acoustic and explosive energy, propagation, and methods used to determine how biological resources may be affected
Appendix E	Acoustic and Explosive Effects Analysis for Marine Mammals, Reptiles, and Fishes in the Hawaii-California Training and Testing Study Area	The analysis of how biological resources are potentially affected by acoustic and explosive energy in the water
Appendix F	Non-Acoustic Effects Supporting Information	Information and methods used to determine how biological resources may be affected by non-acoustic stressors
Appendix G	Air Quality Emissions Calculations and Record of Non-Applicability	Background information, emission factor development, and calculations for the analysis of potential effects to air quality

Table 1-4: Organization of this Environmental Impact Statement/Overseas Environmental Impact Statement (continued)

Chapter/ Appendix	Title	Description
Appendix H	Description of Systems and Ranges	Detailed information on typical systems (e.g., military hardware, weapons, aircraft, vessels, etc.) used during training and testing and the ranges where military readiness activities would occur
Appendix I	Military Expended Materials, Direct Strike, and Ship Strike Effects Analysis	The methods, calculations, and results for quantifying the effects to bottom substrate from explosions, the potential for military expended materials to strike a marine mammal or sea turtle, and the probability of a vessel strike to a marine mammal
Appendix J	Agency Correspondence	Agency correspondence applicable to this project
Appendix K	Geographic Mitigation Assessment	Describes the Navy's methodology in assessing potential mitigation areas within the HCTT Study Area to avoid or reduce potential effects on marine mammals in key areas of biological importance
Appendix L	Public Involvement/Comment Responses	The Action Proponents' public involvement process, including a list of agencies, government officials, tribes, groups, and individuals on the distribution list for receipt of the Draft EIS/OEIS. Includes a summary of the scoping comments received and a copy of all scoping comments received. Public comments on the Draft EIS/OEIS and the Action Proponents' responses will be provided in the Final EIS/OEIS.
Appendix M	Federal Register Notices	Federal Register notices applicable to this project
Appendix N	List of Preparers	The key authors and reviewers of this EIS/OEIS

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2 Description of Proposed Action and Alternatives

The U.S. Navy (including both the U.S. Navy and the USMC), as the lead agency, jointly with the USCG, Army, and USAF, proposes to conduct training activities (hereinafter referred to as "training"); research, development, testing, and evaluation activities (hereinafter referred to as "testing"); and modernization and sustainment of ranges in the HCTT Study Area, as represented in Figure 2-1. Training, testing, and modernization and sustainment of ranges are collectively referred to as military readiness activities.

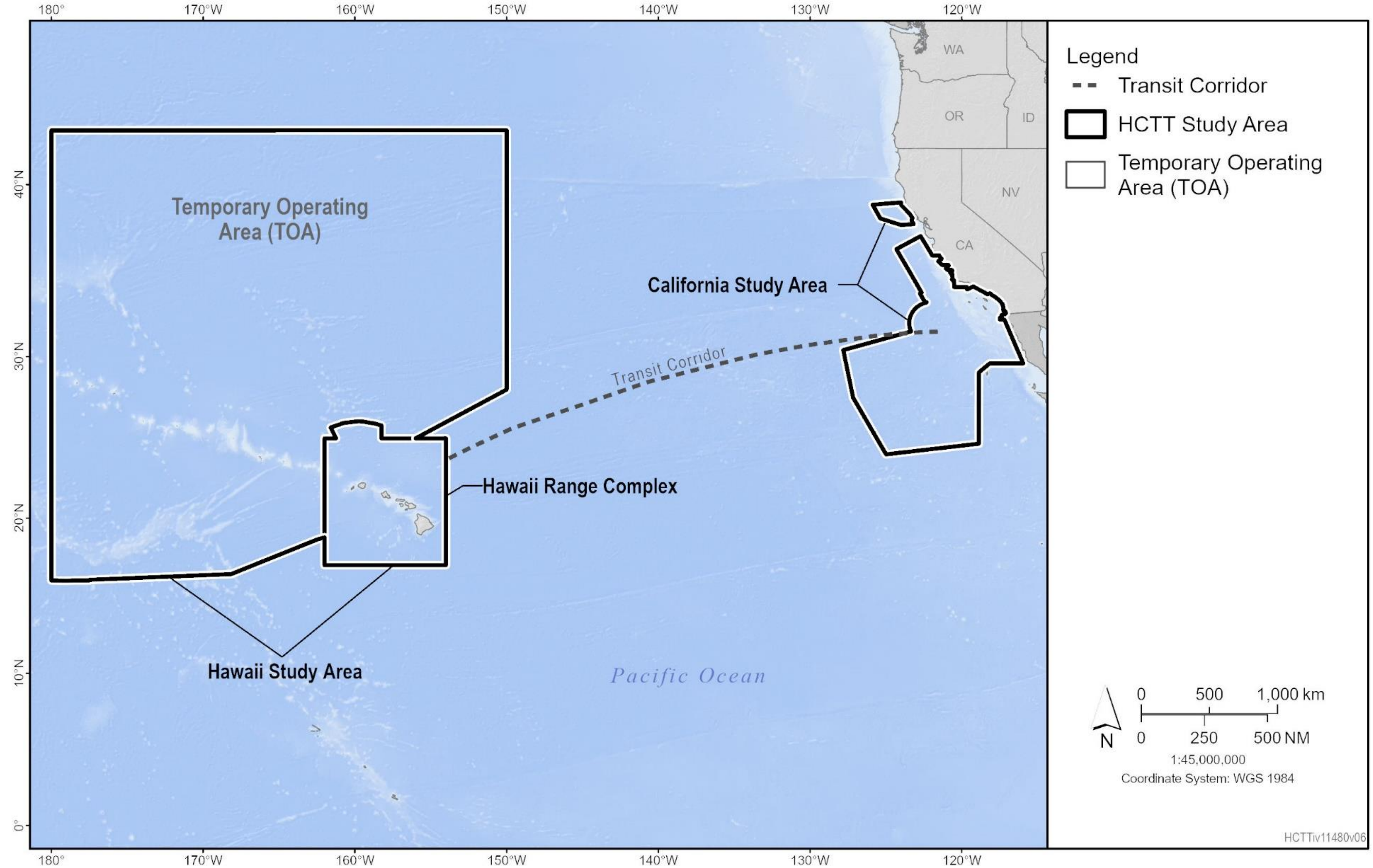
In this chapter, the Navy describes and identifies the primary mission areas under which these military readiness activities are conducted. Each Naval community (e.g., aviation, ship, submarine, and expeditionary) conducts activities that contribute to the success of a primary mission area (described in Section 2.2). Each primary mission area requires unique skills, sensors, weapons, and technologies to accomplish the mission. For example, under the anti-submarine warfare (ASW) primary mission area, surface, submarine, and aviation warfare communities each utilize different skills, sensors, and weapons to locate, track, and eliminate submarine threats. The testing community contributes to the success of ASW by developing technologies and systems that respond to the needs of the warfare communities. As each warfare community develops its basic skills and integrates them into combined units and strike groups, the problems of communication, coordination and planning, movement, and positioning of naval forces and targeting/delivery of weapons become increasingly complex. This complexity creates a need for coordinated training and testing.

This chapter describes the activities necessary to meet military readiness requirements, which includes actions required to modernize and sustain Navy training and testing ranges. The potential effects of those activities on the environment are analyzed in later chapters of this EIS/OEIS. For further details regarding specific training and testing activities, refer to Appendix A. In accordance with the MMPA, the Navy submitted to NMFS an application requesting authorization for the incidental take of marine mammals for proposed military readiness activities described in this EIS/OEIS. NMFS' proposed action would be a direct outcome of responding to the Navy's request for an incidental take authorization pursuant to the MMPA.

2.1 Description of the Hawaii-California Training and Testing Study Area

The HCTT EIS/OEIS Study Area (Study Area) consists primarily of the Hawaii Study Area, the California Study Area, and the Transit Corridor connecting the two. The Study Area includes only the at-sea components of the range complexes, Navy pierside locations and port transit channels, bays, harbors, inshore waterways, amphibious approach lanes, and civilian ports where training and testing activities occur as well as transits between homeports and operating areas. While only the at-sea components of the range complexes are considered in this EIS/OEIS, the potential effects of sound related to missiles, targets, or artillery projectiles fired from San Nicolas Island (SNI) and the Pacific Missile Range Facility (PMRF) on pinnipeds hauled out along the coastline are analyzed in this EIS/OEIS.

The Navy chose this approach in order to consolidate marine mammal impacts to support the MMPA permitting process into one analysis and to maintain consistency with the 2022 PMSR EIS/OEIS. The land-based training and testing activities on SNI remain unchanged from the 2022 PMSR EIS/OEIS. All other aspects of PMRF and SNI launches/firing, as well as activities conducted on all land components of the Range Complexes are analyzed in separate NEPA analysis.



Notes: HCTT = Hawaii-California Training and Testing

Figure 2-1: Hawaii-California Training and Testing Study Area

The HCTT Study Area differs from the HSTT Study Area in that HCTT includes an expanded SOCAL Range Complex (Warning Area 293 [W-293] and W-294 and the sea space beneath); new testing sea space between W-293 and PMSR; the inclusion of sea space associated with two existing training and testing at-sea ranges (PMSR and the NOCAL Range Complex); inclusion of sea space along the Southern California coastline from approximately Dana Point to Port Hueneme; and four amphibious approach lanes providing California land access from NOCAL and PMSR (Figure 2-2). This EIS/OEIS covers only the at-sea portion of the amphibious approach lanes; the land areas associated with the lanes will be covered under separate environmental analyses and use agreements. Nearshore areas within the Hawaii Study Area, such as Kaneohe Bay or Marine Corps Training Area Bellows (MCTAB), may be used more frequently or for new training or testing activities, but the geographic boundary of the Hawaii Study Area is unchanged.

As warfare evolves, the Action Proponents will require larger contiguous areas, or more specific areas due to specific attributes, to conduct training and testing. New weapon systems have greater ranges, and tactics to accommodate those extended ranges demand an expanded battlespace. This requirement is met in part by the expansion of the California Study Area to the north, south, and west. Also, the consolidation of several existing ranges with similar activities in this single analysis is more efficient than conducting multiple NEPA analyses.

For further details regarding specific training and testing ranges and locations, refer to Appendix H.

2.2 Primary Mission Areas

The Navy categorizes its activities into functional warfare areas called primary mission areas. These activities generally fall into the following seven primary mission areas:

- air warfare
- amphibious warfare
- ASW
- electronic warfare
- expeditionary warfare
- mine warfare
- surface warfare

Most training activities addressed in this EIS/OEIS are categorized under one of these primary mission areas; activities that do not fall within one of these areas are listed as "other activities." Each warfare community (aviation, surface, submarine, and expeditionary) may train in some or all of these primary mission areas. The testing community also categorizes most, but not all, of its testing activities under these primary mission areas. A description of the sonar, munitions, targets, systems, and other material used during training and testing activities within these primary mission areas is provided in Appendix H. For a more detailed description of the mission areas, see the 2018 HSTT EIS/OEIS, Section 2.2.

2.3 Proposed Activities

The Action Proponents have been conducting military readiness activities in the Study Area for decades. The tempo and types of training and testing activities have fluctuated because of the introduction of new technologies, the evolving nature of international events, advances in warfighting doctrine and procedures, and changes in force structure (e.g., organization of ships, weapons, and personnel). Such developments influence the frequency, duration, intensity, and location of required training and testing activities. This EIS/OEIS (Phase IV) reflects the most up-to-date compilation of training and testing activities deemed necessary to accomplish military readiness requirements. The types and numbers of activities included in the Proposed Action accounts for fluctuations in training and testing to meet evolving or emergent military readiness requirements.

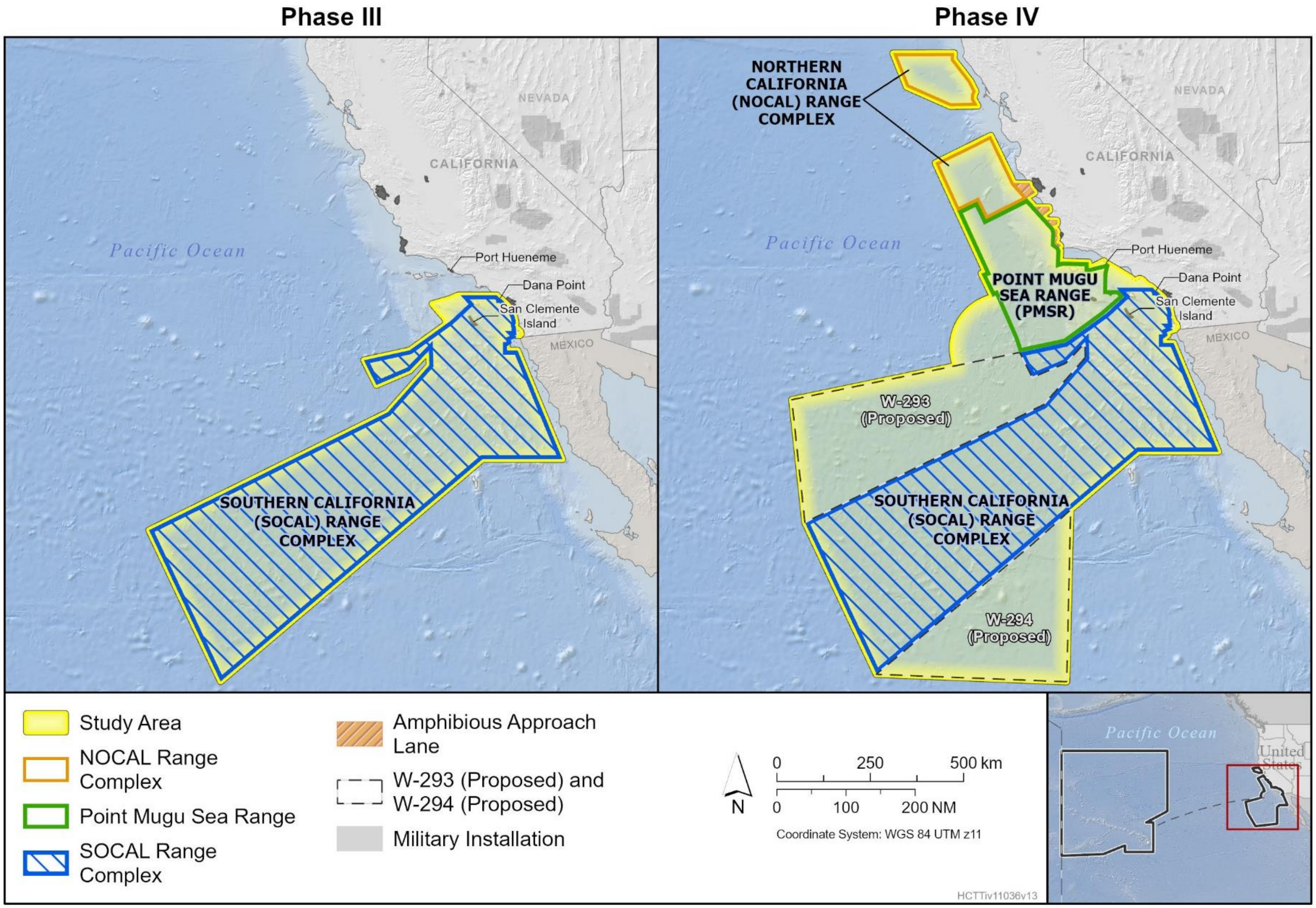


Figure 2-2: Change in the HSTT California Study Area (Phase III) to the HCTT California Study Area (Phase IV)

In addition to training of U.S. Navy and USMC, this EIS/OEIS also covers a limited subset of USCG, Army, and USAF activities. These activities are similar to Navy and USMC military readiness activities.

For training and testing to be effective, units must be able to safely use their sensors and weapon systems, to their optimum capabilities, as they are intended to be used in military missions and combat operations. Standard operating procedures (SOPs) applicable to training and testing have been developed through years of experience, and their primary purpose is to provide for both safety (including public health and safety) and mission success. Because they are essential to safety and mission success, SOPs are part of the Proposed Action and are considered in Chapter 3 environmental analyses for applicable resources. For a detailed discussion of the SOPs, see Section 3.0.4.

2.3.1 Foreign Military Participation

In furtherance of national security objectives, foreign militaries may participate in multinational training and testing events in the Study Area. Foreign military participation is not part of the federal action unless the U.S. military exercises substantial control and responsibility over those foreign military activities. Foreign military vessels and aircraft operate pursuant to their own national authorities and have independent rights under customary international law, embodied in the principle of sovereign immunity, to engage in various activities on the world's oceans and seas.

2.3.2 Proposed Training Activities

Training includes tasks at increasing levels of complexity, from individual, crew, and small-unit events to large major training exercises. A major training exercise is comprised of several "unit-level" range events conducted by several units operating together while commanded and controlled by a single commander. These exercises typically employ an exercise scenario developed to train and evaluate the participants in naval tactical tasks. In a major training exercise, most of the operations and activities being directed and coordinated by the strike group commander are identical in nature to the operations conducted during individual, crew, and smaller unit-level training events. In a major training exercise, however, these individual training tasks are conducted in concert, rather than in isolation. Major training exercises can sometimes include participation by other U.S. services and foreign militaries.

Some integrated or coordinated exercises are similar in that they are comprised of several unit-level exercises but are generally on a smaller scale than a major training exercise, are shorter in duration, and use fewer assets. Three key factors used to identify and group the exercises are the scale of the exercise, duration of the exercise, and amount of hull-mounted sonar hours used during the exercise.

Training activity descriptions are provided in Table 2-1 (Navy and USMC), Table 2-2 (USCG), Table 2-3 (Army), and Table 2-4 (USAF). Navy-led major training exercises and integrated/coordinated exercises shown in Table 2-1 may include joint participation (other U.S. and non-U.S. military services). Appendix A has more detailed descriptions of the activities.

Many of the proposed training activities involve vessels maneuvering as part of the training or transiting to and from the training area. Some vessel maneuvering is associated with normal underway operation of the vessel, such as underway replenishment and the launch and recovery of aircraft on Navy ships. The vessel movements associated with these operations are not part of specific training activities listed in Table 2-1; however, these and all Navy and USCG vessel movements within the Study Area are considered in the analyses.

Table 2-1: Navy and Marine Corps Proposed Training Activity Descriptions

Activity Name	Activity Description
Major Training Exercises – Large Integrated Anti-Submarine Warfare	
Composite Training Unit Exercise – Strike Group	Aircraft carrier and carrier air wing integrate with surface, submarines, and unmanned systems in a challenging multi-threat operational environment that certifies them ready to deploy.
Rim of the Pacific Exercise	A biennial multinational training exercise in which navies from Pacific Rim nations and other allies assemble in Pearl Harbor, Hawaii, to conduct training throughout the Hawaiian Islands in a number of warfare areas. Components of a Rim of the Pacific exercise, such as mine warfare, surface warfare, and amphibious training, may be conducted in the California Operating Area.
Major Training Exercises – Medium Integrated Anti-Submarine Warfare	
Task Force/Sustainment Exercise	Aircraft carrier and carrier air wing integrates with surface and submarine units in a challenging multi-threat operational environment to maintain ability to deploy.
Integrated/Coordinated Anti-Submarine Warfare	
Medium Coordinated Anti-Submarine Warfare	Typically, a 3–10-day exercise with multiple ships, aircraft, and submarines integrating the use of their sensors, including sonobuoys and unmanned systems, to search, detect, and track threat submarines; event may include inert torpedo firings.
Small Coordinated Anti-Submarine Warfare	Typically, a 2-to-5-day exercise with multiple ships, aircraft and submarines integrating the use of their sensors, including sonobuoys, to search, detect, and track threat submarines.
Integrated/Coordinated Training – Other	
Composite Training Unit Exercise – Amphibious Ready Group/Marine Expeditionary Unit	Navy and U.S. Marine Corps forces conduct integration training at sea in preparation for deployment.
Independent Deployer Certification Exercise/Tailored Surface Warfare Training	Multiple ships, aircraft, and submarines conduct integrated multi-warfare training with a surface warfare emphasis. Serves as a ready-to-deploy certification for individual surface ships tasked with surface warfare missions.
Innovation and Demonstration Exercise (also called Tactical Development Exercise)	These exercises are conducted to demonstrate or test new capabilities, tactics, techniques, and procedures; and generate standardized, actionable data for evaluation.
Integrated Air Missile Defense Exercise	Missiles are launched from a ship against a dynamic test target, simulating an airborne threat to ships. These events could be U.S.-led with joint and Coalition forces.
Large Amphibious Exercise	The Large Amphibious Exercise utilizes all elements of the Marine Air Ground Task Force (Amphibious) to secure the battlespace (air, land, and sea), maneuver to and seize the objective, and conduct self-sustaining operations ashore with logistic support of the Expeditionary Strike Group. This exercise could include manned and unmanned activities in multiple warfare areas to secure the battlespace (air, land, and sea) and maneuver and secure operations ashore.

Table 2-1: Navy and Marine Corps Proposed Training Activity Descriptions (continued)

Activity Name	Activity Description
Integrated/Coordinated Training – Other (continued)	
Multi-Warfare Exercise	Multi-Warfare Exercises are integrated events that include training in multiple warfare areas. Events could be comprised of small units up to and including Carrier and Amphibious Strike Groups. Live-fire events could be air-to-surface, ship-to-shore, shore-to-offshore target, and ship-to-ship utilizing live ordnance and laser systems.
Air Warfare	
Air Combat Maneuvers	Fixed-wing aircrews aggressively maneuver against threat aircraft to gain tactical advantage.
Air Defense Exercise	Aircrew and ship crews conduct defensive measures against threat aircraft or simulated missiles.
Gunnery Exercise Air-to-Air Medium-Caliber	Fixed-wing aircraft fire medium-caliber guns at air targets.
Gunnery Exercise Air-to-Air Small-Caliber	Helicopter aircrews fire small-caliber guns at threat air targets.
Gunnery Exercise Surface-to-Air Large-Caliber	Surface ship crews fire large-caliber guns at air targets.
Gunnery Exercise Surface-to-Air Medium-Caliber	Surface ship crews fire medium-caliber guns at air targets.
High-Energy Laser Exercise Surface-to-Air	Ship crews disable or destroy air targets with high-energy laser systems.
Medium Range Interceptor Capability	Ground personnel defend against threat missiles and aircraft with vehicle-launched ground-to-air missile systems.
Missile Exercise Air-to-Air	Fixed-wing aircrews fire air-to-air missiles at air targets.
Missile Exercise Man-portable Air Defense System	Personnel employ a shoulder-fired surface-to-air missile at air targets.
Missile Exercise Surface-to-Air	Surface ship crews defend against threat missiles and aircraft with missiles.
Amphibious Warfare	
Amphibious Assault	Large unit forces move ashore from amphibious ships at sea for the immediate execution of inland objectives.
Amphibious Operations in a Contested Environment	Navy and Marine Corps forces conduct operations in coastal and offshore waterways against air, surface, and subsurface threats.
Amphibious Raid	Small unit forces move from amphibious ships at sea for a specific short-term mission. These are quick operations with as few personnel as possible.
Amphibious Vehicle Maneuvers	Crews practice the employment of amphibious craft, amphibious vehicles, and small boats.

Table 2-1: Navy and Marine Corps Proposed Training Activity Descriptions (continued)

Activity Name	Activity Description
Expeditionary Fires Exercise/Supporting Arms Coordination Exercise	Military units provide integrated and effective close air support, Naval Surface Fire Support fire, and Marine Corps artillery fire in support of amphibious operations.
Naval Surface Fire Support Exercise-At Sea	Surface ship crews fire large-caliber guns at a passive acoustic hydrophone scoring system.
Naval Surface Fire Support Exercise – Land-Based Target	Surface ship crews fire large-caliber guns at land-based targets to support forces ashore.
Non-Combat Amphibious Operation	Amphibious vehicles move personnel and equipment from ships to shore and back.
Shore-to-Surface Artillery Exercise	Amphibious land-based forces fire artillery guns at surface targets.
Shore-to-Surface and/or Air-to-Surface Missile Exercise	Amphibious land-based forces fire anti-surface missiles, rockets, and loitering munitions at surface targets.
Anti-Submarine Warfare	
Anti-Submarine Warfare Torpedo Exercise – Helicopter	Helicopter crews search for, track, and detect submarines. Recoverable air launched torpedoes are employed against submarine targets.
Anti-Submarine Warfare Torpedo Exercise – Maritime Patrol Aircraft	Maritime patrol aircraft aircrews search for, track, and detect submarines. Recoverable air launched torpedoes are employed against submarine targets.
Anti-Submarine Warfare Torpedo Exercise – Ship	Surface ship crews search for, track, and detect submarines. Exercise torpedoes are used.
Anti-Submarine Warfare Torpedo Exercise – Submarine	Submarine crews search for, track, and detect submarines. Exercise torpedoes are used.
Anti-Submarine Warfare Tracking Exercise – Helicopter	Helicopter and tilt-rotor crews search for, track, and detect submarines.
Anti-Submarine Warfare Tracking Exercise –Unmanned Surface Vessel	Unmanned surface vessels search for, detect, and track a sub-surface target simulating a threat submarine with the goal of determining a firing solution that could be used to launch a torpedo.
Anti-Submarine Warfare Tracking Exercise – Maritime Patrol Aircraft	Maritime patrol aircraft aircrews search for, track, and detect submarines.
Anti-Submarine Warfare Tracking Exercise – Ship	Surface ship crews search for, track, and detect submarines.
Anti-Submarine Warfare Tracking Exercise – Submarine	Submarine crews search for, track, and detect submarines.
Training and End-to-End Mission Capability Verification – Torpedo	A submarine launches exercise and explosive torpedoes at a suspended target.

Table 2-1: Navy and Marine Corps Proposed Training Activity Descriptions (continued)

Activity Name	Activity Description
Electronic Warfare	
Counter Targeting Chaff Exercise – Aircraft	Fixed-wing aircraft and helicopter aircrews deploy chaff to disrupt threat targeting and missile guidance radars.
Counter Targeting Chaff Exercise – Ship	Surface ship crews deploy chaff to disrupt threat targeting and missile guidance radars.
Counter Targeting Flare Exercise	Fixed-wing aircraft and helicopter aircrews deploy flares to disrupt threat infrared missile guidance systems.
Electronic Warfare Operations	Aircraft and surface ship crews control the electromagnetic spectrum used by enemy systems to degrade or deny the enemy's ability to take defensive actions.
Expeditionary Warfare	
Dive and Salvage Operations	Navy divers perform dive and salvage operations training.
Gunnery Exercise Ship-to-Shore	Small boat crews fire small- and medium-caliber guns at land-based targets.
Obstacle Clearance	Trains forces to create cleared lanes in simulated enemy obstacle systems to allow friendly forces safe transit from sea to shore.
Personnel Insertion/ Extraction – Air	Personnel are inserted into a water objective via fixed-wing aircraft using parachutes or by helicopters via ropes or jumping into the water. Personnel are extracted by helicopters or small boats.
Personnel Insertion/ Extraction – Surface and Subsurface	Personnel are inserted into and extracted from an objective area by small boats or subsurface platforms.
Personnel Insertion/ Extraction – Swimmer/Diver	Divers and swimmer infiltrate harbors, beaches, or moored vessels and conduct a variety of tasks.
Port Damage Repair	Navy Expeditionary forces train to repair critical port facilities. Training could include diving operations, salvage operations, vibratory and impact pile driving, and vibratory pile removal.
Small Boat Attack	Afloat units defend against attacking watercraft. For this activity, one or two small boats or personal watercraft conduct attack activities on units afloat.
Mine Warfare	
Airborne Mine Countermeasure – Mine Detection	Helicopter aircrews detect mines using towed or laser mine detection systems.
Airborne Mine Laying	Fixed-wing aircraft drop explosive and non-explosive mine shapes.
Amphibious Breaching Operations	Amphibious forces use explosive clearing systems to clear simulated mines on beaches, shallow water, and surf zones for potential landing of personnel and vehicles.

Table 2-1: Navy and Marine Corps Proposed Training Activity Descriptions (continued)

Activity Name	Activity Description
Civilian Port Defense – Homeland Security Anti-Terrorism/Force Protection Exercise	Maritime security personnel train to protect civilian ports against enemy efforts to interfere with access to those ports.
Mine Countermeasure Exercise – Ship Sonar	Littoral Combat Ship crews detect and avoid mines while navigating restricted areas or channels using remotely operated active sonar systems.
Mine Countermeasures – Mine Neutralization – Remotely Operated Vehicle	Ship, small boat, and helicopter crews locate and disable mines using remotely operated underwater vehicles.
Mine Countermeasures – Towed Mine Neutralization	Unmanned Surface Vessels tow systems through the water that are designed to disable or trigger mines.
Mine Neutralization Explosive Ordnance Disposal	Personnel disable threat mines using explosive charges.
Submarine Mine Avoidance Exercise	Submarine crews use active sonar or Unmanned Underwater Vehicles (UUVs), and shore-based personnel operate UUVs to detect and avoid training mine shapes or other underwater hazardous objects.
Submarine Mobile Mine and Mine Laying Exercise	Submarine crews and shore-based personnel operating a UUV deploy exercise (inert) mobile mines or mines.
Surface Ship Object Detection	Ship crews detect and avoid mines while navigating restricted areas or channels, using active sonar.
Training and End-to-End Mission Capability Verification – Mobile Mine and Mine Laying Exercise	Submarine crew launches explosive mobile mine(s), and shore-based personnel operating a UUV or a service craft deploy mine(s) to a planned location where the mines are detonated.
Underwater Demolition Qualification and Certification	Navy divers conduct various levels of training and certification in placing underwater demolition charges.
Underwater Demolitions Multiple Charge – Large Area Clearance	Military personnel use diver-placed explosive charges to destroy barriers or obstacles to amphibious vehicle access to beach areas.
Underwater Mine Countermeasure Raise, Tow, Beach, and Exploitation	Personnel locate mines, perform mine neutralization, raise and tow mines to the beach, and conduct exploitation operations for intelligence gathering.
Surface Warfare	
Bombing Exercise Air-to-Surface	Fixed-wing aircrews and Unmanned Aircraft Systems (UASs) deliver bombs against surface targets.
Gunnery Exercise Air-to-Surface Medium Caliber	Fixed-wing and helicopter aircrews fire medium-caliber guns at surface targets.
Gunnery Exercise Air-to-Surface Small Caliber	Helicopter and tilt-rotor aircrews use small-caliber guns to engage surface targets.

Table 2-1: Navy and Marine Corps Proposed Training Activity Descriptions (continued)

Activity Name	Activity Description
Gunnery Exercise Surface-to-Surface Boat Medium Caliber	Small boat crews fire medium-caliber guns at surface targets.
Gunnery Exercise Surface-to-Surface Boat Small Caliber	Small boat crews fire small-caliber guns at surface targets.
Gunnery Exercise Surface-to-Surface Ship Large Caliber	Surface ship crews fire large-caliber guns at surface targets.
Gunnery Exercise Surface-to-Surface Ship Medium Caliber	Surface ship crews fire medium-caliber guns at surface targets.
Gunnery Exercise Surface-to-Surface Ship Small Caliber	Surface ship crews fire small-caliber guns at surface targets.
Laser Targeting – Aircraft	Fixed-wing and helicopter aircrews illuminate surface targets with lasers.
High-Energy Laser Exercise Surface-to-Surface	Surface ship crews disable or destroy surface targets with high-energy laser systems.
Maritime Security Operations	Helicopter, surface ship, and small boat crews conduct security operations at sea, to include visit, board, search, and seizure; maritime interdiction operations; force protection; and anti-piracy operations.
Missile Exercise Air-to-Surface	Fixed-wing and helicopter aircrews and UASs fire air-to-surface missiles at surface targets.
Missile Exercise Air-to-Surface Rocket	Helicopter aircrews fire both precision-guided and unguided rockets at surface targets.
Missile Exercise Surface-to-Surface	Surface ship crews defend against surface threats (ships or small boats) and engage them with missiles or loitering munitions.
Sinking Exercise	Aircraft, ship, and submarine crews deliberately sink a seaborne target, usually a decommissioned ship made environmentally safe for sinking according to U.S. Environmental Protection Agency standards, with a variety of ordnance.
Surface Warfare Torpedo Exercise – Submarine	Submarine crews search for, detect, and track a surface ship simulating a threat surface ship with the goal of determining a firing solution that could be used to launch a torpedo with the intent to simulate destroying the targets.
Training and End-to-End Mission Capability Verification – Submarine Missile Maritime	Submarine crews launch missile(s) which may have an explosive warhead at a maritime target simulating an adversary surface ship with the goal of destroying or disabling adversary surface ship.
Other Training Exercises	
Aerial Firefighting	Helicopter aircrews conduct proficiency training in the use of airborne firefighting water baskets, dropping seawater on terrestrial targets on San Clemente Island (SCI).

Table 2-1: Navy and Marine Corps Proposed Training Activity Descriptions (continued)

Activity Name	Activity Description
At-Sea Vessel Refueling Training	Crews practice refueling boats at sea from other vessels.
Combat Swimmer/Diver Training and Certification	Navy and Marine Corps personnel conduct combat swimming conditioning swims and surf passage to execute a variety of tasks in the open water and littoral waterways.
Kilo Dip	Functional check of the dipping sonar prior to conducting a full test or training event on the dipping sonar.
Multi-Domain Unmanned Autonomous Systems	Multi-domain (surface, subsurface, and airborne) unmanned autonomous systems are launched from land, ships, and boats, in support of intelligence, surveillance, and reconnaissance operations; and deliver munitions or other non-munition systems to support mission and intelligence requirements.
Precision Anchoring	Surface ship crews release and retrieve anchors in designated locations.
Ship-to-Shore Fuel Transfer Training	Personnel train in the transfer of petroleum (though only sea water is used during training) from a ship to the shore.
Submarine and UUV Subsea and Seabed Warfare Exercise	Submarine crews and shore-based operators train to launch or recover and operate all classes of UUVs in the subsea and seabed environment in order to defend deep ocean and seabed infrastructure or take offensive action against a simulated adversary’s subsea and seabed infrastructure.
Submarine Navigation Exercise	Submarine crews operate sonar for navigation and object detection while transiting into and out of port during reduced visibility.
Submarine Sonar Maintenance and Systems Checks	Maintenance of submarine sonar systems is conducted pierside or at sea.
Submarine Under Ice Training and Certification	Submarine crews train to operate under ice. Ice conditions are simulated during training and certification events.
Surface Ship Sonar Maintenance and Systems Checks	Maintenance of surface ship sonar systems is conducted pierside or at sea.
Training and End-to-End Mission Capability Verification – Subsea and Seabed Warfare Kinetic Effectors	Submarine crews or shore-based operators employ UUV with munitions or non-munition systems on the sea floor or in the water column.
Training and End-to-End Mission Capability Verification – Unmanned Aerial Vehicle (UAV)	Submarine crews or shore-based personnel controlling a UUV launch a capsule containing a UAV. The canister is deployed underwater and ascends to a programmed depth. The canister subsequently launches a UAV, and the canister sinks.
Underwater Survey	Personnel perform methodical reconnoitering of beaches and surf conditions during the day and night to find and clear underwater obstacles and determine the feasibility of landing an amphibious force on a particular beach.
Unmanned Aerial System Training and Certification	Surface ships and submarines launch unmanned aerial systems to conduct intelligence, surveillance, and reconnaissance (ISR) missions.

Table 2-1: Navy and Marine Corps Proposed Training Activity Descriptions (continued)

Activity Name	Activity Description
Unmanned Underwater Vehicle Training – Certification and Development Exercises	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads for multiple purposes to ensure that the systems can be employed effectively in an operational environment.
Waterborne Training	Small boat crews conduct a variety of training, including boat launch and recovery, operation of crew-served unmanned vehicles, mooring to buoys, anchoring, and maneuvering. Small boats include rigid hull inflatable boats, and riverine patrol, assault, and command boats up to approximately 50 feet in length.

Table 2-2: Coast Guard Proposed Training Activity Descriptions

Activity Name	Activity Description
Air Warfare	
Gunnery Exercise Surface-to-Air Large Caliber	Surface ship crews fire large-caliber guns at air targets.
Gunnery Exercise Surface-to-Air Medium Caliber	Surface ship crews fire medium-caliber guns at air targets.
Electronic Warfare	
Counter Targeting Chaff Exercise – Ship	Surface ship crews deploy chaff to disrupt threat targeting and missile guidance radars.
Counter Targeting Flare Exercise	Fixed-wing aircraft and helicopter aircrews deploy flares to disrupt threat infrared missile guidance systems.
Expeditionary Warfare	
Underwater Construction Team Training	Coast Guard personnel conduct diving and salvage operations and perform cutting, welding, assembly, and installation of deep-water structures, mooring systems, underwater instrumentation, and other systems as needed.
Surface Warfare	
Gunnery Exercise Air-to-Surface Medium Caliber	Fixed-wing and helicopter aircrews fire medium-caliber guns at surface targets.
Gunnery Exercise Surface-to-Surface Boat Medium Caliber	Small boat crews fire medium-caliber guns at surface targets.
Gunnery Exercise Surface-to-Surface Boat Small Caliber	Small boat crews fire small-caliber guns at surface targets.
Gunnery Exercise Surface-to-Surface Ship Large Caliber	Surface ship crews fire large-caliber guns at surface targets.

Table 2-2: Coast Guard Proposed Training Activity Descriptions (continued)

Activity Name	Activity Description
Gunnery Exercise Surface-to-Surface Ship Medium Caliber	Surface ship crews fire medium-caliber guns at surface targets.
Gunnery Exercise Surface-to-Surface Ship Small Caliber	Surface ship crews fire small-caliber guns at surface targets.
High-Energy Laser Exercise Surface-to-Surface	Surface ship crews disable or destroy surface targets with high-energy laser systems.
Maritime Security Operations	Helicopter, surface ship, and small boat crews conduct security operations at sea, to include visit, board, search, and seizure; maritime interdiction operations; force protection; maritime environmental response; oil platform defense; ship force protection; and anti-piracy operations.
Other Training Exercises	
Precision Anchoring	Surface ship crews release and retrieve anchors in designated locations.
Search and Rescue	Navy and Coast Guard helicopter and ship crews practice the skills required to recover personnel lost at sea.
Unmanned Aerial System Training and Certification	Coast Guard crews launch and operate unmanned aerial systems.
Unmanned Underwater Vehicle Training – Certification and Development Exercises	Unmanned underwater vehicle certification involves training with unmanned platforms to ensure submarine crew proficiency. Tactical development involves training with various payloads for multiple purposes to ensure that the systems can be employed effectively in an operational environment.
Waterborne Training	Small boat crews conduct a variety of training, including boat launch and recovery, operation of crew-served unmanned vehicles, mooring to buoys, anchoring, safety swimmer and safety lookout qualifications, shallow water training, and maneuvering. Small boats include rigid hull inflatable boats, and riverine patrol, assault, and command boats up to approximately 50 feet in length.

Table 2-3: Army Proposed Training Activity Descriptions

Activity Name	Activity Description
Air Warfare	
Missile Exercise – Man-Portable Air Defense System	Personnel employ a shoulder-fired surface-to-air missile at air targets.
Amphibious Warfare	
Shore-to-Surface Artillery Exercise	Amphibious land-based forces fire artillery guns at surface targets.
Shore-to-Surface Missile Exercise	Amphibious land-based forces fire anti-surface missiles, rockets, and loitering munitions at surface targets.
Surface Warfare	
Gunnery Exercise Surface-to-Surface Boat Medium Caliber	Small boat crews fire medium-caliber guns at surface targets.
Gunnery Exercise Surface-to-Surface Boat Small Caliber	Small boat crews fire small-caliber guns at surface targets.

Table 2-4: Air Force Proposed Training Activity Descriptions

Activity Name	Activity Description
Air Warfare	
Air Combat Maneuvers	Fixed-wing aircrews aggressively maneuver against threat aircraft to gain tactical advantage.
Gunnery Exercise Air-to-Air Medium Caliber	Fixed-wing aircraft fire medium-caliber guns at air targets.

2.3.3 Proposed Testing Activities

The Navy's testing community engages in a broad spectrum of research, development, testing, and evaluation activities as part of the acquisition process and in support of the fleet. These activities include, but are not limited to, basic and applied scientific research and technology development; testing, evaluation, and maintenance of systems (e.g., missiles, radar, and sonar) and platforms (e.g., surface ships, submarines, and aircraft); and acquisition of systems and platforms to support Navy missions and give a technological edge over adversaries.

The Navy operates in an ever-changing strategic, tactical, financially constrained, and time-constrained environment. Testing activities occur in response to emerging science or fleet operational needs. For example, future Navy experiments to develop a better understanding of ocean currents may be designed based on advancements made by non-government researchers not yet published in the scientific literature. Similarly, the Navy may be required to conduct specific operations in a geographic area where those operations have never been conducted before, which may require modifications to Navy assets to account for local environmental conditions. Such modifications must be tested in the field to ensure they meet fleet needs and requirements. Accordingly, generic descriptions of some of these activities are the best that can be articulated in a long-term, comprehensive document, like this EIS/OEIS.

Appendix A has more detailed descriptions of the activities.

2.3.3.1 Naval Air Systems Command Testing Activities

NAVAIR's proposed testing activities generally fall in the primary mission areas used by the fleet and include the evaluation of new and in-service aircraft platforms and systems to deliver critical aviation capabilities to the fleet. To accomplish its mission, NAVAIR conducts ASW tests using fixed-wing and rotary wing aircraft platforms, a suite of passive and active acoustic sonobuoys (to include Lot Acceptance Testing), and dipping sonar systems. NAVAIR's proposed testing activities are described in Table 2-5.

Table 2-5: Naval Air Systems Command Proposed Testing Activity Descriptions

Activity Name	Activity Description
Air Warfare	
Air Combat Maneuver Test	Aircrews engage in flight maneuvers designed to gain a tactical advantage during combat. Fixed-wing aircrews aggressively maneuver against threat aircraft to gain tactical advantage.
Air Platform – Vehicle Test	Testing is performed to quantify the flying qualities, handling, airworthiness, stability, controllability, and integrity of an air platform or vehicle. No explosive weapons are released during an air platform vehicle test.
Air Platform Weapons Integration Test	Testing performed to quantify the compatibility of weapons with the aircraft from which they would be launched or released. Non-explosive weapons or shapes are used.
Air-to-Air Missile Test	Test is performed to evaluate the effectiveness of air-launched missiles against designated airborne targets. Fixed-wing aircraft will be used.
Intelligence, Surveillance, and Reconnaissance Test	Aircrews use all available sensors to collect data on threat vessels.
Large Force Test Event	Navy led Large Force Test Event focused on interoperability testing and tactics of near-future capabilities in a maritime environment across the DoD's air, sea, and space domains. No ordnance would be used.
Surface-to-Air Gunnery Test – Large Caliber	Evaluates the performance and effectiveness of software and hardware modifications or upgrades of ground-based and ship-based large-caliber gunnery systems against aerial targets.
Surface-to-Air Gunnery Test – Medium Caliber	Evaluates the performance and effectiveness of software and hardware modifications or upgrades of ground-based and ship-based medium-caliber gunnery systems against aerial targets.
Surface-to-Air High-Energy Laser Test	The specifications, integration, and performance of a vessel-mounted, high-energy laser are evaluated against an unmanned aerial target.
Surface-to-Air High-Power Microwave Test	High-power microwave systems, operating within a wide range of frequencies from 1 megahertz to 100 gigahertz, transmit energy from a ship or land-based system to a target to degrade or destroy electrical components in the target.
Surface-to-Air Missile Test	Testing with surface-to-air missiles involves Navy ships firing their self-defense missiles against airborne targets.

Table 2-5: Naval Air Systems Command Proposed Testing Activity Descriptions (continued)

Activity Name	Activity Description
Anti-Submarine Warfare	
Anti-Submarine Warfare Torpedo Test (Aircraft)	Test evaluates anti-submarine warfare systems onboard rotary-wing and fixed-wing aircraft and the ability to search for, detect, classify, localize, track, and attack a submarine or similar target.
Anti-Submarine Warfare Tracking Test (Fixed-Wing)	The test evaluates the sensors and systems used by fixed-wing aircraft to detect and track submarines and to ensure that aircraft systems used to deploy the tracking systems perform to specifications and meet operational requirements.
Anti-Submarine Warfare Tracking Test (Rotary-Wing)	The test evaluates the sensors and systems used to detect and track submarines and to ensure that rotary-wing aircraft systems used to deploy the tracking systems perform to specifications.
Kilo Dip Test	Functional check of a rotary-wing aircraft-deployed dipping sonar system prior to conducting a testing or training event using the dipping sonar system.
Sonobuoy Lot Acceptance Test	Sonobuoys are deployed from surface vessels and aircraft to verify the integrity and performance of a lot or group of sonobuoys in advance of delivery to the fleet for operational use.
Electronic Warfare	
Chaff Test	Chaff tests evaluate newly developed or enhanced chaff, chaff dispensing equipment, or modified aircraft systems against chaff deployment. Tests may also train pilots and aircrew in the use of new chaff dispensing equipment. Chaff tests are often conducted with flare tests and air combat maneuver events, as well as other test events, and are not typically conducted as standalone tests.
Electronic Systems Test	Test that evaluates the effectiveness of electronic systems to control, deny, or monitor critical portions of the electromagnetic spectrum. In general, electronic warfare testing will assess the performance of three types of electronic warfare systems: electronic attack, electronic protect, and electronic support.
Flare Test	Flare tests evaluate newly developed or enhanced flares, flare dispensing equipment, or modified aircraft systems against flare deployment. Tests may also train pilots and aircrew in the use of newly developed or modified flare deployment systems. Flare tests are often conducted with chaff tests and air combat maneuver events, as well as other test events, and are not typically conducted as standalone tests.
Mine Warfare	
Airborne Dipping Sonar Minehunting Test	A mine-hunting dipping sonar system is deployed from rotary-wing aircraft and uses high-frequency sonar for the detection and classification of bottom and moored mines.
Airborne Laser Mine Detection System Test	An airborne laser mine detection system test that is operated from a rotary-wing aircraft and evaluates the system's ability to detect, classify, and fix the location of floating and near-surface, moored mines. The system uses a low-energy laser to locate mines.

Table 2-5: Naval Air Systems Command Proposed Testing Activity Descriptions (continued)

Activity Name	Activity Description
Airborne Mine Neutralization System Test	A test of the airborne mine neutralization system evaluates the system's ability to detect and destroy mines from an airborne mine countermeasures capable rotary-wing aircraft. The airborne mine neutralization system uses up to four unmanned underwater vehicles equipped with high-frequency sonar, video cameras, and explosive and non-explosive neutralizers.
Airborne Sonobuoy Minehunting Test	A mine-hunting system made up of sonobuoys is deployed from rotary-wing aircraft. A field of sonobuoys, using high-frequency sonar, is used for detection and classification of bottom and moored mines.
Mine Laying Test	Fixed-wing aircraft evaluate the performance of mine laying equipment and software systems to lay mines. A mine test may also train aircrew in laying mines using a new or enhanced mine deployment system.
Surface Warfare	
Air-to-Surface Bombing Test	Fixed-wing aircraft test the delivery of bombs against surface maritime targets with the goal of evaluating the bomb, the bomb carry and delivery system, and any associated systems that may have been newly developed or enhanced.
Air-to-Surface Gunnery Test	Fixed-wing and rotary-wing aircrews evaluate new or enhanced aircraft guns against surface maritime targets to test that the gun, gun ammunition, or associated systems meet required specifications or to train aircrew in the operation of a new or enhanced weapons system.
Air-to-Surface High-Energy Laser Test	High-energy laser tests would evaluate the specifications, integration, and performance of an aircraft-mounted, approximately 25-kilowatt high-energy laser. The laser is intended to be used as a weapon to disable small surface vessels.
Air-to-Surface High-Power Microwave Test	A High-Power Microwave Test is where energy is directed from a ship or land-based system to engage a surface target, or energy is directed from a system mounted on an aircraft platform onto a surface target.
Air-to-Surface Laser Targeting Test	Aircrews illuminate enemy targets with lasers.
Air-to-Surface Missile Test	Test may involve both fixed-wing and rotary-wing aircraft launching missiles at surface maritime targets to evaluate the weapons system or as part of another systems integration test.
Long-Range Weapons Delivery Systems (Over-the-Horizon)/Hypersonic Vehicle Test	A flight vehicle is released from a platform where its solid rocket motor booster ignites. The spent booster or boosters and protective shroud then separate from the test vehicle, which continues towards a pre-determined impact site.
Rocket Test	Rocket tests are conducted to evaluate the integration, accuracy, performance, and safe separation of guided and unguided rockets fired from a hovering or forward flying rotary-wing aircraft or tiltrotor aircraft.
Subsurface-to-Surface Missile Test	Submarines launch missiles at surface maritime targets with the goal of destroying or disabling enemy ships or boats.

Table 2-5: Naval Air Systems Command Proposed Testing Activity Descriptions (continued)

Activity Name	Activity Description
Surface-to-Surface Gunnery Test – Large-Caliber	Evaluates the performance and effectiveness of software and hardware modifications or upgrades of ship-based large-caliber gunnery systems against surface targets.
Surface-to-Surface Gunnery Test – Medium-Caliber	Evaluates the performance and effectiveness of software and hardware modifications or upgrades of ship-based medium-caliber gunnery systems against surface targets.
Surface-to-Surface Gunnery Test – Small-Caliber	Evaluates the performance and effectiveness of software and hardware modifications or upgrades of ship-based small-caliber gunnery systems against surface targets.
Surface-to-Surface High-Energy Laser Test	High-energy laser weapons tests evaluate the specifications, integration, and performance of a vessel-mounted high-energy laser which can be used as a weapon to disable small surface targets.
Surface-to-Surface High-Power Microwave Test	A High-Power Microwave Test where energy is directed from a ship or land-based system to engage a surface target, or energy is directed from a system mounted on an aircraft platform onto a surface target.
Surface-to-Surface Missile Test	Surface ships launch missiles at surface maritime targets.
Other Testing Activities	
Acoustic and Oceanographic Research	Active transmissions within the band 10 hertz–100 kilohertz from sources deployed from ships and aircraft.
Air Platform Shipboard Integration Test	Aircraft are tested to determine operability from shipboard platforms, performance of shipboard physical operations, and to verify and evaluate communications and tactical data links.
Undersea Range System Test	Following installation of a Navy underwater warfare training and testing range, tests of the nodes (components of the range) will be conducted to include node surveys and testing of node transmission functionality.

2.3.3.2 Naval Facilities Engineering and Expeditionary Warfare Center Proposed Testing Activities

EXWC provides research, development, testing, and evaluation, as well as in-service engineering and lifecycle management for the shore, oceans, and expeditionary domains. EXWC's proposed activities include ocean energy and cable systems research; undersea range system testing; and underwater search, deployment, and recovery. Table 2-6 describes EXWC's proposed testing activities.

Table 2-6: Naval Facilities Engineering and Expeditionary Warfare Center Proposed Testing Activity Descriptions

Activity Name	Activity Description
Unmanned Systems	
Ocean Energy and Cable Systems Research	Testing of ocean and marine energy harvesting/producing systems, energy storage & distribution, subsea power systems and associated infrastructure, and temporary subsea cable network deployment and interoperability.
Undersea Range System Testing	This activity supports advanced ocean technology development for fixed ocean and seafloor systems, including deployment of free-fall penetrometers and gravity deployed anchors used to determine seafloor characteristics and seafloor interaction testing of anchors, small foundations, and packages.
Other Testing Activities	
Underwater Search, Deployment, and Recovery	Tests various systems associated with Remotely Operated Vehicles and Unmanned Underwater Vehicles, to include seafloor sampling, surveying, seafloor soil excavating, and subsea cable deployment.

2.3.3.3 Naval Sea Systems Command Testing Activities

NAVSEA's proposed testing activities are generally aligned with the primary mission areas used by the fleet. NAVSEA's proposed activities include, but are not limited to, testing of new ship constructions, life cycle support, and other weapon system development and testing. Table 2-7 describes NAVSEA's proposed testing activities.

Table 2-7: Naval Sea Systems Command Proposed Testing Activity Descriptions

Activity Name	Activity Description
Anti-Submarine Warfare	
Anti-Submarine Warfare Mission Package Testing	Ships and their supporting platforms (e.g., rotary-wing aircraft, unmanned aerial systems) detect, localize, and prosecute submarines.
At-Sea Sonar Testing	At-sea testing to ensure systems are fully functional in an open ocean environment.
Pierside Sonar Testing	Pierside testing to ensure systems are fully functional in a controlled pierside environment prior to at-sea test activities.
Surface Ship Sonar Testing/Maintenance	Pierside and at-sea testing of ship systems occur periodically following major maintenance periods and for routine maintenance.
Torpedo (Explosive) Testing	Air, surface, or submarine crews employ explosive and non-explosive torpedoes against virtual targets.
Torpedo (Non-Explosive) Testing	Air, surface, or submarine crews employ non-explosive torpedoes against targets, submarines, or surface vessels.
Electronic Warfare	
Radar and Other System Testing	Test may include use of military or commercial radar, communication systems (or simulators), or high-energy lasers. Testing may occur aboard a ship against drones, small boats, rockets, missiles, or other targets.

Table 2-7: Naval Sea Systems Command Proposed Testing Activity Descriptions (continued)

Activity Name	Activity Description
Mine Warfare	
Mine Countermeasure and Neutralization Testing	Air, surface, and subsurface vessels neutralize threat mines and mine-like objects.
Mine Countermeasure Mission Package Testing	Vessels and associated aircraft conduct mine countermeasure operations.
Mine Detection and Classification Testing	Air, surface, and subsurface vessels and systems detect, classify, and avoid mines and mine-like objects. Vessels also assess their potential susceptibility to mines and mine-like objects.
Surface Warfare	
Gun Testing – Large Caliber	Surface crews test large-caliber guns to defend against surface targets.
Gun Testing – Medium Caliber	Surface crews test medium-caliber guns to defend against surface targets.
Gun Testing – Small Caliber	Surface crews test small-caliber guns to defend against surface targets.
Missile and Rocket Testing	Missile and rocket testing includes various missiles or rockets fired from submarines and surface combatants. Testing of the launching system and ship defense is performed.
Unmanned Systems	
Underwater Search, Deployment, and Recovery	Various underwater, bottom crawling, robotic vehicles are utilized in underwater search, recovery, installation, and scanning activities.
Unmanned Surface Vehicle System Testing	Unmanned surface vehicles are primarily autonomous systems designed to augment current and future platforms to help deter maritime threats. They employ a variety of sensors designed to extend the reach of manned ships.
Unmanned Underwater Vehicle Testing	Testing involves the production or upgrade of unmanned underwater vehicles. This may include testing mine detection capabilities, evaluating the basic functions of individual platforms, or conducting complex events with multiple vehicles.
Vessel Evaluation	
Air Defense Testing	Test the ship's capability to detect, identify, track, and successfully engage live and simulated targets. Gun systems are tested using explosive and non-explosive rounds.
In-Port Maintenance Testing	Each combat system is tested to ensure they are functioning in a technically acceptable manner and are operationally ready to support at-sea testing.
Propulsion Testing	Ship is run at high speeds in various formations (e.g., straight-line and reciprocal paths).

Table 2-7: Naval Sea Systems Command Proposed Testing Activity Descriptions (continued)

Activity Name	Activity Description
Signature Analysis Operations	Surface ship and submarine testing of electromagnetic, acoustic, optical, and radar signature measurements.
Small Ship Shock Trial	Underwater detonations are used to test new ships or major upgrades.
Submarine Sea Trials – Weapons System Testing	Submarine weapons and sonar systems are tested at-sea to meet integrated combat system certification requirements.
Surface Warfare Testing	Tests capability of shipboard sensors to detect, track, and engage surface targets. Testing may include ships defending against surface targets using explosive and non-explosive rounds, gun system structural test firing, and demonstration of the response to Call for Fire against land-based targets (simulated by sea-based locations).
Undersea Warfare Testing	Ships demonstrate capability of countermeasure systems and underwater surveillance, weapons engagement, and communications systems. This tests ships' ability to detect, track, and engage undersea targets.
Vessel Signature Evaluation	Surface ship, submarine, and auxiliary system signature assessments. This may include electronic, radar, acoustic, infrared, and magnetic signatures.
Other Testing Activities	
Acoustic and Oceanographic Research	Research using active transmissions from sources deployed from ships, aircraft, and unmanned underwater vehicles. Research sources can be used as proxies for current and future Navy systems.
Countermeasure Testing	Countermeasure testing involves the testing of systems that detect, localize, and engage incoming weapons, including marine vessel targets. Testing includes surface ship torpedo defense systems, marine vessel stopping payloads.
Insertion/Extraction	Testing of submersibles capable of inserting and extracting personnel and payloads into denied areas from strategic distances.
Non-Acoustic Component Testing	Testing of towed or floating buoys for communications through radio frequencies or two-way optical communications between an aircraft and underwater system(s). Also includes testing of non-acoustic and *de minimis* sources.
Semi-Stationary Equipment Testing	Semi-stationary equipment (e.g., hydrophones) is deployed to determine functionality.
Simulant Testing	Testing of the capability of surface ship and aircraft defense systems to detect and protect against chemical and biological attacks.

2.3.3.4 Naval Information Warfare Systems Command Testing Activities

NAVWAR is the information warfare systems command for the Navy. The mission of NAVWAR is to identify, develop, deliver, and sustain information warfare capabilities and services that enable naval, joint, coalition, and other national missions operating in warfighting domains from seabed to space; and to perform such other functions and tasks as directed.

Table 2-8 describes the proposed NAVWAR testing activities to be conducted in the Study Area.

Table 2-8: Naval Information Warfare Systems Command Proposed Testing Activity Descriptions

Activity Name	Activity Description
Acoustic and Oceanographic Science and Technology	
Acoustic, Oceanographic, and Energy Research	Testing includes activities utilizing the marine environment for research, development, test, and evaluation of activity-related systems. Tests may involve radar, environmental sensors, magnetic sensors, passive and active acoustic sensors, optical sensors, and lasers. Surface operations utilize a variety of vessels and vehicles for deployment, operation, and testing. Energy research would include the development and testing of energy harvesting and storage technologies, maritime charging stations, remote communications, and associated infrastructure. This testing would also include bioacoustics research in support of marine mammal science.
Other Testing Activities	
Communications	Testing of maritime communications, underwater network systems with fiber optics cables, laser communications, acoustic modem networks and deployment of communication payloads and objects.
Intelligence, Surveillance, Reconnaissance	Testing intelligence, surveillance, and reconnaissance technologies may include mine detection and classification, detection and classification of targets of interest, devices under test on submarine cables, systems to detect mine shapes on ship hulls and pier structures, sensors for swimmer interdiction and other threats, and instrumentation that can detect explosive, radioactive, and other signatures of concern.
Vehicle Testing	Testing of autonomous, remotely operated, or manned vehicles in multiple domains (surface, subsurface, and airborne), and related sensor systems, communication systems, navigation systems, and payloads. Test events may evaluate vehicles individually or with multiple vehicles at a time.

2.3.3.5 Office of Naval Research Testing Activities

ONR's mission is to plan, foster, and encourage scientific research in recognition of its paramount importance as related to the maintenance of future naval power, and the preservation of national security. ONR manages the Navy's basic, applied, and advanced research to foster transition from science and technology to higher levels of research, development, test, and evaluation. ONR is also a parent organization for the Naval Research Laboratory, which operates as the Navy's corporate research laboratory and conducts a broad multidisciplinary program of scientific research and advanced technological development. Table 2-9 describes ONR's proposed testing activities.

Table 2-9: Office of Naval Research Proposed Testing Activity Descriptions

Activity Name	Activity Description
Acoustic and Oceanographic Science and Technology	
Acoustic and Oceanographic Research	Research using active transmissions from sources deployed from ships, aircraft, and unmanned underwater vehicles. Research sources can be used as proxies for current and future Navy systems.
Large Displacement Unmanned Undersea Vehicle Testing	Autonomy testing and environmental data collection with Large Displacement Unmanned Underwater Vehicles.
Long Range Acoustic Communications	Low-frequency bottom-mounted acoustic source off of the Hawaiian island of Kauai transmitting a variety of acoustic communications sequences.
Mine Countermeasure Technology Research	Test involves the use of broadband acoustic sources on unmanned underwater vehicles.

2.3.4 Proposed Modernization and Sustainment of Ranges

The Navy's training and testing ranges provide the air, sea, and undersea space necessary for personnel to conduct live training and testing. As technology changes, weapons and systems evolve to provide improved capabilities. Often those new capabilities require modifications to the range to allow for full utilization of the new technology. In addition, existing components of the ranges require maintenance or replacement as they come to the end of their service life. These modernization and sustainment actions are described briefly in Table 2-10. See Section A.3 of Appendix A for a complete description of these activities.

Table 2-10: Proposed Modernization and Sustainment of Ranges

Activity Name	Activity Description
Special Use Airspace Modification	The Navy proposes to increase the Study Area in the Southern California Range Complex with a corresponding increase in special use airspace proximate to the current Warning Area 291 (W-291). The Navy is coordinating with the Federal Aviation Administration in its non-rulemaking action for establishing the two new airspace areas.
Southern California Offshore Anti-Submarine Warfare Range (SOAR) Modernization	The Navy proposes to upgrade the existing, deep-water SOAR, located west of SCI, by installing new hydrophones and undersea cables.
Shallow Water Training Ranges (SWTRs) Installation	The Navy would install and maintain two underwater hydrophone instrumentation systems that would establish two SWTRs to enhance training in conjunction with the SOAR. The proposed instrumentation would be in the form of undersea cables and sensor nodes, similar to instrumentation currently in place in SOAR.
Sustainment of Undersea Ranges	Sustainment of undersea ranges includes the maintenance of systems and associated components. Maintenance may include, but is not limited to inspections, system replacement to extend service life (e.g., anodes and clamps), replacement of corrosion inhibitor solutions, and catastrophic repairs.

Table 2-10: Proposed Modernization and Sustainment of Ranges (continued)

Activity Name	Activity Description
Deployment of Seafloor Cables and Instrumentation	The Navy proposes to deploy undersea fiber optic cables and devices under test to existing undersea infrastructure along the seafloor in three locations in the HCTT Study Area: south and west of SCI in the California Study Area, to the northeast of Oahu, and west of Kauai in the Hawaii Study Area.
Installation and Maintenance of Mine Warfare and Other Training Areas	Support crews deploy, move, and retrieve mine countermeasure (MCM) targets or targets simulating adversary subsea and seabed infrastructure to include cables of varying diameters and lengths, bottom equipment, and equipment tethered to the bottom that is floating in the water column. MCM targets could be inserted on the seafloor (bottom targets) or tethered to anchors that are on the seafloor (moored). Other temporary training areas can be established by installing devices that could include hydrophones anchored to the seafloor similarly to anchored mine training shapes or other subsea/seabed targets.
Installation and Maintenance of Underwater Platforms	Underwater landing platforms would be installed to support underwater vehicle pilot proficiency training. One platform would be installed in Hawaii, in an open sandy bottom area just west of the Daniel K. Inouye International Airport, and one would be installed just west of the Silver Strand Training Complex boat lanes. Maintenance would include removal of each platform and transfer to a shipyard approximately every five years for in-depth inspection, repairs, and preservation.

2.4 Action Alternatives Development

The identification, consideration, and analysis of alternatives are critical components of the NEPA process and contribute to the goal of informed decision making. The CEQ issued regulations implementing the NEPA, and these regulations require the decision maker to consider the environmental effects of the proposed action and a reasonable range of alternatives (including the No Action Alternative) to the proposed action (40 CFR section 1502.14). CEQ regulations guidance further provides that an EIS must evaluate reasonable alternatives to the proposed actions; identify the environmentally preferable alternative; and, for alternatives eliminated from detailed study, briefly discuss the reasons for their elimination. To be reasonable, an alternative, except for the No Action Alternative, must be technically and economically feasible and meet the purpose and need for the proposed action.

The following screening criteria were developed to determine that a potential alternative is reasonable and meets the purpose and need if it supports:

- the conduct of realistic military readiness activities.
- unit-level to advanced training.
- requisite air, surface, and sub-surface range tracking, instrumentation, and communications capabilities.
- variable training and testing schedules by allowing year-round training and testing.
- the training tempo as required by the Optimized Fleet Response Plan.
- military readiness by allowing for testing and introduction of new weapon systems and platforms.

- training and testing in proximity to home ports where crews are located.
- maximizes access to and utilization of existing and future offshore and land-based range infrastructure resources and facilities.
- training and testing access to diverse and variable marine environments that replicate real-world conditions where Service members would be expected to operate.
- a continuous operating area large enough to test and train new weapons systems and the tactics to employ them.

The Action Alternatives, and in particular the mitigation measures incorporated within the Action Alternatives, were developed to meet both the Action Proponents' purpose and need to train and test and NMFS' independent purpose and need to evaluate the potential impacts of the Action Proponents' activities. The Action Proponents will implement mitigation measures to avoid or reduce potential impacts from the Proposed Action on environmental resources. Mitigation measures could be implemented under either Action Alternative and are detailed and analyzed in Chapter 5.

The Action Proponents developed the alternatives considered in this EIS/OEIS after careful assessment by subject matter experts, including military commands that utilize the ranges, military range management professionals, and environmental managers and scientists. The Action Proponents also used the most recent military policy and historical data in developing alternatives.

By comparing Navy's Strategic Planning for projected capability requirements against historical analysis of multiple years of classified sonar usage data, followed by cross referencing the training requirements during the same time period, the Action Proponents produced a refined estimate of sonar usage anticipated to meet its training and testing requirements, which support the development of the action alternatives. The Navy, in its role as the Lead Agency, continues this refining process of checks and balances from phase to phase.

With regards to testing activities, the level of activity in any given year is highly variable and is dependent on technological advancements, emergent requirements identified during operations, and fiscal fluctuations. Therefore, the environmental analysis must consider all testing activities that could possibly occur to ensure that the analysis fully captures the potential environmental effects. These factors were considered in alternatives carried forward for consideration and analysis as described in Section 2.5.

2.4.1 Alternatives Eliminated from Further Consideration

Alternatives eliminated from further consideration are described in the following sections. The Navy determined that these alternatives did not meet the purpose of and need for the Proposed Action after a thorough consideration of each.

2.4.1.1 Alternative Training and Testing Locations

Navy ranges have evolved over the decades and, considered together, allow for the entire spectrum of training and testing to occur in a given range complex. While some unit-level training and some testing activities may require only one training element (e.g., airspace, sea surface space, or undersea space), more advanced training and testing events may require a combination of air, surface, and undersea space as well as access to land ranges. The ability to utilize the diverse and multi-dimensional capabilities of each range complex or testing range allows the Navy to develop and maintain high levels of readiness. The Study Area and the range complexes and testing ranges it contains have attributes necessary to support effective training and testing. No other locations match the Study Area attributes, which are as follows:

- proximity to the homeport regions of San Diego and Hawaii, and the Navy, USMC, and USCG commands, ships, submarines, schools, and aircraft units stationed there
- proximity to shore-based facilities and infrastructure, and the logistical support provided for training and testing activities
- proximity to military families, minimizing the length of time Sailors and Marines spend deployed away from home and benefitting overall readiness and retention
- presence of unique ranges, which include instrumented deep and shallow ranges in Hawaii and Southern California that offer training and testing capabilities not available elsewhere in the Pacific, and ranges that offer both actual and simulated shore gunnery training for Navy ships
- environmental conditions (e.g., bathymetry, topography, and weather) found in the Study Area that maximize the training realism and testing effectiveness

The uniquely interrelated nature of the features and attributes of the range complexes located within the Study Area (as detailed in Section 2.1) provides the training and testing support needed for complex military activities. There is no other series of integrated ranges in the Pacific Ocean that affords this level of operational support and comprehensive integration for range activities. There are no other potential locations in the Pacific where land ranges, Operating Areas (OPAREAs), undersea terrain and ranges, and military airspace combine to provide the venues necessary for the training and testing realism and effectiveness required to train and certify naval forces for combat operations.

2.4.1.2 No Change to the Current Study Area

The Action Proponents considered alternatives within the same Study Area as analyzed in the 2018 HSTT EIS/OEIS. Since 2018, adversary countries have significantly improved and enlarged their naval capability to the point where some of these countries' navies are considered "near peer" with respect to U.S. capabilities. To ensure that the U.S. military services can continue to maintain, train, and equip combat-ready forces that can effectively deter aggression and, if necessary, win wars against these countries, the United States must test and train using the most advanced technology and most capable weapon systems available. These systems, and the tactics to employ them, require a complex of ranges larger than the 2018 HSTT Study Area. The addition of the NOCAL and PMSR areas provide a continuous naval operating area of over 400 nautical miles from north to south. Therefore, any alternatives that do not include the expanded HCTT Study Area described in Section 2.1 would not meet the Navy's Purpose and Need.

2.4.1.3 Simulated Training and Testing Only

The Navy currently uses simulation for training and testing whenever possible (e.g., command and control exercises conducted without operational forces); however, there are significant limitations, and its use cannot replace live training or testing.

To detect and counter mine shapes and hostile submarines, the Navy uses both passive and active sonar. Sonar proficiency is a complex and perishable skill that requires regular, hands-on training in realistic and diverse conditions. More than 300 extremely quiet, newer-generation submarines are operated by more than 40 nations worldwide, and these numbers are growing. These difficult-to-detect submarines, as well as torpedoes and underwater mines, are true threats to global commerce, national security, and the safety of military personnel. As a result, defense against enemy submarines is a top priority for the Navy. ASW training and testing activities include the use of active and passive sonar systems and small explosive charges, which prepare and equip Sailors for countering threats. Inability to train with sonar would eliminate or diminish ASW readiness. Failure to detect and defend against hostile submarines can cost lives, such as the 46 Sailors who lost their lives when a Republic of Korea frigate (CHEONAN) was sunk by a North Korean submarine in March 2010.

There are limits to the realism that current simulation technology can presently provide. Unlike live training, today's simulation technology does not permit ASW training with the degree of realism and complexity required to maintain proficiency. While simulators are used for the basic training of sonar technicians, they are of limited value beyond basic training. A simulator cannot match the dynamic nature of the environment, such as bathymetry and sound propagation properties, or the training activities involving several units with multiple crews interacting in a variety of acoustic environments.

Sonar operators must train regularly and frequently to develop and maintain the skills necessary to master the process of identifying underwater threats in the complex subsurface environment. Sole reliance on simulation would deny service members the ability to develop battle-ready proficiency in the employment of active sonar in the following areas:

- Bottom bounce and other environmental conditions. Sound hitting the ocean floor (bottom bounce) reacts differently depending on the bottom type and depth. Likewise, sound passing through changing currents, eddies, or across differences in ocean temperature, pressure, or salinity is also affected. Both are extremely complex and difficult to simulate, and both are common in actual sonar operations.
- Mutual sonar interference. When multiple sonar sources are operating in the vicinity of each other, interference due to similarities in frequency can occur. Again, this is a complex variable that must be recognized by sonar operators but is difficult to simulate with any degree of fidelity.
- Interplay between ship and submarine target. Ship crews, from the sonar operator to the ship's Captain, must react to the changing tactical situation with a real, thinking adversary (a Navy submarine for training purposes). Training in actual conditions with actual submarine targets provides a challenge that cannot be duplicated through simulation.
- Interplay between ASW teams in the strike group. Similar to the interplay required between ships and submarine targets, a ship's crew must react to all changes in the tactical situation, including changes from cooperating ships, submarines, and aircraft.

Similar to the challenges presented in the training situations described in the preceding paragraphs, operational testing cannot be based exclusively on computer modeling or simulation either (see 10 U.S.C. sections 2366 and 2399). At-sea testing provides the critical information on operability and supportability needed by the Navy to make decisions on the procurement of platforms and systems, ensuring that what is purchased performs as expected and that tax dollars are not wasted. Meeting this testing requirement is also critical to protecting the Sailors and Marines who depend on these technologies to execute their mission with minimal risk to themselves.

As the acquisition authority for the Navy, the Systems Commands are responsible for administering large contracts for the Navy's procurement of platforms and systems. These contracts include performance criteria and specifications that must be verified to ensure that the Navy accepts platforms and systems that support the warfighter's needs. Although simulation is a key component in platform and systems development, it does not adequately provide information on how a system will perform or whether it will be available to meet performance and other specification requirements because of the complexity of the technologies in development and marine environments in which they will operate. For this reason, at some point in the development process, platforms and systems must undergo at-sea or in-flight testing. Therefore, simulation as an alternative that replaces training and testing in the field does not meet the purpose of and need for the Proposed Action and has been eliminated from detailed study.

2.4.1.4 Training and Testing Without the Use of Active Sonar

As explained in Section 2.4.1.3, in order to detect and counter submerged mines and hostile submarines, the Navy needs to use both passive and active sonar. Therefore, training and testing without the use of active sonar does not meet the purpose and need for the Proposed Action.

2.4.1.5 Alternative Including Geographic Mitigation

The Action Proponents considered, but did not develop, an alternative based solely on geographic mitigation. Developing such an alternative would mean that geographic or temporal restrictions would be included for one action alternative but not for others. Such a framework would not meet the Navy's purpose and need for the reasons described in the following text and outlined in Chapter 1.

NEPA regulations allow agencies to "Include appropriate mitigation measures not already included in the Proposed Action or alternatives" (40 CFR section 1502.14[e]). The Navy defines its Proposed Action and alternatives prior to conducting its environmental analyses. As a general approach, the Navy develops mitigation outside of (i.e., after) the alternatives development framework, and mitigation is designed to be implemented under all action alternatives carried forward. This approach allows the Navy to refine and tailor its mitigation measures based on the findings of its environmental analyses, potential benefits to marine resources, suggestions received through public comments during scoping and on the Draft EIS/OEIS, consultations with environmental regulatory agencies, and operational practicality assessments. The Action Proponents will consider applicable existing mitigation measures developed during previous EIS/OEIS projects and develop new mitigations as appropriate.

The Action Proponents conduct extensive biological effectiveness and operational practicality assessments of all potential mitigations. Senior military leadership reviews and approves all mitigations included in a Draft or Final EIS/OEIS. Therefore, if the Navy were to create a geographic mitigation alternative, all mitigations included in that alternative would have been verified as effective and practical, and approved by senior military leadership prior to publication of the Draft EIS/OEIS. From an MMPA compliance standpoint, NMFS would consequently require the Navy to implement those mitigations that benefit marine mammals under all action alternatives (i.e., not only the mitigation alternative) in order to meet the least practicable adverse impact standard. In other words, approved and effective mitigation would be implemented regardless of its association with an alternative; therefore, basing an alternative solely on geographic mitigation would not be reasonable. Overall, the Navy's mitigation development process ensures that it includes the maximum level of mitigation that is practical to implement under the Proposed Action.

2.4.1.6 "Status Quo" Alternative

The Action Proponents considered a Status Quo Alternative based on the 2018 HSTT EIS/OEIS Preferred Alternative (Section 2.5.2), the 2018 HSTT EIS/OEIS Record of Decision, the 2022 PMSR EIS/OEIS, and the 2022 PMSR EIS/OEIS Record of Decision (U.S. Department of the Navy, 2022). Under such an alternative, the Navy would continue the present course of action, such as continuation of Navy military readiness activities in the Study Area at current levels documented in the 2018 HSTT EIS/OEIS and the 2022 PMSR EIS/OEIS Records of Decision and requesting separate authorizations under the MMPA and ESA as required. A Status Quo Alternative would limit the Navy's ability to expand training and testing in the SOCAL and NOCAL Range Complexes, thereby preventing Navy forces from effectively training with new weapon systems and tactics. The Navy could continue to conduct training and testing activities, but not at the level and scope of activities necessary to fulfill its statutory responsibilities described in the Purpose and Need of the Proposed Action. A Status Quo Alternative would lock the Navy into using obsolete systems and platforms, and unneeded training; would not allow for new testing requirements; and, therefore, would not allow the Navy to meet future training and testing requirements necessary to achieve and maintain Fleet readiness. Thus, such an alternative would not be reasonable and has been eliminated from detailed study.

2.5 Alternatives Carried Forward

Historical usage data from the Navy's ongoing sonar reporting program was used to project the number of active sonar hours required to meet ASW training requirements into the reasonably foreseeable future. In addition to meeting the Navy's purpose and need to train and test, the Action Alternatives, and in particular the mitigation measures that are incorporated in the Action Alternatives, were developed to meet NMFS' independent purpose and need.

2.5.1 No Action Alternative

Under the No Action Alternative, the Action Proponents would not conduct the proposed training and testing activities in the HCTT Study Area. Consequently, the No Action Alternative of not conducting the proposed live, at-sea training and testing in the Study Area is inherently unreasonable in that it does not meet the purpose and need (see Section 1.5). However, the analysis associated with the No Action Alternative is carried forward in order to compare the magnitude of the potential environmental effects of the Proposed Action with the conditions that would exist if the Proposed Action did not occur (refer to Section 3.0).

From NMFS' perspective, pursuant to its obligation to grant or deny requests for authorization to take marine mammals under the MMPA, the No Action Alternative involves NMFS denying Navy's application for Letters of Authorization under section 101(a)(5)(A) of the MMPA. If NMFS were to deny the Navy's application, the Navy would not be authorized to incidentally take marine mammals, and the Navy would not conduct the proposed training and testing activities proposed in this EIS/OEIS. Thus, NMFS assumes that there would be no take of marine mammals by the applicant.

Cessation of proposed at-sea training and testing activities would mean that the Action Proponents would not meet their statutory requirements and would be unable to properly defend themselves and the United States from enemy forces, unable to successfully detect enemy submarines, and unable to effectively use their weapons systems or defensive countermeasures. Military personnel would essentially not be taught how to use necessary weapon systems in any realistic scenario.

Additionally, without proper training, members of the military and Coast Guard would not be prepared to operate complex equipment in inherently dynamic and dangerous environments. Thus, even during routine non-combat operations, it is likely that there would be an increase in the number of mishaps, potentially resulting in death or serious injury. Failing to allow our military members and Guardsmen to achieve and maintain the skills necessary to defend the United States and its interests results in an unacceptable increase in the danger they willingly face.

Adverse effects could include a reduced ability of U.S. military services to provide humanitarian/disaster relief and rescue services, and to enforce freedom of navigation for commercial shipping traffic.

Finally, the lack of live training and testing would require a higher reliance on simulated training and testing. While the Navy continues to research new ways to provide realistic training through simulation, there are limits to the realism that current technology can provide. Sole reliance on simulation would deny service members the ability to develop battle-ready proficiency in the employment of active sonar (Section 2.4.1.3).

2.5.2 Alternative 1 (Preferred Alternative and the Environmentally Preferred Action Alternative)

Alternative 1 is the Preferred Alternative and the Environmentally Preferable Action Alternative because it has a lower level of activities than Alternative 2 and would therefore generally have lesser effects on certain resources of the two action alternatives. Alternative 1 reflects a representative level of training and testing to account for the natural fluctuations of training cycles, testing programs, and deployment schedules that generally limit the maximum level of training and testing from occurring for the reasonably foreseeable future.

2.5.2.1 Training

Under this alternative, the Action Proponents propose to conduct training activities in the expanded HCTT Study Area into the reasonably foreseeable future, as necessary to meet current and future readiness requirements. These training activities include new activities as well as activities subject to previous analysis that are currently ongoing and have historically occurred in the Study Area. The requirements for the types of activities to be conducted, as well as the intensity at which they need to occur, have been validated by senior military leadership. Specifically, training activities are based on the requirements of the Optimized Fleet Response Plan and on changing world events, advances in technology, and Navy tactical and strategic priorities. These activities account for force structure changes and include training with new aircraft, vessels, unmanned/autonomous systems, and weapon systems that will be introduced to the fleet after December 2025. The numbers and locations of all proposed training activities are provided in Table 2-11 through Table 2-14 in Section 2.6.1.

Using a representative level of activity rather than a yearly maximum tempo of training activity has reduced the amount of hull-mounted mid-frequency active sonar estimated to be necessary to meet training requirements. Both unit-level training and major training exercises are adjusted to meet this representative year, as discussed in the following text.

Under Alternative 1, the Action Proponents assume that some unit-level ASW training would be conducted using synthetic means (e.g., simulators). Additionally, this alternative assumes that some unit-level active sonar training would be completed during integration with other larger training exercises. This alternative takes a similar approach to estimating levels of some of the larger training exercises as it does for unit-level training. Specifically, this alternative does not analyze a maximum number of carrier strike group Composite Training Unit Exercises (one type of major certification exercise) every year, but instead assumes a maximum number of exercises would occur during four years of any 7-year period. As a result, Alternative 1 analyzes a maximum of 2 Composite Training Unit Exercises (and certain other coordinated events leading up to a Composite Training Unit Exercise) in any given year.

The Optimized Fleet Response Plan and various training plans identify the number and duration of training cycles that could occur over a 7-year period. Alternative 1 considers fluctuations in training cycles and deployment schedules that do not follow a traditional annual calendar but instead are influenced by in-theater demands and other external factors.

This alternative incorporates a degree of risk that the Navy will not have sufficient capacity in potential MMPA and ESA authorizations to support the full spectrum of training potentially necessary to respond to a future national emergency crisis.

This risk associated with the preferred alternative was deemed acceptable by Commander, Pacific Fleet based on training requirements needed to meet the current world geo-political environment.

2.5.2.2 Testing

Under Alternative 1, the Action Proponents propose an annual level of testing that reflects the fluctuations in testing programs by recognizing that the maximum level of testing would likely not be conducted each year. The majority of testing activities that would be conducted under this alternative are the same as, or similar to, those conducted currently or in the past. This alternative also includes the testing of new technologies and takes into account the inherent uncertainties in this type of testing after December 2025.

Alternative 1 presumes a typical level of readiness requirements. The numbers and locations of all proposed testing activities are listed in Table 2-15 through Table 2-19.

2.5.2.3 Modernization and Sustainment of Ranges

This alternative includes the establishment of new special use airspace, modernization of the existing Southern California Offshore Anti-Submarine Warfare Range (SOAR) underwater tracking and communication range, the installation of two Shallow Water Training Ranges (SWTRs) as extensions to the SOAR, sustainment of undersea ranges, deployment of seafloor cables and instrumentation, installation and maintenance of mine warfare and other training areas, and installation and maintenance of underwater platforms, as described in Section 2.3.4.

2.5.3 Alternative 2

2.5.3.1 Training

As under Alternative 1, this alternative includes new and ongoing activities. Under this alternative, the Action Proponents would be enabled to meet the highest levels of military readiness by conducting the majority of its training live at sea, and by meeting unit-level training requirements using dedicated, discrete training events, instead of combining them with other training activities as described in Alternative 1. The numbers and locations of all proposed training activities are provided in Table 2-11 through Table 2-14.

Alternative 2 reflects the maximum number of training activities that could occur within a given year and assumes that the maximum level of activity would occur every year over a 7-year period. This allows for the greatest flexibility for the Action Proponents to maintain readiness when considering potential changes in the national security environment, fluctuations in training and deployment schedules, and anticipated in-theater demands. Both unit-level training and major training exercises are assumed to occur at a maximum level every year.

2.5.3.2 Testing

As under Alternative 1, this alternative includes new and ongoing activities. Under this alternative, the Action Proponents would be enabled to meet the highest levels of military readiness by conducting the proposed testing.

Alternative 2 would include the testing of some new systems using new technologies, taking into account the potential for delayed or accelerated testing schedules, variations in funding availability, and innovations in technology development. To account for these inherent uncertainties in testing, this alternative assumes a greater level of testing efforts predicted for each individual system or program could occur in any given year. This alternative also includes the contingency for augmenting some weapon systems tests in response to potential increased world conflicts and changing military leadership priorities as the result of a direct challenge from a naval opponent that possesses near-peer capabilities. Therefore, this alternative includes the provision for higher levels of annual testing of certain systems to support expedited delivery of these systems to the fleet. All proposed testing activities are listed in Table 2-15 through Table 2-19.

2.5.3.3 Modernization and Sustainment of Ranges

Under Alternative 2, Range Modernization and Sustainment is unchanged from Alternative 1.

2.6 Proposed Training and Testing Activities for Both Action Alternatives

Because the level of activities in Alternative 1 are expected to fluctuate from year to year, and the level in Alternative 2 is proposed to be a maximum level every year, the difference between Alternative 1 and Alternative 2 becomes apparent when aspects of the activities are compared over a 7-year period. For example, hull-mounted mid-frequency active sonar use over 7 years is 24 percent greater under Alternative 2 than under Alternative 1 (63,178 hours vs. 51,103 hours).

2.6.1 Proposed Training Activities

All proposed training activities are listed in Table 2-11 through Table 2-14.

Table 2-11: Navy and Marine Corps Proposed Training Activities

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Major Training Exercises - Large Integrated Anti-Submarine Warfare			
Composite Training Unit Exercise (Carrier Strike Group)	HCTT Study Area	1–2	2
Rim of the Pacific Exercise	Hawaii Study Area	0–1	1
Major Training Exercises - Medium Integrated Anti-Submarine Warfare			
Task Force/Sustainment Exercise[1]	Hawaii Study Area	0–1	1
	California Study Area	0–1	1
Integrated/Coordinated Anti-Submarine Warfare Training			
Independent Deployer Certification Exercise/Tailored Surface Warfare Training	California Study Area	9–18	18
Medium Coordinated Anti-Submarine Warfare	Hawaii Study Area	12–17	17
	California Study Area	5–13	13
Small Coordinated Anti-Submarine Warfare	Hawaii Study Area	1	1
	California Study Area	4–9	9

Table 2-11: Navy and Marine Corps Proposed Training Activities (continued)

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Integrated/Coordinated Training – Other			
Composite Training Unit Exercise (Amphibious Ready Group/Marine Expeditionary Unit)	California Study Area	1–2	2
Innovation and Demonstration Exercise	Hawaii Study Area	1	1
	California Study Area	3	3
	Transit Corridor	1	1
Integrated Air Missile Defense Exercise	Hawaii Study Area	0–1	1
Large-Scale Amphibious Exercise	Hawaii Study Area	0–1	1
	California Study Area	2–3	3
Multi-Warfare Exercise	Hawaii Study Area	6–7	7
	California Study Area	2	2
Air Warfare			
Air Combat Maneuvers	Hawaii Study Area	2,314	2,314
	California Study Area	10,400–11,400	11,400
Air Defense Exercise	Hawaii Study Area	40–50	50
	California Study Area	550	550
Gunnery Exercise Air-to-Air Medium Caliber	Hawaii Study Area	2	3
	California Study Area	2	2
Gunnery Exercise Air-to-Air Small Caliber	Hawaii Study Area	5	5
	California Study Area	5	5
Gunnery Exercise Surface-to-Air Large Caliber	Hawaii Study Area	25	25
	California Study Area	55	55
Gunnery Exercise Surface-to-Air Medium Caliber	Hawaii Study Area	79	79
	California Study Area	85	85
High-Energy Laser Exercise Surface-to-Air	Hawaii Study Area	4	4
	California Study Area	4	4
Medium Range Interceptor Capability	Hawaii Study Area	14–21	21
	California Study Area	10	10
Missile Exercise Air-to-Air	Hawaii Study Area	23–28	28
	California Study Area	123	123
Missile Exercise – Man Portable Air Defense System	Hawaii Study Area	7	7
	California Study Area	10	10
Missile Exercise Surface-to-Air	Hawaii Study Area	30	30
	California Study Area	36	36
Amphibious Warfare			
Amphibious Assault	Hawaii Study Area	48	48
	California Study Area	21	21

Table 2-11: Navy and Marine Corps Proposed Training Activities (continued)

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Amphibious Operations in a Contested Environment	Hawaii Study Area	15	15
	California Study Area	10	10
Amphibious Raid	Hawaii Study Area	24	24
	California Study Area	2,404	2,404
Amphibious Vehicle Maneuvers	Hawaii Study Area	20	20
	California Study Area	31–35	35
Expeditionary Fires Exercise/Supporting Arms Coordination Exercise	California Study Area	8	8
Naval Surface Fire Support Exercise – At Sea	Hawaii Study Area	20–25	25
Naval Surface Fire Support Exercise – Land-Based Target	California Study Area	67	67
Non-Combat Amphibious Operation[2]	Hawaii Study Area	6	6
	California Study Area	1	1
Shore-to-Surface Artillery Exercise	Hawaii Study Area	4	4
	California Study Area	12	12
Shore-to-Surface Missile Exercise	Hawaii Study Area	10	10
	California Study Area	15	15
Anti-Submarine Warfare			
Anti-Submarine Warfare Torpedo Exercise – Helicopter	Hawaii Study Area	3–5	5
	California Study Area	3–5	5
Anti-Submarine Warfare Torpedo Exercise – Maritime Patrol Aircraft	Hawaii Study Area	20–80	80
	California Study Area	60–80	80
Anti-Submarine Warfare Torpedo Exercise – Ship	Hawaii Study Area	34	34
	California Study Area	104	104
Anti-Submarine Warfare Torpedo Exercise – Submarine	Hawaii Study Area	48	48
	California Study Area	26	26
Anti-Submarine Warfare Tracking Exercise – Helicopter	Hawaii Study Area	125–130	130
	California Study Area	125–130	130
Anti-Submarine Warfare Tracking Exercise – Unmanned Surface Vessel	Hawaii Study Area	5	5
	California Study Area	2	2
Anti-Submarine Warfare Tracking Exercise – Maritime Patrol Aircraft	Hawaii Study Area	150–200	200
	California Study Area	200	200
Anti-Submarine Warfare Tracking Exercise – Ship	Hawaii Study Area	60–119	119
	California Study Area	240–480	480
Anti-Submarine Warfare Tracking Exercise – Submarine	Hawaii Study Area	205	205
	California Study Area	64	64
	Transit Corridor	9	9
Training and End-to-End Mission Capability Verification - Torpedo	Hawaii Study Area	2	2
	California Study Area	1	1

Table 2-11: Navy and Marine Corps Proposed Training Activities (continued)

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Electronic Warfare			
Counter Targeting Chaff Exercise – Aircraft	Hawaii Study Area	26–31	31
	California Study Area	148–153	153
Counter Targeting Chaff Exercise – Ship	Hawaii Study Area	37	37
	California Study Area	125	125
Counter Targeting Flare Exercise	Hawaii Study Area	101–108	108
	California Study Area	115–123	123
Electronic Warfare Operations	Hawaii Study Area	55	60
	California Study Area	222–326	326
Expeditionary Warfare			
Dive and Salvage Operations	Hawaii Study Area	17–18	18
	California Study Area	6–8	8
Gunnery Exercise Ship-to-Shore	California Study Area	380–480	480
Obstacle Loading	Hawaii Study Area	70	70
	California Study Area	106–156	156
Personnel Insertion/Extraction – Air	Hawaii Study Area	534	534
	California Study Area	1,354–1,554	1,554
Personnel Insertion/Extraction – Surface and Subsurface	Hawaii Study Area	270–336	336
	California Study Area	1,049–1,149	1,149
Personnel Insertion/Extraction – Swimmer/Diver	Hawaii Study Area	495	495
	California Study Area	1,080–1,280	1,280
Port Damage Repair	California Study Area	12	12
Small Boat Attack	Hawaii Study Area	6	6
	California Study Area	115	115
Mine Warfare			
Airborne Mine Countermeasure – Mine Detection	Hawaii Study Area	20	20
	California Study Area	20	20
Airborne Mine Laying	California Study Area	4–6	6
Amphibious Breaching Operations	Hawaii Study Area	100	100
	California Study Area	638–645	645
Civilian Port Defense – Homeland Security Anti-Terrorism/Force Protection Exercise	Hawaii Study Area	3–4	4
	California Study Area	2–3	3
Mine Countermeasure Exercise – Ship Sonar	Hawaii Study Area	72	72
	California Study Area	256	256
Mine Countermeasures – Mine Neutralization – Remotely Operated Vehicle Operations	Hawaii Study Area	7–8	8
	California Study Area	30–33	33
Mine Countermeasures – Towed Mine Neutralization	California Study Area	30	30

Table 2-11: Navy and Marine Corps Proposed Training Activities (continued)

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Mine Neutralization Explosive Ordnance Disposal	Hawaii Study Area	11–15	15
	California Study Area	400–431	431
Submarine Mine Avoidance Exercise	Hawaii Study Area	80	80
	California Study Area	40	40
Submarine Mobile Mine and Mine Laying Exercise	Hawaii Study Area	20	20
	California Study Area	30	30
Surface Ship Object Detection	Hawaii Study Area	72	72
	California Study Area	256	256
Training and End-to-End Mission Capability Verification – Mobile Mine and Mine Laying Exercise	Hawaii Study Area	2	2
	California Study Area	2	2
Underwater Demolition Qualification and Certification	Hawaii Study Area	5	5
	California Study Area	34–44	44
Underwater Demolitions Multiple Charge – Large Area Clearance	California Study Area	6	6
Underwater Mine Countermeasure Raise, Tow, Beach, and Exploitation	Hawaii Study Area	6	6
	California Study Area	372	372
Surface Warfare			
Bombing Exercise Air-to-Surface	Hawaii Study Area	194	194
	California Study Area	663	663
Gunnery Exercise Air-to-Surface Medium Caliber	Hawaii Study Area	191–201	201
	California Study Area	469–479	479
Gunnery Exercise Air-to-Surface Small Caliber	Hawaii Study Area	229–429	429
	California Study Area	490–690	690
Gunnery Exercise Surface-to-Surface Boat Medium Caliber	Hawaii Study Area	10	10
	California Study Area	14	14
Gunnery Exercise Surface-to-Surface Boat Small Caliber	Hawaii Study Area	31	31
	California Study Area	345	345
Gunnery Exercise Surface-to-Surface Ship Large Caliber	Hawaii Study Area	32	32
	California Study Area	125	125
	Transit Corridor	13	13
Gunnery Exercise Surface-to-Surface Ship Medium Caliber	Hawaii Study Area	5–50	50
	California Study Area	17–180	180
	Transit Corridor	6–40	40
Gunnery Exercise Surface-to-Surface Ship Small Caliber	Hawaii Study Area	65	65
	California Study Area	355	355
	Transit Corridor	20	20
Laser Targeting – Aircraft	Hawaii Study Area	50–100	100
	California Study Area	50–100	100

Table 2-11: Navy and Marine Corps Proposed Training Activities (continued)

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
High-Energy Laser Exercise Surface-to-Surface	Hawaii Study Area	4	4
	California Study Area	4	4
Maritime Security Operations	Hawaii Study Area	70	70
	California Study Area	250	250
Missile Exercise Air-to-Surface	Hawaii Study Area	17–22	22
	California Study Area	94–99	99
Missile Exercise Air-to-Surface – Rocket	Hawaii Study Area	109–129	129
	California Study Area	251–271	271
Missile Exercise Surface-to-Surface	Hawaii Study Area	28–32	32
	California Study Area	10	10
Sinking Exercise	Hawaii Study Area	2–3	3
	California Study Area	0–1	1
Surface Warfare Torpedo Exercise – Submarine	Hawaii Study Area	30	30
	California Study Area	10	10
Training and End-to-End Mission Capability Verification – Submarine Missile Maritime	Hawaii Study Area	2	2
	California Study Area	3	3
Other Training Activities			
Aerial Firefighting	California Study Area	4	4
At-Sea Vessel Refueling Training	California Study Area	10	10
Combat Swimmer/Diver Training and Certification	Hawaii Study Area	395	395
	California Study Area	320	320
Kilo Dip	Hawaii Study Area	30	30
	California Study Area	30	30
Multi-Domain Unmanned Autonomous Systems	Hawaii Study Area	50–100	100
	California Study Area	100–200	200
Precision Anchoring	Hawaii Study Area	20	20
	California Study Area	37–48	48
Ship-to-Shore Fuel Transfer Training	Hawaii Study Area	4	4
	California Study Area	6	6
Submarine and UUV Subsea and Seabed Warfare Exercise	Hawaii Study Area	20	20
	California Study Area	20	20
Submarine Navigation Exercise	Hawaii Study Area	220	220
	California Study Area	80	80
Submarine Sonar Maintenance and Systems Checks	Hawaii Study Area	520	520
	California Study Area	185	185
	Transit Corridor	10	10
Submarine Under Ice Training and Certification	Hawaii Study Area	12	12
	California Study Area	6	6

Table 2-11: Navy and Marine Corps Proposed Training Activities (continued)

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Surface Ship Sonar Maintenance and Systems Checks	Hawaii Study Area	155	155
	California Study Area	500	500
	Transit Corridor	8	8
Training and End-to-End Mission Capability Verification – Subsea and Seabed Warfare Kinetic Effectors	Hawaii Study Area	20	20
	California Study Area	20	20
Training and End-to-End Mission Capability Verification – UAV	Hawaii Study Area	10	70
	California Study Area	10	10
Underwater Survey	Hawaii Study Area	60	60
	California Study Area	260–360	360
Unmanned Aerial System Training	Hawaii Study Area	192–234	234
	California Study Area	120	120
	Transit Corridor	3	3
Unmanned Underwater Vehicle Training – Certification and Development Exercises	Hawaii Study Area	182–278	278
	California Study Area	532–888	888
Waterborne Training	Hawaii Study Area	16–30	30
	California Study Area	612–715	715

[1] Sustainment Exercise was called "Fleet Exercise/Sustainment Exercise" in Phase III.

[2] Non-Combat Amphibious Operation was called "Humanitarian Assistance Operations" in Phase III.

Note: HCTT = Hawaii-California Training and Testing, UAV = Unmanned Aerial Vehicle.

The majority of the Composite Training Unit Exercise and all of the Anti-Submarine Warfare associated with it would be conducted in the California Study Area. Only small elements of the exercise would be conducted in the Hawaii Study Area.

Table 2-12: Coast Guard Proposed Training Activities

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Air Warfare			
Gunnery Exercise Surface-to-Air Large Caliber	Hawaii Study Area	15	15
	California Study Area	45	45
Gunnery Exercise Surface-to-Air Medium Caliber	Hawaii Study Area	19	19
	California Study Area	70	70
Electronic Warfare			
Counter Targeting Chaff Exercise – Ship	Hawaii Study Area	5	5
	California Study Area	20	20
Counter Targeting Flare Exercise	California Study Area	10	10

Table 2-12: Coast Guard Proposed Training Activities (continued)

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Expeditionary Warfare			
Underwater Construction Team Training	Hawaii Study Area	8	8
	California Study Area	1,048	1,048
Surface Warfare			
Gunnery Exercise Air-to-Surface Medium Caliber	Hawaii Study Area	100	100
	California Study Area	120	120
Gunnery Exercise Surface-to-Surface Boat Medium Caliber	Hawaii Study Area	2	2
	California Study Area	158	158
Gunnery Exercise Surface-to-Surface Boat Small Caliber	Hawaii Study Area	100	100
	California Study Area	188	188
Gunnery Exercise Surface-to-Surface Ship Large Caliber	Hawaii Study Area	5	5
	California Study Area	24	24
Gunnery Exercise Surface-to-Surface Ship Medium Caliber	Hawaii Study Area	20	20
	California Study Area	36	36
Gunnery Exercise Surface-to-Surface Ship Small Caliber	Hawaii Study Area	100	100
	California Study Area	220	220
High-Energy Laser Exercise Surface-to-Surface	Hawaii Study Area	4	4
	California Study Area	4	4
Maritime Security Operations	Hawaii Study Area	145	145
	California Study Area	887	887
Other Training Activities			
Precision Anchoring	Hawaii Study Area	9	9
	California Study Area	950	950
Search and Rescue	Hawaii Study Area	110	110
	California Study Area	580	580
Unmanned Aerial System Training	Hawaii Study Area	50	50
	California Study Area	350	350
Unmanned Underwater Vehicle Training – Certification and Development Exercises	Hawaii Study Area	200	200
	California Study Area	310	310
Waterborne Training	Hawaii Study Area	69	69
	California Study Area	436	436

Table 2-13: Army Proposed Training Activities

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Air Warfare			
Missile Exercise – Man Portable Air Defense System	Hawaii Study Area	2	2
Amphibious Warfare			
Shore-to-Surface Artillery Exercise	Hawaii Study Area	37	37
Shore-to-Surface Missile Exercise	Hawaii Study Area	5	5
Surface Warfare			
Gunnery Exercise Surface-to-Surface Boat Medium Caliber	Hawaii Study Area	4	8
Gunnery Exercise Surface-to-Surface Boat Small Caliber	Hawaii Study Area	4	8

Table 2-14: Air Force Proposed Training Activities

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Air Warfare			
Air Combat Maneuvers	Hawaii Study Area	272	272
Gunnery Exercise Air-to-Air Medium Caliber	Hawaii Study Area	12	12

2.6.2 Proposed Testing Activities

All proposed testing activities are listed in Table 2-15 through Table 2-19.

Table 2-15: Naval Air Systems Command Proposed Testing Activities

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Air Warfare			
Air Combat Maneuvers Test	Hawaii Study Area	22–24	24
	California Study Area	310–321	321
Air Platform – Vehicle Test	Hawaii Study Area	7–8	8
	California Study Area	50–54	54
Air Platform Weapons Integration Test	Hawaii Study Area	10–11	11
	California Study Area	10–11	11
Air-to-Air Missile Test	California Study Area	49	49
Intelligence, Surveillance, and Reconnaissance Test	Hawaii Study Area	14–15	15
	California Study Area	254–279	279
Large Force Test Event	California Study Area	6	42
Surface-to-Air Gunnery Test – Large Caliber	California Study Area	12	12

Table 2-15: Naval Air Systems Command Proposed Testing Activities (continued)

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Surface-to-Air Gunnery Test – Medium Caliber	California Study Area	12	12
Surface-to-Air High-Energy Laser Test	California Study Area	50	50
Surface-to-Air High-Power Microwave Test	California Study Area	75	75
Surface-to-Air Missile Test	California Study Area	155	155
Anti-Submarine Warfare			
Anti-Submarine Warfare Torpedo Test (Aircraft)	Hawaii Study Area	24–26	26
	California Study Area	71–78	78
Anti-Submarine Warfare Tracking Test (Fixed-Wing)	Hawaii Study Area	61–67	67
	California Study Area	68–75	75
Anti-Submarine Warfare Tracking Test (Rotary-Wing)	Hawaii Study Area	66–73	73
	California Study Area	132–145	145
Kilo Dip Test	Hawaii Study Area	6–7	7
	California Study Area	6–7	7
Sonobuoy Lot Acceptance Test	Hawaii Study Area	32–38	38
	California Study Area	320–352	352
Electronic Warfare			
Chaff Test	Hawaii Study Area	10–11	11
	California Study Area	29–31	31
Electronic Systems Test	Hawaii Study Area	4	4
	California Study Area	204	204
Flare Test	Hawaii Study Area	10–11	11
	California Study Area	29–31	31
Mine Warfare			
Airborne Dipping Sonar Minehunting Test	Hawaii Study Area	18–20	20
	California Study Area	18–20	20
Airborne Laser Mine Detection System Test	Hawaii Study Area	20–22	22
	California Study Area	20–22	22
Airborne Mine Neutralization System Test	Hawaii Study Area	36–39	39
	California Study Area	81–84	84
Airborne Minehunting Test – Sonobuoy	Hawaii Study Area	9–10	10
	California Study Area	9–10	10
Mine Laying Test	Hawaii Study Area	1	1
	California Study Area	2	2

Table 2-15: Naval Air Systems Command Proposed Testing Activities (continued)

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Surface Warfare			
Air-to-Surface Bombing Test	Hawaii Study Area	8–9	9
	California Study Area	66–67	67
Air-to-Surface Gunnery Test	Hawaii Study Area	6–7	7
	California Study Area	70–76	76
Air-to-Surface High-Energy Laser Test	Hawaii Study Area	54–59	59
	California Study Area	324–329	329
Air-to-Surface High-Power Microwave Test	California Study Area	25	25
Air-to-Surface Laser Targeting Test	Hawaii Study Area	5–6	6
	California Study Area	5–6	6
Air-to-Surface Missile Test	Hawaii Study Area	18–20	20
	California Study Area	188–194	194
Long-Range Weapons Delivery Systems/ Hypersonic Vehicle Test	California Study Area	56	56
Rocket Test	Hawaii Study Area	2	2
	California Study Area	30–32	32
Subsurface-to-Surface Missile Test	California Study Area	4	4
Surface-to-Surface Gunnery Test – Large-Caliber	California Study Area	10	10
Surface-to-Surface Gunnery Test – Medium-Caliber	California Study Area	26	26
Surface-to-Surface Gunnery Test – Small-Caliber	California Study Area	10	10
Surface-to-Surface High-Energy Laser Test	California Study Area	50	50
Surface-to-Surface High-Power Microwave Test	California Study Area	25	25
Surface-to-Surface Missile Test	California Study Area	44	44
Other Testing Activities			
Acoustic and Oceanographic Research	Hawaii Study Area	2	2
	California Study Area	3	3
Air Platform Shipboard Integration Test	Hawaii Study Area	7-8	8
	California Study Area	136–150	150
Undersea Range System Test	Hawaii Study Area	30–33	33
	California Study Area	19–21	21

Table 2-16: Naval Facilities Engineering and Expeditionary Warfare Center Proposed Testing Activities

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Unmanned Systems			
Ocean Energy and Cable System Research	Hawaii Study Area	2–4	4
	California Study Area	2–6	6
Undersea Range System Testing	California Study Area	8–12	12
Other Testing Activities			
Underwater Search, Deployment, and Recovery	California Study Area	20–30	30

Table 2-17: Naval Sea Systems Command Proposed Testing Activities

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Anti-Submarine Warfare			
Anti-Submarine Warfare Mission Package Testing	Hawaii Study Area	1	1
	California Study Area	1	1
At-Sea Sonar Testing	Hawaii Study Area	8–11	11
	California Study Area	27–43	43
Pierside Sonar Testing	Hawaii Study Area	13–24	24
	California Study Area	59–75	76
Surface Ship Sonar Testing/Maintenance	Hawaii Study Area	6	6
	California Study Area	6	6
Torpedo (Explosive) Testing	Hawaii Study Area	1–2	2
	California Study Area	1–2	2
Torpedo (Non-Explosive) Testing	Hawaii Study Area	6–8	8
	California Study Area	7–9	9
Electronic Warfare			
Radar and Other System Testing	Hawaii Study Area	9–25	25
	California Study Area	22–44	44
Mine Warfare			
Mine Countermeasure and Neutralization Testing	California Study Area	18–45	45
Mine Countermeasure Mission Package Testing	Hawaii Study Area	16	16
	California Study Area	25–26	26
Mine Detection and Classification Testing	Hawaii Study Area	6–10	10
	California Study Area	10–20	20
Surface Warfare			
Gun Testing – Large Caliber	California Study Area	8–33	33
Gun Testing – Medium Caliber	California Study Area	9–14	14

Table 2-17: Naval Sea Systems Command Proposed Testing Activities (continued)

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Gun Testing – Small Caliber	California Study Area	0–5	5
Missile and Rocket Testing	Hawaii Study Area	1	1
	California Study Area	232–238	238
Unmanned Systems			
Underwater Search, Deployment, and Recovery	California Study Area	17–30	30
Unmanned Surface Vehicle System Testing	California Study Area	4–10	10
Unmanned Underwater Vehicle Testing	Hawaii Study Area	2	2
	California Study Area	680–685	685
Vessel Evaluation			
Air Defense Testing	Hawaii Study Area	4	4
	California Study Area	18–27	27
In-Port Maintenance Testing	Hawaii Study Area	5	5
	California Study Area	15	15
Propulsion Testing	Hawaii Study Area	0–41	41
	California Study Area	0–23	23
Signature Analysis Operations	Hawaii Study Area	2–4	4
	California Study Area	0–1	1
Small Ship Shock Trial	California Study Area	0–1	0–1*
Submarine Sea Trials – Weapons System Testing	Hawaii Study Area	2–4	4
	California Study Area	2–4	4
Surface Warfare Testing	Hawaii Study Area	4–16	16
	California Study Area	18–53	53
Undersea Warfare Testing	Hawaii Study Area	3–13	13
	California Study Area	25–60	60
Vessel Signature Evaluation	California Study Area	2–6	6
Other Testing Activities			
Acoustic and Oceanographic Research	Hawaii Study Area	5–6	6
	California Study Area	2–3	3
Countermeasure Testing	Hawaii Study Area	2–4	4
	California Study Area	8–14	14
Insertion/Extraction	Hawaii Study Area	2	2
	California Study Area	2	2
Non-Acoustic Component Testing	California Study Area	0–4	4
Semi-Stationary Equipment Testing	Hawaii Study Area	4–8	8
	California Study Area	4–8	8
Simulant Testing	California Study Area	0–5	5

*Only one small ship shock trial would be conducted for the 7-year period 2026–2032.

Table 2-18: Naval Information Warfare Systems Command Proposed Testing Activities

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Acoustic and Oceanographic Science and Technology			
Acoustic, Oceanographic, and Energy Research	Hawaii Study Area	2	2
	California Study Area	145–180	180
Other Testing Activities			
Communications	Hawaii Study Area	4	4
	California Study Area	8	8
Intelligence, Surveillance, Reconnaissance	Hawaii Study Area	6	6
	California Study Area	200–287	287
Vehicle Testing	Hawaii Study Area	16–23	23
	California Study Area	42–51	51
	Transit Corridor	3–7	7

Table 2-19: Office of Naval Research Proposed Testing Activities

Activity Name	Location	Annual # of Events	
		Alternative 1	Alternative 2
Acoustic and Oceanographic Science and Technology			
Acoustic and Oceanographic Research	Hawaii Study Area	4–5	5
	California Study Area	8–10	10
Large Displacement Unmanned Undersea Vehicle Testing	Hawaii Study Area	2–3	3
	California Study Area	6–8	8
Long Range Acoustic Communications	Hawaii Study Area	1–2	2
Mine Countermeasure Technology Research	California Study Area	6–8	8
	Hawaii Study Area	1–2	2

REFERENCES

U.S. Department of the Navy. (2022). *Record of Decision for the Final Environmental Impact Statement/Overseas Environmental Impact Statement for Point Mugu Sea Range*. Washington, DC: U.S. Department of Defense.

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3 Affected Environment and Environmental Consequences

3.0 Introduction

This chapter describes existing environmental conditions in the HCTT Study Area as well as the analysis of resources potentially impacted by the Proposed Action described in Chapter 2. The Study Area is described in Section 2.1 and depicted in Figure 2-1. The activities analyzed in this EIS/OEIS are largely a continuation of activities that have been ongoing for decades and were analyzed previously in the 2018 HSTT EIS/OEIS and the 2022 PMSR EIS/OEIS. Activities related to modernization and sustainment of ranges activities are also analyzed. Since the completion of the 2018 HSTT EIS/OEIS, new information is available and is used in this updated analysis. That information typically takes the form of new science or research that has been completed since 2018. This new information is identified when it is used throughout the remainder of this updated EIS/OEIS.

This section provides the ecological characterization of the Study Area and describes the resources evaluated in the analysis. The Overall Approach to Analysis section (Section 3.0.3) explains that each proposed military readiness activity was examined to determine which environmental stressors could potentially impact a resource. Additionally, this section describes how the potential adverse effects of activities are used to make significance determinations that inform a comparison of environmental consequences amongst the alternatives.

Resources Analyzed:

Physical Resources:

- Air Quality
- Sediments and Water Quality

Biological Resources:

- Vegetation
- Invertebrates
- Habitats
- Fishes
- Marine Mammals
- Reptiles
- Birds

Human Resources:

- Cultural Resources
- Socioeconomic Resources and Environmental Justice
- Public Health and Safety

3.0.1 Navy Compiled and Generated Data

While preparing this document, the Navy used the best available data, science, and information recognized by the relevant and appropriate regulatory and scientific communities to establish a baseline in the environmental analyses for all resources in accordance with NEPA (Section 102(2)(A)), the Administrative Procedure Act (5 U.S.C. sections 551–596), and EO 12114.

In support of the environmental baseline and environmental consequences sections for this and other environmental documents, the Navy has sponsored and supported both internal and independent research and monitoring efforts. The Navy's research and monitoring programs, as described below, are largely focused on filling data gaps and obtaining the most up-to-date science.

3.0.1.1 Marine Species Monitoring and Research Programs

Through the Commander, U.S. Pacific Fleet Environmental Readiness Program; U.S. Navy Marine Species Monitoring Program; Living Marine Resources Program; ONR; USCG environmental programs; and other programs and offices, the Navy has sponsored research and monitoring for over 30 years. The USCG also spends tens of millions of dollars annually protecting living marine resources through its maritime response, prevention, and law enforcement missions, which have a direct and positive impact on the maritime environment. Additional details are provided in Table 3.0-1.

Table 3.0-1: Marine Species Monitoring and Research Programs

Research Sponsor	Research Focus	Additional Information
U.S. Navy Marine Species Monitoring Program	The U.S. Navy Marine Species Monitoring Program was established to meet regulatory compliance requirements under the MMPA and ESA. This program focuses on improving the broader scientific understanding of protected marine species across Study Areas, including species occurrences, responses to stressor exposure, and consequences of stressor exposure on individuals and populations. The monitoring program coordinates its investments across all regions where the Navy conducts military readiness activities, and it allocates resources based on a set of standardized objectives through what is known as the Integrated Comprehensive Monitoring Program. Program goals and objectives were developed in coordination with NMFS and in consultation with a Science Advisory Group and other regional experts. The monitoring program is designed to be flexible, scalable, and adjustable to periodically assess progress and reevaluate objectives. Detailed and specific studies that support the Action Proponents' and NMFS's top-level monitoring goals will continue to be developed through what is known as the Strategic Planning Process. Monitoring methods include a combination of field techniques, including visual surveys, passive acoustic monitoring, short- and long-term animal tagging, biopsy sampling, and photo-identification. The monitoring program uses a combination of techniques so that detection and observation of marine animals is maximized and meaningful information can be derived to address monitoring objectives.	Monitoring data are available to the public on the webpages of the Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations webpage (http://seamap.env.duke.edu/) and Animal Telemetry Network (https://ioos.noaa.gov/project/atn/), and through collaborations such as the National Oceanic and Atmospheric Administration's Passive Acoustic Cetacean Map (https://apps-nefsc.fisheries.noaa.gov/pacm/#/) and WhaleMap (https://whalemap.org/WhaleMap/). Additional information about the monitoring program, including annual reports, technical reports, publications, and project summaries are provided on the U.S. Navy Marine Species Monitoring webpage (http://www.navymarinespeciesmonitoring.us/).

Table 3.0-1: Marine Species Monitoring and Research Programs (continued)

Research Sponsor	Research Focus	Additional Information
Living Marine Resources Program	The Living Marine Resources program's fundamental mission supports the ability for uninterrupted training and testing by broadening the use of or improving the technology and methods available to the U.S. Navy Marine Species Monitoring Program, and improving best available science on potential impacts of military readiness activities on marine species. Sponsored research covers four main investment areas: (1) data to support risk threshold criteria, (2) data analysis and processing tools, (3) technology demonstrations, and (4) standards and metrics. Research on data to support risk threshold criteria is used to support the acoustic effects analyses as discussed in the Marine Mammal Auditory Weighting Functions and Exposure Functions for U.S. Navy Phase IV Acoustic Effects Analyses Technical Report and Sea Turtle Auditory Criteria and Thresholds for U.S. Navy Phase IV Acoustic Effects Analyses Technical Report.	For publications, program reports, and details about current and completed projects, see the Living Marine Resources program webpage (https://exwc.navfac.navy.mil/LMR).
U.S. Navy Office of Naval Research	The ONR's Marine Mammals and Biology program supports basic and applied research and technology development related to understanding the effects of sound on marine mammals. The program focuses on characterizing and understanding behavioral, ecological, physiological, and population-level impacts on marine mammals, primarily from exposure to sonar. Sponsored research across five main concentration areas (monitoring and detection, integrated ecosystem research, sensing and tag development, effects of sound on marine life, and models and databases) focuses on improving marine mammal monitoring capabilities by developing technology such as passive acoustics, infrared, tags and sensors, and detection and signal processing software. An example of a recent success is the adaptation of autonomous ocean gliders for timely, reliable, accurate, and actionable marine mammal monitoring. A key goal is to make technologies available to the broader research and Navy communities.	For additional information, see the program's webpage (https://www.nre.navy.mil/organization/departments/code-32/division-322/marine-mammals-and-biology).

Notes: MMPA = Marine Mammal Protection Act, ESA = Endangered Species Act, NMFS = National Marine Fisheries Service, ONR = Office of Naval Research

3.0.1.2 Navy's Quantitative Analysis to Determine Impacts to Sea Turtles and Marine Mammals

When an activity introduces sound or explosive energy into the marine environment, the potential impacts on marine species are analyzed to obtain a quantitative value for the impact. The density of animals of each species and stock, along with criteria and thresholds, which define the levels of sound and energy that may cause certain types of impacts, is used to conduct the analysis. The Navy's acoustic effects model incorporates the density and the criteria and thresholds as inputs and analyzes training and testing activities. A detailed explanation of this analysis is provided in the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing*.

3.0.1.2.1 Marine Species Density Database

A quantitative analysis of impacts on a species requires data on their abundance and distribution in the potentially impacted area. The most appropriate metric for this type of analysis is density, which is the number of animals present per unit area. Estimating marine species density requires substantial surveys and effort to collect and analyze data to produce a usable estimate. NMFS is the primary agency responsible for estimating marine mammal and sea turtle density within the U.S. Exclusive Economic Zone (EEZ). Other agencies and independent researchers often publish density data for species in specific areas of interest, including areas outside the U.S. EEZ. In areas where surveys have not produced adequate data to allow robust density estimates, methods such as model extrapolation from surveyed areas, Relative Environmental Suitability (habitat) models, or expert opinion are used to estimate occurrence. These density estimation methods rely on information such as animal sightings from adjacent locations, amount of survey effort, and the associated environmental variables (e.g., depth, sea surface temperature).

There is no single source of density data for every area of the world, species, and season because of the fiscal, resource, and practical limitations, as well as the level of effort required to provide survey coverage to sufficiently estimate density. Therefore, to characterize marine species density for large areas, such as the Study Area, the Navy compiled data from multiple sources and developed a protocol to select the best available density estimates based on species, area, and time (i.e., season).

The resulting Geographic Information System database includes density values, defined seasonally where possible, for every marine mammal and sea turtle species present within the Study Area. This database is described in the technical report *U.S. Navy Marine Species Density Database Phase IV for the Hawaii-California Training and Testing Study Area*. These data are used as an input into the Navy Acoustic Effects Model.

3.0.1.2.2 Developing Acoustic and Explosive Criteria and Thresholds

Information about the numerical sound and energy levels that are likely to elicit certain types of physiological and behavioral reactions is needed to analyze potential impacts to marine species. Phase IV criteria and thresholds for quantitative modeling of impacts use the best available existing data from scientific journals, technical reports, and monitoring reports to develop thresholds and functions for estimating impacts on marine species. A detailed description of the Phase IV acoustic and explosive criteria and threshold development is included in the supporting technical report *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase IV)* (U.S. Department of the Navy, In Progress).

3.0.1.2.3 The Navy's Acoustic Effects Model

The Navy Acoustic Effects Model was developed to conduct a comprehensive acoustic impact analysis for use of sonars, air guns, and explosives[1] in the marine environment. This model considers the physical environment, including bathymetry, seafloor composition/sediment type, wind speed, and sound speed profiles, to estimate propagation loss. The propagation information combined with data on the locations, numbers, and types of military readiness activities and marine resource densities provides estimated numbers of effects to each stock.

Individual animals are represented as "animats," which function as dosimeters and record acoustic energy from all active underwater sources during a simulation of a training or testing event. Each animat's depth changes during the simulation according to the typical depth pattern observed for each species. During any individual modeled event, impacts on individual animats are considered over 24-hour periods.

The model estimates the number of instances in which an effect threshold was exceeded over the course of a year, it does not estimate the number of times an individual in a population may be impacted over a year. Some individuals could be impacted multiple times, while others may not experience any impact.

The Navy Acoustic Effects Model (described in the *Quantitative Analysis Technical Report*) underwent several notable changes from the prior analysis that influence estimates of the number of marine mammals that could be impacted in each training or testing event.

- Broadband sonar bins are split into one octave sub-bins, propagation calculations performed, and then the energy in each one-octave bin is summed at the receiver (i.e., animat). Broadband sources were represented and modeled in previous analyses using only the source's center frequency. Using the full frequency spectrum of the source, as opposed to only the center frequency, may lead to higher weighted received levels for some hearing groups, dependent on the overlap of source frequencies with the auditory range of the hearing group. This will increase sound exposure level (SEL)-based impacts (i.e., temporary threshold shift [TTS] and auditory injury [AINJ]) for broadband sources in this analysis versus prior analyses for the same event. Sometimes in prior analyses, broadband sonar sources were not analyzed for some hearing groups if the center frequency was beyond the group's frequency cutoffs. Now considering the full broadband frequency spectra of the signal, some previously discounted hearing groups are now assessed for impacts from those sources.
- The impulsive propagation model was updated to use an equation that was more suitable for use in water. The total peak pressure and overall energy of both equations is the same and not expected to result in significant differences in estimates for the number of non-auditory injury, AINJ, TTS, or behavioral effects. However, because of the slower decay time of the updated equation, there would be a slight increase in modeled non-auditory injury and mortality as compared to prior analyses.
- Animal avoidance of high sources levels was incorporated into the Navy Acoustic Effects Model, with marine mammal avoidance thresholds based on their sensitivity to behavioral response. Some species that are less sensitive to behavioral response (i.e., most odontocetes and

[1] Explosives analyzed in the Navy Acoustic Effects Model include those that are expected to occur in air within 30 ft. (9 m) of the water surface (e.g., those that detonate at a surface target). These explosives are modeled at 0.1 m depth with no release at the surface.

mysticetes) had less reduction in AINJ due to avoidance than in the prior analysis, leading to higher AINJ estimates.

3.0.2 Effects Analysis Framework

Consistent with the revised NEPA regulations promulgated by the CEQ on May 1, 2024, the Navy as the lead agency must determine the environmental consequences of the Proposed Action and reasonable alternatives. Per 40 CFR 1502.16(a), a comparison of the proposed action and reasonable alternatives is based on the reasonably foreseeable effects of their activities and the significance of those effects under the criteria presented in 40 CFR section 1501.3.

A significance determination under 1501.3(d) considers the context of the action and the intensity of the effect to determine the significance of reasonably foreseeable adverse effects of activities under the proposed action. A significance determination is only required for activities that have reasonably foreseeable adverse effects on the human environment based on the eight listed factors in 1501.3(d)(2) (Table 3.0-2). To this end, the significance determination analysis reaches a significant/less than significant conclusion only for activities with reasonably foreseeable adverse effects on any of the listed factors. This avoids conflating the degree of adverse effects on a particular resource with the holistic look at activity effects on the human environment, as explained by the CEQ regulations. Ultimately, the significance determinations in subsequent sections are used to compare environmental consequences amongst the alternatives.

Table 3.0-2: Factors to Consider for Intensity of Effects

Agencies shall analyze the intensity of effects considering the following factors, as applicable to the proposed action and in relationship to one another:
1) The degree to which the action may adversely affect public health and safety. 2) The degree to which the action may adversely affect unique characteristics of the geographic area such as historic or cultural resources, parks, Tribal sacred sites, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas. 3) Whether the action may violate relevant Federal, State, Tribal, or local laws or other requirements or be inconsistent with Federal, State, Tribal, or local policies designed for the protection of the environment. 4) The degree to which the potential effects on the human environment are highly uncertain 5) The degree to which the action may adversely affect resources listed or eligible for listing in the National Register of Historic Places. 6) The degree to which the action may adversely affect an endangered or threatened species or its habitat, including habitat that has been determined to be critical under the Endangered Species Act of 1973. 7) The degree to which the action may adversely affect communities with environmental justice concerns. 8) The degree to which the action may adversely affect rights of Tribal Nations that have been reserved through treaties, statutes, or Executive Orders.

3.0.3 Overall Approach to Analysis

The overall approach to analysis in this EIS/OEIS is consistent with the approach used in previous analyses and included the following general steps:

- Determine if information about the affected environment has changed.
- Identify new or changed actions.
- Identify resources (e.g., biological resources, air quality, and cultural resources) and stressors (e.g., physical disturbance and strike, acoustic, and entanglement) for analysis.

- Analyze resource-specific impacts for individual stressors by reviewing and applying new literature, including science, surveys, and information on how resources could be affected by stressors.
- Analyze resource-specific impacts for multiple stressors.
- Review and consider comments received from members of the public and other stakeholders during scoping.
- Identify past, present, and reasonably foreseeable future actions to analyze the cumulative impacts.
- Consider mitigation measures to reduce identified potential impacts.

Stressor: an agent, condition, or other stimulus that causes stress to an organism or alters physical, socioeconomic, or cultural resources.

Military readiness activities that comprise the Proposed Action may produce one or more stimuli that cause stress on a resource. Each proposed activity was examined to determine its potential stressors. The term stressor is broadly used in this document to refer to an agent, condition, or other stimulus that causes stress to an organism or alters physical, socioeconomic, or cultural resources. Not all stressors affect every resource, nor do all proposed activities produce all stressors. See Appendix B to see the relationship of stressors to activities and stressors to resources.

The potential direct, indirect, and cumulative impacts of the Proposed Action were analyzed based on these potential stressors being present within range of the resource. Data sets used for analysis were considered across the full spectrum of military readiness activities for the foreseeable future. For the purposes of analysis and presentation within this EIS/OEIS, data were organized and evaluated in 1-year increments. Direct impacts result when an action and a resource occur at the same time and place. Indirect impacts result when a direct impact on one resource induces an impact on another resource (referred to as a secondary stressor). Indirect impacts would be reasonably foreseeable because of a functional relationship between the directly impacted resource and the secondarily impacted resource. For example, a change in water quality could also result in impacts on those resources that rely on water quality, such as marine animals and public health and safety. Cumulative effects or impacts are the incremental impacts of the action added to other past, present, and reasonably foreseeable future actions.

First, a preliminary analysis was conducted to determine the environmental resources potentially impacted and associated stressors. Second, each resource was analyzed for potential effects of individual stressors if those stressors would have reasonably foreseeable adverse effects. This was followed by an analysis of the combined impacts of all stressors related to the Proposed Action. Last, a cumulative impact analysis was conducted (Chapter 4).

In this sequential approach, the initial analyses were used to develop each subsequent step so the analysis focused on relevant issues (defined during scoping) that warranted the most attention. The systematic nature of this approach allowed the Proposed Action with the associated stressors and potential impacts to be effectively tracked throughout the process. This approach provides a comprehensive analysis of applicable stressors and potential impacts. Each step is described in more detail below.

3.0.3.1 Resources and Issues Evaluated

Categories of resources evaluated include physical (air quality, sediments and water quality); biological resources (including threatened and endangered species), such as habitats, vegetation, invertebrates, fishes, marine mammals, reptiles, and birds; and human resources (e.g., cultural resources, socioeconomic resources and environmental justice, and public health and safety). These resources each have unique stressors described in their respective sections of Chapter 3.

The evaluation concluded that the stressors associated with the Proposed Action would not result in any reasonably foreseeable adverse effects on two resource areas: Sediments and Water Quality, and Public Health and Safety. These resource areas remain included in this Draft EIS/OEIS to document and support the analysis leading to this conclusion.

3.0.3.2 Resources and Issues Eliminated from Further Consideration

This EIS/OEIS analyzes only activities that affect resources that are beneath, on, or over the ocean. Therefore, some resource areas are not analyzed. Resources and issues considered but not carried forward for further consideration include land use, demographics, and children's health and safety. Land use and demographics were not further considered because the effects associated with the Proposed Action occur at sea away from human populations and would not result in a change in the land use or demographics within the coastal areas that abut the Study Area. To the extent an action originated from land but has impacts at sea (missile and target launches from SNI and PMRF as noted in Chapter 2, Section 2.1 of this EIS/OEIS), the land activities have been evaluated in other environmental analyses that may be re-evaluated periodically. EO 13045 was not considered because all of the proposed activities occur in the ocean, where there are no child populations present. Therefore, the Proposed Action would not lead to disproportionate risks to children that result from environmental health risks or safety risks.

3.0.3.3 Identifying Stressors for Analysis

The proposed military readiness activities were evaluated to identify specific components that could act as stressors by having direct or indirect impacts on the environment. This analysis considers the locations where activities may occur (i.e., spatial variation). Matrices were prepared to identify associations between stressors, resources, and the spatial relationships of those stressors, resources, and activities within the Study Area under the Proposed Action. Each stressor includes a description of activities that may generate the stressor.

A preliminary analysis identified the stressor/resource interactions that warrant further analysis in this EIS/OEIS based on public comments received during scoping, previous NEPA analyses, and professional opinions of subject matter experts. Stressor/resource interactions that were determined to have negligible or no impacts were not carried forward for analysis in this EIS/OEIS.

In subsequent sections, tables are provided in which the annual number of events that could involve a particular stressor are totaled by alternative and by location, within the categories of training and testing. It is important to note that the various tables are not exclusive of each other, and that the stressors from a single named activity from Chapter 2 could show up on several tables. For example, the activity ASW Tracking Exercise – Helicopter could include acoustic stressors (Table 3.0-3), physical disturbance stressors (Table 3.0-23), strike stressors (Table 3.0-21), entanglement stressors (Table 3.0-24), and ingestion stressors (Table 3.0-18, Table 3.0-19, Table 3.0-21, and (Table 3.0-26). Also, activities are not always conducted independently of each other. For example, there are instances where a training activity could occur on a vessel while another training activity or a testing activity is being conducted on the same vessel simultaneously. Finally, note that some of the tables that follow in this section count individual items expended (e.g., Table 3.0-20) while others count the annual number of events in which that stressor could occur at least once during the conduct of that activity (e.g., Table 3.0-22).

3.0.3.3.1 Acoustic Stressors

The categories of acoustic sources identified for analysis in this EIS/OEIS are the same as those in the 2018 HSTT EIS/OEIS (sonar and other transducers, pile driving, vessel noise, aircraft noise, weapons noise, and air guns). Detailed information describing these sources can be found in Appendix D.

In order to better organize and facilitate the analysis of hundreds of individual sources of underwater sound produced by the Action Proponents, including sonars and explosives, a schema of source bins was previously developed and is used in this study. A fuller description of the schema and the benefit of using this method is described in more detail in the Technical Report "*Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing*."

In previous phases, non-impulsive, narrow-band sources were grouped into bins that were defined by their acoustic properties and in some cases, their purpose or application. For Phase IV, binning by purpose or application is being revised, and sources are binned based only on their acoustic properties. As in previous phases, each bin was represented by the most impactful characteristics of any source within that bin. Specifically, bin parameters were based on (1) highest source level, (2) lowest geometric mean frequency, (3) highest duty cycle, and (4) largest horizontal and vertical beam patterns.

Breaking the bins up to represent smaller ranges of acoustic properties resulted in bin parameters that more closely match those of the sources contained within. In binning sources for the purpose of modeling, the combination of the four parameters above allowed for over 1,000 potential unique bins. While HCTT military readiness activities only use sources falling into a small number of these potential bins, the binning construct allows for easy addition of bins as required in the future. For this EIS/OEIS, bins will only be described by their frequency (low, medium, high, or very high) and their source level (low, medium, or high), resulting in 12 individual non-impulsive acoustic bins.

In many cases, sources that previously fell into one purpose-based bin now fall into multiple bins. Likewise, sources with similar acoustic parameters that were previously broken into separate bins due to different purposes now share a bin. As a result, the new bins do not represent a one-for-one replacement in comparison to bins used in previous EIS/OEIS phases, and a crosswalk table between the old bins and new bins is not possible. An exception to the new naming convention was retention of "MF1" and "MF1K" to represent the hull-mounted surface ship sonar that was previously in the MF1 and MF1K bins. The retention of these names was to allow for clear comparison to past documents due to the extensive use of these sources in training and testing activities.

Separate from the acoustic bins described above, explosives were divided into bins E0–E16, with HCTT training and testing using explosives falling into only 14 of these explosives bins. Broadband sources were divided into bins BB1–BB27, with HCTT training and testing using only sources falling into 12 of these broadband bins, which were further generalized into 4 bins. As in previous studies, some sources were removed from quantitative analysis because they are not anticipated to result in takes of protected species. These sources are typically referred to as de minimis and include those with low source level, narrow beamwidth, downward-directed transmission, short pulse lengths, frequencies above known hearing ranges of marine mammals and sea turtles, or some combination of these factors, as well as sources used for safety of navigation.

Sonars and other transducers are now grouped into bins based on the frequency or bandwidth, source level, duty-cycle, and three-dimensional beam coverage.

The use of source bins provides the following benefits:

- provides the ability for new sensors or munitions to be covered under existing authorizations, as long as those sources fall within the parameters of a bin;
- improves efficiency of source utilization data collection and reporting requirements anticipated under MMPA authorizations;
- ensures a conservative approach to all impact estimates, as all sources within a given class are modeled as the most impactful source (highest source level, longest duty cycle, or largest net explosive weight) within that bin; and
- allows analyses to be conducted in a more efficient manner, without any compromise of analytical results; and provides a framework to support the reallocation of source usage (hours/explosives) between different source bins, as long as the total numbers of takes remain within the overall analyzed and authorized limits. This flexibility is required to support evolving training and testing requirements, which are linked to real-world events.

Table 3.0-3 shows the broadband and non-impulsive bin use that could occur in any year under each action alternative for military readiness activities. A range of annual bin use indicates that use of that bin is anticipated to vary annually, consistent with the variation in the number of annual activities described in Chapter 2.

Table 3.0-3: Sonar and Transducer Sources Quantitatively Analyzed

Source Class Category	Description	Unit	Annual Training		Annual Testing	
			Alternative 1	Alternative 2	Alternative 1	Alternative 2
Broadband Sources						
LF	<205 dB	H	-	-	430–570	430–570
LF to HF	<205 dB	C	804–818	804–818	686–859	686–859
		H	-	-	1,662–2,077	1,670–2,077
LF to MF	<205 dB	H	-	-	2,801–2,833	2,801–2,833
MF to HF	<205 dB	H	8,082–11,585	10,047–11,585	1,451–1,779	1,451–1,779
Low-Frequency Acoustic Sources						
LFL	160 dB to 185 dB	H	-	-	12	12
LFM	185 dB to 205 dB	C	-	-	1,160–1,384	1,384
		H	468–536	468–536	7,531–8,984	9,031–9,056
LFH	>205 dB	C	1,493–2,120	1,863–2,120	6,046–6,704	6,704
		H	14	14	4,050–6,050	4,230–6,050
Mid-Frequency Acoustic Sources Other Than Hull-Mounted						
MFL	160 dB to 185 dB	H	-	-	12,632–14,982	12,632–14,982
MFM	185 dB to 205 dB	C	4,890–6,552	5,568–6,552	15,080–16,928	16,698–16,928
		H	30	30	14,381–16,081	14,747–16,129
MFH	>205 dB	H	1,942–3,003	2,831–3,003	8,115–10,424	8,389–10,448
Hull-Mounted Surface Ship Sonar						
MF1C	Hull-mounted surface ship sonar (previously MF11) with duty cycle >80%	H	796–1,406	1,315–1,406	45	45
MF1K	Hull-mounted surface ship sonar (previously MF1K) in Kingfisher mode	H	455	455	14	14
MF1	Hull-mounted surface ship sonar (previously MF1)	H	5,084–8,758	8,146–8,758	413–917	413–917
High-Frequency Acoustic Sources						
HFL	160 dB to 185 dB	H	60	60	21,326–22,076	21,326–22,076
HFM	185 dB to 205 dB	C	9	9	1,800–2,346	2,346
		H	3,907–5,290	5,266–5,290	12,409–13,259	12,762–13,307
HFH	>205 dB	C	801–899	804–899	835–1,137	876–1,137
		H	2,419–2,498	2,494–2,498	1,367–1,920	1,409–1,920

Table 3.0-3: Sonar and Transducer Sources Quantitatively Analyzed (continued)

Source Class Category	Description	Unit	Annual Training		Annual Testing	
			Alternative 1	Alternative 2	Alternative 1	Alternative 2
Very High-Frequency Acoustic Sources						
VHFL	160 dB to 185 dB	H	30	30	9,160	9,160
VHFM	185 dB to 205 dB	H	-	-	96	120
VHFH	>205 dB	C	-	-	72–106	72–106
		H	5,458–7,862	6,362–7,862	12,544–16,824	12,544–16,824

Notes: dB = decibel(s), H = hours; C = count; LF = low frequency; MF = mid frequency; HF = high frequency; VHF = very high frequency; the third letter following LF, MF, HF, and VHF corresponds to: L = low power, M = medium power, H = high power; when following “MF1” C = duty cycle > 80%, K = Kingfisher mode.

3.0.3.3.1.1 Air Guns

Air guns are essentially stainless-steel tubes charged with high-pressure air via a compressor. An impulsive sound is generated when the air is almost instantaneously released into the surrounding water, providing a consistent sound source used to evaluate performance capabilities of acoustic sensor systems. Small air guns with capacities up to 60 cubic inches would be used during testing activities in the offshore areas of the Study Area. Table 3.0-4 shows the number of air gun shots proposed in the HCTT Study Area.

Table 3.0-4: Air Gun Sources Quantitatively Analyzed

Source Class Category	Bin	Unit	Annual Training	Annual Testing
Air Guns (AG): small underwater air guns	AG	Count	0	30,432–36,780

Generated impulses would have short durations, typically a few hundred milliseconds, with dominant frequencies below 1 kilohertz (kHz). The root-mean-square sound pressure level (SPL) and peak pressure (SPL peak) at a distance 1 m from the air gun would be approximately 215 decibels (dB) referenced to 1 micropascal re 1 µPa) and 227 dB re 1 µPa, respectively, if operated at the full capacity of 60 cubic inches. The size of the air gun chamber can be adjusted, which would result in lower SPLs and sound exposure level per shot.

3.0.3.3.1.2 Pile Driving

Impact pile driving and vibratory pile removal would occur during training for Port Damage Repair, an activity that trains forces to repair critical port facilities.

Table 3.0-5 summarizes the number of piles that would be installed (Impact) or removed (Vibratory) during Port Damage Repair activities annually and over a 7-year period.

Table 3.0-5: Summary of Pile Driving and Removal Activities During Port Damage Repair

Method	Alternative 1		Alternative 2	
	Annual	7-Year	Annual	7-Year
Impact	864	6,048	864	6,048
Vibratory	4,248	29,736	4,248	29,736

Pile driving for the Port Damage Repair would occur in shallower water at Port Hueneme, California. Sound from in-water pile driving could be transmitted on direct paths through the water, be reflected at the water surface or bottom, or travel through bottom substrate. Soft substrates such as sand bottom would absorb or attenuate the sound more readily than hard substrates (rock), which may reflect the acoustic wave.

Impact pile driving would involve the use of an impact hammer with both it and the pile held in place by a crane. When the pile driving starts, the hammer part of the mechanism is raised up and allowed to fall, transferring energy to the top of the pile. The pile is thereby driven into the sediment by a repeated series of these hammer blows. Each blow results in an impulsive sound emanating from the length of the pile into the water column as well as from the bottom of the pile through the sediment. Broadband impulsive signals are produced by impact pile driving methods, with most of the acoustic energy concentrated below 1,000 hertz (Hz) (Hildebrand, 2009b).

Vibratory installation and extraction would involve the use of a vibratory hammer suspended from the crane and attached to the top of a pile. The pile is then vibrated by hydraulic motors rotating eccentric weights in the mechanism, causing a rapid vibration of the pile. The vibration and the weight of the hammer applying downward force drives the pile into the sediment. During removal, the vibration causes the sediment particles in contact with the pile to lose frictional grip on the pile. The crane slowly lifts the vibratory extraction hammer and pile until the pile is free of the sediment. In some cases, the crane may be able to lift the pile without the aid of an extraction hammer (i.e., dead pull), in which case no noise would be introduced into the water. Vibratory driving and removal create broadband, non-impulsive noise at low source levels, for a short duration with most of the energy dominated by lower frequencies (Hildebrand, 2009a).

Table 3.0-6 summarizes the sound levels selected for use in the acoustic analysis for each pile size and type to be used during Port Damage Repair activities.

Table 3.0-6: Summary of Pile Driving and Removal Activities During Port Damage Repair

Pile Descriptions	Unattenuated Single Strike Level (dB)			Unattenuated SPL (dB rms)
	Peak SPL	RMS	SEL	
Impact (install only)				
12 to 20-inch Timber Round Piles[1]	180	170	160	-
12 to 20-inch Steel H-Piles[2]	195	180	170	-
12 to 20-inch Steel, Timber or Composite Round Piles[3]	203	189	178	-
Vibratory (install and/or remove)				
18 or 27.5-inch steel or FRP Z-piles[4]	-	-	-	159
12 to 20-inch Steel, Timber or Composite Round or H-Piles[5]	-	-	-	166

Sources: (1) 14-inch round timber piles (Caltrans, 2020); (2) 14-inch steel H-beam piles (Caltrans, 2020); (3) 24-inch steel pipe piles (Illingworth and Rodkin Inc., 2007); (4) 25-inch steel sheet piles (Naval Facilities Engineering Systems Command Southwest, 2020); (5) 24-inch steel piles (Washington State Department of Transportation, 2010).

In addition to underwater noise, the installation and removal of piles would also result in airborne noise in the environment. Impact pile driving creates in-air impulsive sound up to a maximum of 114 dB re 20 µPa (unweighted) at a range of 15 meters (m) for 24-inch (in.) and 36-in. steel piles (Illingworth and Rodkin, 2015, 2017; Illingworth and Rodkin Inc., 2013). Reported sound levels for vibratory driving or extraction would be lower than that produced during impact driving (e.g., 94 dB re 20 µPa within a range of 10–15 m).

3.0.3.3.1.3 Vessel Noise

See Appendix D, Section D.2.2.1, for a discussion of vessel noise in the HCTT Study Area.

3.0.3.3.1.4 Aircraft Noise

Fixed-wing, tiltrotor, and rotary-wing aircraft are used for a variety of training and testing activities throughout the Study Area, contributing both airborne and underwater sound to the ocean environment. Sounds in air are often measured using A-weighting, which adjusts received sound levels based on human hearing abilities. Aircraft used in training and testing generally have turboprop, or jet engines. Motors, propellers, and rotors produce the most noise, with some noise contributed by aerodynamic turbulence. Aircraft sounds have more energy at lower frequencies. Aircraft may transit to or from vessels at sea throughout the Study Area from established airfields on land. Takeoffs and landings occur at established airfields as well as on vessels across the Study Area. Takeoffs and landings from Navy vessels produce in-water noise at a given location for a brief period as the aircraft climbs to cruising altitude. Kuehne et al. (2020) observed EA-18G aircraft during takeoff and landing and detected broadband noise (20 Hz – 20 kHz) at received levels as high as 119 dB re 20 µPa at a water depth of 30 m. Military activities involving aircraft generally are dispersed over large expanses of open ocean but can be highly concentrated in time and location. Table 3.0-7 provides source levels for some typical aircraft used during training and testing in the Study Area and depicts comparable airborne source levels for the F-35A, EA-18G, and F/A-18C/D during takeoff.

Table 3.0-7: Representative Aircraft Sound Characteristics

Noise Source	Sound Pressure Level
In-Water Noise Level	
F/A-18 Subsonic at 1,000 ft. (300 m) Altitude	152 dB re 1 µPa at 2 m below water surface[1]
F/A-18 Subsonic at 10,000 ft. (3,000 m) Altitude	128 dB re 1 µPa at 2 m below water surface[1]
H-60 Helicopter Hovering at 82 ft. (25 m) Altitude	Approximately 125 dB re 1 µPa at 1 m below water surface[2*]
Airborne Noise Level	
F/A-18C/D Under Military Power	143 dBA re 20 µPa at 13 m from source[3]
F/A-18C/D Under Afterburner	146 dBA re 20 µPa at 13 m from source[3]
F35-A Under Military Power	145 dBA re 20 µPa at 13 m from source[3]
F-35-A Under Afterburner	148 dBA re 20 µPa at 13 m from source[3]
H-60 Helicopter Hovering at 82 ft. (25 m) Altitude	113 dBA re 20 µPa at 25 m from source[2]
H-60 Helicopter Hovering at 82 ft. (25 m) Altitude	113 dBA re 20 µPa at 25 m from source[2]
F-35A Takeoff Through 1,000 ft. (300 m) Altitude	119 dBA re 20 $\mu Pa^2 s$[4**] (per second of duration)
EA-18G Takeoff Through 1,622 ft. (500 m) Altitude	115 dBA re 20 $\mu Pa^2 s$[5**] (per second of duration)

Sources: [1]Eller and Cavanagh (2000) [2]Bousman and Kufeld (2005); [3]U.S. Naval Research Advisory Committee (2009), [4]U.S. Department of the Air Force (2016), [5]U.S. Department of the Navy (2012)
* estimate based on in-air level
**average sound exposure level
Notes: dB re 1 µPa = decibel(s) referenced to 1 micropascal, dBA re 20 µPa = A-weighted decibel(s) referenced to 20 micropascals, m = meter(s), ft. = feet

An intense but infrequent type of aircraft noise is the sonic boom, produced when an aircraft exceeds the speed of sound. Supersonic flight over land or within 30 miles offshore would be conducted only in specifically designated areas. As a general policy, sonic booms would not be intentionally generated below 30,000 feet (ft.) of altitude unless over water and more than 30 miles from inhabited land areas or islands. However, deviation from these guidelines may be authorized for tactical missions that require supersonic flight, phases of formal training requiring supersonic speeds, research and test flights that require supersonic speeds, and for flight demonstration purposes when authorized by the Chief of Naval Operations (U.S. Department of the Navy, 2016a).

In air, the energy from a sonic boom is concentrated in the frequency range from 0.1 to 100 Hz. The underwater sound field due to transmitted sonic boom waveforms is primarily composed of low-frequency components (Sparrow, 2002). Frequencies greater than 20 Hz have been found to be difficult to observe at depths greater than 33 ft. (10 m) (Sohn et al., 2000). F/A-18 Hornet supersonic flight was modeled to obtain peak SPLs and energy flux density at the water surface and at depth (U.S. Department of the Air Force, 2000). These results are shown in Table 3.0-8.

Table 3.0-8: Sonic Boom Underwater Sound Levels Modeled for F/A-18 Hornet Supersonic Flight

Mach Number*	Aircraft Altitude (km)	Peak SPL (dB re 1 µPa)			Energy Flux Density (dB re 1 μPa^2-s)[1]		
		At surface	50 m Depth	100 m Depth	At surface	50 m Depth	100 m Depth
1.2	1	176	138	126	160	131	122
	5	164	132	121	150	126	117
	10	158	130	119	144	124	115
2	1	178	146	134	161	137	128
	5	166	139	128	150	131	122
	10	159	135	124	144	127	119

* Mach number equals aircraft speed divided by the speed of sound.
[1] Equivalent to SEL for a plane wave.
Notes: SPL = sound pressure level, dB re 1 µPa = decibel(s) referenced to 1 micropascal, dB re 1 μPa^2-s = decibel(s) referenced to 1 micropascal squared seconds, m = meter(s)

3.0.3.3.1.5 Weapon Noise

The Navy trains and tests using a variety of weapons, as described in Appendix A. Depending on the weapon, incidental (unintentional) noise may be produced at launch or firing, while in flight, or upon impact. Other devices intentionally produce noise to serve as a non-lethal deterrent. Not all weapons utilize explosives, either by design or because they are non-explosive practice munitions. Noise produced by explosives, both in air and water, are discussed in Section 3.0.3.3.2.

Noise associated with large-caliber weapons firing, missile firing, target launching, and the impact of non-explosive practice munitions or kinetic weapons would typically occur at locations greater than 12 nautical miles (NM) from shore in warning areas or special use airspace for safety reasons, with the exception of areas near SCI and SNI in the California Study Area and PMRF in the Hawaii Study Area. Small- and medium-caliber weapons firing could occur throughout the Study Area in identified training areas.

Examples of some types of weapons noise are shown in Table 3.0-9. Noise produced by other weapons and devices are described further below.[2]

Table 3.0-9: Example Weapons Noise

Noise Source	Sound Level
In-Water Noise Level	
Naval Gunfire Muzzle Blast (5-inch)	Approximately 200 dB re 1 µPa peak directly under gun muzzle at 1.5 m below the water surface[1]
Airborne Noise Level	
Naval Gunfire Muzzle Blast (5-inch)	178 dB re 20 µPa peak directly below the gun muzzle above the water surface[1]
Hellfire Missile Launch from Aircraft	149 dB re 20 µPa at 4.5 m[2]
RIM 116 Surface-to-Air Missile	122–135 dBA re 20 µPa between 2 and 4 m from the launcher on shore[3]

Sources: [1]Yagla and Stiegler (2003); [2](U.S. Department of the Army, 1999); [3](Investigative Science and Engineering, 1997)
Notes: dB re 1 µPa = decibel(s) referenced to 1 micropascal, dB re 20 µPa = decibel(s) referenced to 20 micropascals, dBA re 20 µPa = A-weighted decibel(s) referenced to 20 micropascals, m = meter(s)

3.0.3.3.2 Explosive Stressors

This section describes the characteristics of explosions during military training and testing and provides the basis for analysis of explosive impacts on resources in the remainder of Chapter 3. The activities analyzed in the EIS/OEIS that use explosives are described in Appendix A. Explanations of the terminology and metrics used when describing explosives in this EIS/OEIS are in Appendix D.

The near-instantaneous rise from ambient to an extremely high peak pressure is what makes an explosive shock wave potentially damaging. Farther from an explosive, the peak pressures decay and the explosive waves propagate as an impulsive, broadband sound. Several parameters influence the effect of an explosive: the weight of the explosive warhead; the type of explosive material; the boundaries and characteristics of the propagation medium; and, in water, the detonation depth. The net explosive weight, which is the explosive power of a charge expressed as the equivalent weight of trinitrotoluene (TNT), accounts for the first two parameters. The effects of these factors are explained in Appendix D.

In order to better organize and facilitate the analysis of training and testing activities using explosives that could detonate in water or at the water surface, explosive classification bins based on net explosive weight were developed and are shown in Table 3.0-10. The use of explosive classification bins provides the same benefits as described for acoustic source classification bins in Section 3.0.3.3.1.

[2] While the island of Kaʻula is used for non-explosive practice munitions training, there are not reasonably foreseeable at-sea effects, therefore the training is being evaluated in the ongoing analysis of the PMRF Land Based Training and Testing EA.

Table 3.0-10: Explosive Sources Quantitatively Analyzed that Could be Used Underwater or at the Surface

Bin	Net Explosive Weight	Example Explosive Source	Annual Training	Annual Testing
E1	0.1–0.25	Medium-caliber projectile	1,750–4,303	7,305–7,430
E2	> 0.25–0.5		2,950–3,000	-
E3	> 0.5–2.5	2.75-in. rocket	5,588–5,870	4,744–6,568
E4	> 2.5–5	Mine neutralization charge	179–190	1,324–2,624
E5	> 5–10	5 in. projectile	5,059–5,984	2,024–2,676
E6	> 10–20	Hellfire missile	2,293–2,357	144–148
E7	> 20–60	Demo block/shaped charge	115–190	549–622
E8	> 60–100	Lightweight torpedo	3–5	213–234
E9	> 100–250	500 lb. bomb	386–408	111–115
E10	> 250–500	Harpoon missile	89	13
E11	> 500–675	650 lb. mine	7–11	1–2
E12	> 675–1,000	2,000 lb. bomb	17–19	-
E13	> 1,000–1,740	Underwater demolitions – large area clearance	6	-
E16	10,000	Ship shock detonation	-	0–3

Notes: > = greater than; in. = inch; lb. = pound

3.0.3.3.3 Energy Stressors

This section describes the characteristics of energy introduced through military readiness activities and the relative magnitude and location of these activities to provide the basis for analysis of potential impacts on resources from in-water electromagnetic devices, high-power microwave systems, and high-energy lasers.

3.0.3.3.3.1 In-Water Electromagnetic Devices

In-water electromagnetic energy devices include towed or unmanned mine warfare systems that simply mimic the electromagnetic signature of a vessel passing through the water. None of the devices include any type of electromagnetic “pulse.” A mine neutralization device could be towed through the water by a surface vessel or remotely operated vehicle, emitting an electromagnetic field and mechanically generated underwater sound to simulate the presence of a ship. The sound and electromagnetic signature cause nearby mines to detonate.

Generally, voltage used to power these systems is around 30 volts. Since saltwater is an excellent conductor, just 35 volts (capped at 55 volts) is required to generate the current. These are considered safe levels for marine species due to the low electric charge relative to salt water.

The static magnetic field generated by the mine neutralization devices is of relatively minute strength. Typically, the maximum magnetic field generated would be approximately 2,300 microteslas[3]. This level of electromagnetic density is very low compared to magnetic fields generated by other everyday items. The magnetic field generated is between the levels of a refrigerator magnet (15,000–20,000 microteslas) and a standard household can opener (up to 400 microteslas at 4 in.). The strength of the

[3] The microtesla is a unit of measurement of magnetic flux density, or “magnetic induction.”

electromagnetic field decreases quickly away from the cable. The magnetic field generated is very weak, comparable to the earth's natural field (U.S. Department of the Navy, 2005).

Cables deployed on the seafloor during SOAR modernization, the installation of two Shallow Water Training Ranges, and the deployment of seafloor cables and instrumentation all generate an electromagnetic force (EMF). The EMF produced by the cable is less than that of the natural background magnetic force of the earth at distances beyond 0.6 centimeters (cm) (0.25 in) from the cable. As electromagnetic energy dissipates exponentially by distance from the energy source, the magnetic field from the cable would be equal to 0.1 percent of the earth's at a distance of 6 m (20 ft.). The cables and nodes would be installed at the bottom of the ocean floor, in most cases at a minimum depth of 37 m (120 ft.).

Electromagnetic energy emitted into the water from magnetic influence mine neutralization systems is considered in this document. Table 3.0-11 shows the number and location of proposed activities, primarily mine sweeping, that include the use of in-water electromagnetic devices.

Table 3.0-11: Events Including In-Water Electromagnetic Devices

Activity Area	Annual Training # of Events		Annual Testing # of Events	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Hawaii Study Area	0	0	8–15	15
California Study Area	30	30	14–33	33
Total	**30**	**30**	**22–48**	**48**

3.0.3.3.3.2 High-Power Microwave Systems

Pulsed-wave high-power microwave systems convert electrical or chemical energy into radiated energy and deliver high-power, short bursts of radiofrequency energy to neutralize a target. High-power microwave systems operate within a wide range of frequencies, from 1 megahertz to 100 gigahertz, and transmit energy to a target to degrade or destroy electrical components in the target. High-power microwave systems would be used only during testing activities off California and can be based on land, ships, or aircraft and directed to engage air, land, or surface targets.

Table 3.0-12 shows the number and location of proposed activities that include the use of high-power microwave systems.

Table 3.0-12: Events Including High-Power Microwave Systems

Activity Area	Annual Training # of Events		Annual Testing # of Events	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
California Study Area	0	0	100	100
Total	**0**	**0**	**100**	**100**

3.0.3.3.3.3 High-Energy Lasers

High-energy laser weapons testing involves the use of up to 30 kilowatts of directed energy as a weapon against small surface vessels and airborne targets. High-energy lasers would be employed from surface ships or aircraft and are designed to create small but critical failures in potential targets. Table 3.0-13 shows the number and location of proposed testing events that include the use of high-energy lasers.

Table 3.0-13: Events Including High-Energy Lasers

Activity Area	Annual Training # of Events		Annual Testing # of Events	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Hawaii Study Area	8	8	55–63	63
California Study Area	8	8	555–565	565
Total	**16**	**16**	**610–628**	**628**

3.0.3.3.4 Physical Disturbance and Strike Stressors

This section describes the characteristics of physical disturbance and strike stressors from military readiness activities. It also describes the magnitude and location of these activities to provide the basis for analyzing the potential physical disturbance and strike impacts on resources in the remainder of Chapter 3.

3.0.3.3.4.1 Vessels and In-Water Devices

Vessels used as part of the Proposed Action include ships (e.g., aircraft carriers, surface combatants), support craft, and submarines ranging in size from 15 ft. to over 1,000 ft. Table 3.0-14 provides examples of the types of vessels, length, and speeds used in both training and testing activities. Vessel speeds during modernization and sustainment of ranges activities are much slower, typically 0-3 knots. The U.S. Navy Fact Files, available on the Internet at https://www.navy.mil/Resources/Fact-Files/, provide the latest information on the quantity and specifications of the vessels operated by the Navy. More information about Coast Guard operational assets, including vessels, can be found at https://www.uscg.mil/About/Assets/.

Table 3.0-14: Representative Vessel Types, Lengths, and Speeds

Type	Example(s)	Length	Typical Operating Speed
U.S. Navy Vessels			
Aircraft Carrier	Aircraft Carrier (CVN)	>1,000 ft.	10–15 knots
Surface Combatant	Cruisers (CG), Destroyers (DDG), Frigates (FFG), Littoral Combat Ships (LCS)	300–700 ft.	10–15 knots
Amphibious Warfare Ship	Amphibious Assault Ship (LHA, LHD), Amphibious Transport Dock (LPD), Dock Landing Ship (LSD), Medium Landing Ship (LSM), Stern Landing Vessel (SLV)	200–900 ft.	10–15 knots
Combat Logistics Force Ships	Fast Combat Support Ship (T-AOE), Dry Cargo/Ammunition Ship (T-AKE), Fleet Replenishment Oilers (T-AO)	600–750 ft.	8–12 knots
Support Craft/Other	Amphibious Assault Vehicle (AAV); Combat Rubber Raiding Craft (CRRC); Landing Craft, Mechanized (LCM); Landing Craft, Utility (LCU); Submarine Tenders (AS); Yard Patrol Craft (YP); Range Support; Torpedo Retrievers	15–140 ft.	0–20 knots
Support Craft/Other – Specialized High Speed	High Speed Ferry/Catamaran; Patrol Combatants (PC); Rigid Hull Inflatable Boat (RHIB); Expeditionary Fast Transport (EPF); Landing Craft, Air Cushion (LCAC)	33–320 ft.	0–50+ knots
Submarines	Fleet Ballistic Missile Submarines (SSBN), Attack Submarines (SSN), Guided Missile Submarines (SSGN)	300–600 ft.	8–13 knots

Table 3.0-14: Representative Vessel Types, Lengths, and Speeds (continued)

Type	Example(s)	Length	Typical Operating Speed
U.S. Coast Guard Vessels			
Large cutters	Legend-Class, Heritage-Class, Famous-Class, Juniper-Class, Reliance-Class	181–418 ft.	0–30 knots
Small cutters	Keeper-Class, Sentinel-Class, Bay-Class, Island-Class, Marine Protector-Class, Small Harbor Tug	66–180 ft.	0–30 knots
Boats	Aid to Navigation Boats, Screening Vessels, Lifeboats, Response Boats, Training Boats, Long Range Interceptors, Law Enforcement Boats, Cutterboat Over the Horizon, Transportable Security Boats	13–65 ft.	0–40 knots

Physical disturbance and strike can occur as vessels move through the water and as some smaller craft and amphibious vessels can come into contact with the seafloor in the nearshore environment.

As described earlier in Section 3.0.3.3, activities are not always conducted independently of each other, as there are instances where a training activity could occur on a vessel while another training activity or a testing activity is being conducted on the same vessel simultaneously. The location and hours of Navy vessel usage for military readiness activities are dependent upon the locations of Navy ports, piers, and established at-sea training and testing areas. Table 3.0-15 shows the historic underway days and distribution of Navy and USCG vessels within the HCTT Study Area from 2016 to 2023. The expansion of the HCTT Study Area would support these proposed activities in areas such as PMSR and the NOCAL Range Complex, where the military has a history of operating.

Table 3.0-15: Past Average Annual Underway Days of Navy and Coast Guard Vessels

Activity Area	Navy Underway Days	USCG Underway Days	Total Navy/USCG Underway Days	Underway Distribution by Range
Hawaii Range Complex	401	55	456	20%
SOCAL Range Complex	1,342	183	1,525	67%
PMSR	90	12	102	5%
NOCAL Range Complex	50	7	57	2%
Transit Corridor	120	16	136	6%
Total	**2,003**	**273**	**2,276**	**100%**

Source: Mintz (2024)

Notes: USCG = U.S. Coast Guard, SOCAL = Southern California Range Complex, PMSR = Point Mugu Sea Range, NOCAL = Northern California Range Complex

In-water devices as discussed in this analysis include unmanned vehicles, such as remotely operated vehicles, unmanned surface vehicles, unmanned underwater vehicles, motorized autonomous targets, and towed devices. These devices are self-propelled and unmanned or towed through the water from a variety of platforms, including helicopters, unmanned underwater vehicles, and surface ships. In-water devices are generally smaller than most Navy vessels, ranging from several inches to about 50 ft. Table 3.0-16 provides a range of in-water devices used. Table 3.0-17 shows the number and location of proposed events that include the use of vessels or in-water devices. For a list of activities by name that include the use of in-water devices, see Appendix B.

Table 3.0-16: Representative Types, Sizes, and Speeds of In-Water Devices

Type	Example(s)	Length	Typical Operating Speed
Towed Device	Minehunting Sonar Systems; Improved Surface Tow Target; Towed Sonar System; MK-103, MK-104 and MK-105 Minesweeping Systems	< 33 ft.	10–40 knots
Medium USV	Long Range USV, Common USV, MK-33 Seaborne Power Target Drone Boat, QST-35A Seaborne Powered Target, Ship Deployable Seaborne Target, Small Waterplane Area Twin Hull, Unmanned Influence Sweep System	< 190 ft.	Variable, up to 50+ knots
Large USV	Research and Development Surface Vessels, Patrol Boats, Ranger, USV, Nomad USV, Mariner, Vanguard USV	200 - 300 ft.	Typical 1–15 knots, sprint 25–50 knots
Unmanned Underwater Vehicle (UUV)	Acoustic Mine Targeting System, Airborne Mine Neutralization System, Archerfish Common Neutralizer, Crawlers, CURV 21, Deep Drone 8000, Deep Submergence Rescue Vehicle, Gliders, Expendable Mobile Anti-Submarine Warfare Training Targets, Magnum Remotely Operated Vehicle, Manned Portables, MK 30 Anti-Submarine Warfare Targets, Remote Multi-Mission Vehicle, Remote Minehunting System, Large Displacement UUV, Extra-Large UUV	< 100 ft.	1–15 knots
Torpedoes	Light-weight and Heavy-weight Torpedoes	< 33 ft.	20–30 knots

Note: ft. = feet, USV = Unmanned Surface Vehicle

Table 3.0-17: Number and Location of Events Including Vessels or In-Water Devices

Activity Area	Annual Training # of Events		Annual Testing # of Events	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Vessels				
Hawaii Study Area	5,319–5,727	5,727	248–387	388
California Study Area	19,094–21,003	21,003	2,284–2,661	2,671
Transit Corridor	71–109	109	0	0
Total	**24,484–26,839**	**26,839**	**2,532–3,048**	**3,059**
In-Water Devices				
Hawaii Study Area	3,237–3,907	3,907	378–450	452
California Study Area	7,888–9,139	9,139	2,571–2933	2,940
Transit Corridor	30–64	64	4–5	5
Total	**11,155–13,110**	**13,110**	**2,953–3,388**	**3,397**

3.0.3.3.4.2 Military Expended Materials

Military expended materials (MEM) that may cause physical disturbance or strike include (1) all sizes of non-explosive practice munitions (Table 3.0-18); (2) fragments from high-explosive munitions (Table 3.0-19); (3) expendable targets (Table 3.0-20); and (4) expended materials other than munitions, such as sonobuoys or torpedo accessories (Table 3.0-21). See Appendix I for more information on the type and quantities of MEM proposed to be used.

For living marine resources in the water column, the discussion of MEM strikes focuses on the potential of a strike at the surface of the water. The effect of materials settling on the bottom is discussed as an alteration of the bottom substrate and associated organisms (e.g., invertebrates and vegetation) or as an impact to cultural resources.

Table 3.0-18: Number and Location of Non-Explosive Practice Munitions Expended During Training and Testing Activities

Activity Area	Annual Training # of Items		Annual Testing # of Items	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Bombs				
Hawaii Study Area	358	358	41–46	46
California Study Area	1,216	1,216	64–69	69
Total	**1,574**	**1,574**	**105–115**	**115**
Flechettes				
California Study Area	0	0	72	72
Total	**0**	**0**	**72**	**72**
Large Caliber Projectiles				
Hawaii Study Area	1,416–1,625	1,625	1,196–3,408	3,408
California Study Area	1,757–1,789	1,789	3,509–4,628	4,628
Transit Corridor	63	63	0	0
Total	**3,236–3,477**	**3,477**	**4,705–8,036**	**8,036**
Large Caliber – Casings Only				
Hawaii Study Area	163–185	185	85–195	195
California Study Area	304–306	306	464–602	602
Transit Corridor	33	33	0	0
Total	**500–524**	**524**	**549–797**	**797**
Medium Caliber Projectiles				
Hawaii Study Area	334,680–364,800	365,600	30,250–33,750	33,750
California Study Area	624,020–745,450	745,450	93,950–118,050	118,050
Transit Corridor	3,900–24,300	24,300	0	0
Total	**962,600–1,134,550**	**1,135,350**	**124,200–151,800**	**151,800**
Medium Caliber – Casings Only				
Hawaii Study Area	5,219–6,674	6,690	730–905	905
California Study Area	14,975–20,463	20,463	3,549–4,754	4,754
Transit Corridor	190–1,227	1,227	0	0
Total	**20,384–28,364**	**28,380**	**4,279–5,659**	**5,659**
Missiles				
Hawaii Study Area	8–22	22	44–51	51
California Study Area	0	0	343–412	412
Total	**8–22**	**22**	**387–463**	**463**

Table 3.0-18: Number and Location of Non-Explosive Practice Munitions Expended During Training and Testing Activities (continued)

Activity Area	Annual Training # of Items		Annual Testing # of Items	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Rockets				
Hawaii Study Area	791–1,001	1,001	46–61	61
California Study Area	1,785–1,925	1,925	554–735	735
Transit Corridor	28	28	0	0
Total	**2,604–2,954**	**2,954**	**600–796**	**796**
Small-Caliber Projectiles				
Hawaii Study Area	2,175,350–2,736,350	2,736,350	1,250	1,250
California Study Area	7,912,343–7,913,342	7,913,342	12,650–15,050	15,050
Transit Corridor	98,849	98,849	0	0
Total	**10,187,541–10,747,542**	**10,747,542**	**13,900–16,300**	**16,300**
Small Caliber – Casings Only				
Hawaii Study Area	439,770–551,970	551,970	250–1,050	1,050
California Study Area	1,722,409–1,742,209	1,742,209	3,331–4,971	4,971
Transit Corridor	19,770	19,770	0	0
Total	**2,181,949–2,313,949**	**2,313,949**	**3,581–6,021**	**6,021**
Torpedoes[1] (Heavyweight)				
Hawaii Study Area	18	18	53–100	100
California Study Area	9	9	40–77	77
Total	**27**	**27**	**93–177**	**177**
Torpedoes[1] (Lightweight)				
Hawaii Study Area	3–6	6	3	3
California Study Area	10–11	11	7–11	11
Total	**13–17**	**17**	**10–14**	**14**

[1]Non-explosive torpedoes are recovered after use.

Table 3.0-19: Number and Location of Explosives that May Result in Fragments Used During Training and Testing Activities

Activity Area	Annual Training # of Items		Annual Testing # of Items	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Airborne Mine Neutralization System (AMNS) Neutralizers[1]				
Hawaii Study Area	16–20	20	216	216
California Study Area	63–70	70	1,106–2,404	2,404
Total	**79–90**	**90**	**1,322–2,620**	**2,620**
Bombs				
Hawaii Study Area	37–39	39	0	0
California Study Area	122–124	124	54	54
Total	**159–163**	**163**	**54**	**54**

Table 3.0-19: Number and Location of Explosives that May Result in Fragments Used During Training and Testing Activities (continued)

Activity Area	Annual Training # of Items		Annual Testing # of Items	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Large-Caliber Projectiles				
Hawaii Study Area	2,824–3,092	3,092	480	480
California Study Area	8,552–8,580	8,580	6,654–9,184	9,184
Transit Corridor	568	568	0	0
Total	**11,972–12,212**	**12,212**	**7,134–9,664**	**9,664**
Medium-Caliber Projectiles				
Hawaii Study Area	13,142–14,625	14,625	125–250	250
California Study Area	21,748–23,978	23,978	17,700	17,700
Transit Corridor	60–400	400	0	0
Total	**34,950–39,003**	**39,003**	**17,825–17,950**	**17,950**
Missiles				
Hawaii Study Area	446–574	574	128–132	132
California Study Area	504–525	525	1,128–1,235	1,235
Transit Corridor	14	14	0	0
Total	**964–1,113**	**1,113**	**1,256–1,367**	**1,367**
Rockets				
Hawaii Study Area	2,290–2,430	2,430	3	3
California Study Area	2,693–2,833	2,833	76–82	82
Total	**4,983–5,263**	**5,263**	**79–85**	**85**
Torpedoes (Heavyweight)				
Hawaii Study Area	6–8	8	0-1	1
California Study Area	1–3	3	1	1
Total	**7–11**	**11**	**1–2**	**2**

[1]AMNS Neutralizers are used during Remotely Operated Vehicle MIW activities.

Table 3.0-20: Number and Location of Targets Expended During Training and Testing Activities

Activity Area	Annual Training # of Targets		Annual Testing # of Targets	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Air Targets – Flare				
Hawaii Study Area	12–14	14	0	0
California Study Area	62	62	0	0
Total	**74–76**	**76**	**0**	**0**
Air Targets – Decoy				
Hawaii Study Area	11–14	14	0	0
California Study Area	61	61	20	20
Total	**72–75**	**75**	**20**	**20**

Table 3.0-20: Number and Location of Targets Expended During Training and Testing Activities (continued)

Activity Area	Annual Training # of Targets		Annual Testing # of Targets	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Air Targets – Unmanned Aircraft System (UAS)				
Hawaii Study Area	8	8	29–40	40
California Study Area	460–535	535	330–474	474
Transit Corridor	5	5	0	0
Total	**473–548**	**548**	**359–514**	**514**
Air Targets – Other				
Hawaii Study Area	15	15	1–2	2
California Study Area	26	26	1	1
Total	**41**	**41**	**2–3**	**3**
Air Targets – Supersonic UAS				
Hawaii Study Area	4	4	11–21	21
Total	**4**	**4**	**139–188**	**188**
Mine Shapes				
Hawaii Study Area	146–153	153	289–427	427
California Study Area	348–490	490	936–988	988
Total	**494–643**	**643**	**1,225–1,415**	**1,415**
Sub-surface Targets (Maneuvering)				
Hawaii Study Area	290–376	376	212–266	266
California Study Area	485–658	658	417–635	635
Transit Corridor	1	1	0	0
Total	**776–1,035**	**1,035**	**629–901**	**901**
Surface Targets – Floating (Large)				
Hawaii Study Area	33–55	55	13–58	58
California Study Area	97–178	178	67–108	108
Transit Corridor	10–27	27		
Total	**140–260**	**260**	**80–166**	**166**
Surface Targets – Floating (Medium)				
Hawaii Study Area	254–276	276	34–61	61
California Study Area	957–1,002	1,002	77–102	102
Transit Corridor	5	5		
Total	**1,216–1,284**	**1,284**	**111–163**	**163**
Surface Targets – Floating (Small)				
Hawaii Study Area	422–537	537	0	0
California Study Area	966–981	981	0	0
Total	**1,388–1,518**	**1,518**	**0**	**0**
Surface Targets – Maneuvering				
Hawaii Study Area	7	7	1–9	9
California Study Area	13	13	14–26	26
Total	**20**	**20**	**15–35**	**35**

Table 3.0-21: Number and Location of Other Military Materials Expended During Training and Testing Activities

Activity Area	Annual Training # of Materials		Annual Testing # of Materials	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Acoustic Countermeasures				
Hawaii Study Area	486–495	495	440–533	533
California Study Area	314–318	318	529–609	609
Transit Corridor	6	6	0	0
Total	**806–819**	**819**	**969–1,142**	**1,142**
AMNS Neutralizers (Non-Explosive)[1]				
Hawaii Study Area	1	1	3–4	4
California Study Area	2–3	3	8	8
Total	**3–4**	**4**	**11–12**	**12**
Anchors – Mine				
Hawaii Study Area	308–383	383	10	10
California Study Area	2,228–3,661	3,661	160	160
Transit Corridor	2	2	0	0
Total	**2,538–4,046**	**4,046**	**170**	**170**
Anchors – Other				
Hawaii Study Area	0	0	367–634	634
California Study Area	0	0	461–761	761
Total	**0**	**0**	**837–1,395**	**1,395**
Anti-Torpedo Torpedo Accessories				
Hawaii Study Area	0	0	72–107	107
California Study Area	0	0	75–107	107
Total	**0**	**0**	**147–214**	**214**
Bottom-Placed Instruments				
Hawaii Study Area	0	0	1	1
California Study Area	0	0	30–44	44
Total	**0**	**0**	**31–45**	**45**
Buoys (Non-Explosive)				
Hawaii Study Area	5	5	19–37	37
California Study Area	2	2	10–28	28
Total	**7**	**7**	**29–65**	**65**
Canisters – Miscellaneous				
Hawaii Study Area	40	40	0	0
California Study Area	40	40	0	0
Total	**80**	**80**	**0**	**0**
Chaff – Air Cartridges				
Hawaii Study Area	780–930	930	1,300–1,464	1,464
California Study Area	4,440–4,590	4,590	3,696–4,055	4,055
Total	**5,220–5,520**	**5,520**	**4,996–5,519**	**5,519**

Table 3.0-21: Number and Location of Other Military Materials Expended During Training and Testing Activities (continued)

Activity Area	Annual Training # of Materials		Annual Testing # of Materials	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Chaff – Ship Cartridges				
Hawaii Study Area	790	790	96–144	144
California Study Area	2,700	2,700	144–192	192
Total	**3,490**	**3,490**	**240–336**	**336**
Chemical/Biological Simulants				
Hawaii Study Area	0	0	0	0
California Study Area	0	0	0–60	60
Total	**0**	**0**	**0–60**	**60**
Decelerators/Parachutes – Extra Large				
Hawaii Study Area	0	0	5–20	20
California Study Area	0	0	106–133	133
Total	**0**	**0**	**111–153**	**153**
Decelerators/Parachutes – Large				
Hawaii Study Area	45–83	83	103–137	137
California Study Area	63	63	779–1,053	1,053
Transit Corridor	17	17	0	0
Total	**125–163**	**163**	**882–1,190**	**1,190**
Decelerators/Parachutes – Medium				
Hawaii Study Area	12–14	14	0	0
California Study Area	62	62	0	0
Total	**74–76**	**76**	**0**	**0**
Decelerators/Parachutes – Small				
Hawaii Study Area	5,621–10,298	10,298	16,927–18,922	18,922
California Study Area	11,494–16,341	16,341	30,152–33,962	33,962
Transit Corridor	184	184	0	0
Total	**17,299–26,823**	**26,823**	**47,079–52,884**	**52,884**
Endcaps – Chaff and Flares				
Hawaii Study Area	6,852–7,424	7,424	2,600–2,854	2,854
California Study Area	11,402–12,032	12,032		
Total	**18,254–19,456**	**19,456**	**12,752–13,798**	**13,798**
Expendable Bathythermographs				
Hawaii Study Area	1,743–2,419	2,419	144–210	210
California Study Area	1,834–3,301	3,301	422–872	872
Transit Corridor	186	186	0	0
Total	**3,763–5,906**	**5,906**	**566–1,082**	**1,082**
Fiber Optic Canister				
Hawaii Study Area	30–36	36	360–372	372
California Study Area	113–126	126	564–576	576
Total	**143–162**	**162**	**924–948**	**948**

Table 3.0-21: Number and Location of Other Military Materials Expended During Training and Testing Activities (continued)

Activity Area	Annual Training # of Materials		Annual Testing # of Materials	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Flares				
Hawaii Study Area	12–14	14	1,300–1,390	1,390
California Study Area	62	62	6,456–6,889	6,889
Total	**74–76**	**76**	**7,756–8,279**	**8,279**
Heavyweight Torpedo Accessories				
Hawaii Study Area	354	354	224–349	349
California Study Are	183–187	187	266–434	434
Total	**537–541**	**541**	**490–783**	**783**
Jet Assist Take Off Bottles				
Hawaii Study Area	2–7	7	63–112	112
California Study Area	26	26	652–718	718
Transit Corridor	6	6	0	0
Total	**34–39**	**39**	**715–830**	**830**
Landers				
Hawaii Study Area	0	0	180–225	225
California Study Area	0	0	180–226	226
Total	**0**	**0**	**360–450**	**450**
Lightweight Torpedo Accessories				
Hawaii Study Area	61–130	130	52–64	64
California Study Area	201–226	226	145–225	225
Transit Corridor	3	3	0	0
Total	**265–359**	**359**	**197–289**	**289**
Marine Markers				
Hawaii Study Area	0-2	2	0	0
California Study Area	5–6	6	0	0
Transit Corridor	3	3	0	0
Total	**9–10**	**10**	**0**	**0**
Sonobuoys (Non-Explosive)				
Hawaii Study Area	5,680–10,289	10,289	17,338–19,380	19,380
California Study Area	11,446–16,267	16,267	30,683–34,673	34,673
Transit Corridor	184	184	0	0
Total	**17,310–26,740**	**26,740**	**48,021–54,053**	**54,053**
Surface Device – Floating (Small)				
Hawaii Study Area	110	110	0	0
California Study Area	580	580	0	0
Total	**690**	**690**	**0**	**0**
Torpedoes				
Hawaii Study Area	0	0	56–105	105
California Study Area	0	0	49–89	89
Total	**0**	**0**	**105–194**	**194**

[1]AMNS Neutralizers are used during Remotely Operated Vehicle MIW activities.

3.0.3.3.4.3 Seafloor Devices

Seafloor devices represent non-explosive items used during military readiness activities that are deployed onto the seafloor and typically recovered. Recovery could be immediate or after a prolonged time, depending on the device's need for maintenance or removal. These items include moored mine shapes, recoverable anchors, bottom-placed instruments, temporary and permanent bottom cable arrays, energy harvesting devices, and robotic vehicles referred to as "crawlers." Bottom-placed instruments usually include an anchor which may be expended while recovering the instrument. Seafloor devices are either stationary or move very slowly along the bottom and do not pose a threat to highly mobile organisms when in place; however, during the deployment process, they may pose a physical disturbance or strike risk. The effect of devices on the bottom is discussed as an alteration of the bottom substrate and associated living resources (e.g., invertebrates and vegetation) and as a strike risk to cultural resources. Permanent bottom cable arrays and mine/temporary instrument anchors associated with modernization and sustainment of ranges are not recovered.

Table 3.0-22 shows the number and location of proposed events that include the use of seafloor devices.

Table 3.0-22: Number and Location of Events Including Seafloor Devices

Activity Area	Annual # of Training Events		Annual # of Testing Events	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Hawaii Study Area	660–729	729	364–446	446
California Study Area	4,618–5,182	5,182	767–966	966
Transit Corridor	1	1	4–5	5
Total	**5,279–5,912**	**5,912**	**1,135–1,417**	**1,417**

3.0.3.3.4.4 Aircraft

Aircraft involved in military training and testing activities are separated into three categories: (1) fixed-wing aircraft, (2) rotary-wing aircraft, and (3) unmanned aircraft systems (UASs). Fixed-wing aircraft include, but are not limited to, planes such as F-35, P-8, F/A-18, and E/A-18G. Rotary-wing aircraft are also referred to as helicopters (e.g., MH-60) and tilt-rotor aircraft. UASs include a variety of platforms, including but not limited to, the Small Tactical UAS – Tier II, Triton UAS, Fire Scout Vertical Take-off and Landing UAS, and the MQ-25 Stingray Carrier Based UAS. The locations of Navy aircraft usage for training and testing activities depend on the locations of military air stations and established training and testing areas. The expansion of the HCTT Study Area would support these proposed activities in areas such as PMSR and the NOCAL Range Complex, where the Navy has a history of operating. These areas have not appreciably changed in decades and are not expected to change in the foreseeable future.

Table 3.0-23 shows the number and location of proposed events that include the use of aircraft.

Table 3.0-23: Number and Location of Events Including Aircraft

Activity Area	Annual # of Training Events		Annual # of Testing Events	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Hawaii Study Area	4,650–5,174	5,174	481–544	544
California Study Area	18,754–20,211	20,211	2,677–2,896	2,896
Transit Corridor	4	4	0	0
Total	**23,408–25,389**	**25,389**	**3,158–3,440**	**3,440**

3.0.3.3.5 Entanglement Stressors

This section describes the entanglement stressors introduced into the water from the Proposed Action, the relative magnitude and location of these activities, and provides the basis for analysis of potential impacts on resources in the remainder of Chapter 3. To assess the entanglement risk of materials expended during military readiness activities, the characteristics of these items (e.g., size and rigidity) was examined for their potential to entangle marine animals. For a constituent of MEM to entangle a marine animal, the item must be flexible enough to wrap around the animal or appendages or be trapped in the jaw or baleen. This analysis includes the potential impacts from three types of entanglement risks: (1) wires and cables, (2) nets, and (3) decelerators/parachutes. Except for nets, which are used rarely during some testing activities, the Action Proponents' equipment is not designed for trapping or entanglement purposes.

3.0.3.3.5.1 Wires, Cables, and Nets

The varieties of expended wires, cables, and nets includes fiber optic cables, guidance wires, and sonobuoy wires (including bathythermograph wires). During some proposed military readiness activities, the Navy may temporarily install and remove or expend different types of wires and cables. Temporary installations could include arrays or mooring lines attached to the seafloor or to surface buoys or vessels. Because these wires and cables are generally taut while in use, and then are later recovered, they are not considered an entanglement risk to marine species. During modernization and sustainment of ranges activities cables and sensors are installed on the seafloor and are therefore not considered an entanglement risk, but could be a risk of disturbing cultural resources.

As part of Extra Large Unmanned Underwater Vehicle (XLUUV) testing, scenarios would be developed to create subsurface obstacle avoidance interactions and would be recovered at the end of the test. Nets are anticipated to be a maximum size of 300-ft. wide and 100-ft. deep, with a 1-in. mesh. Net deployment and retrieval are estimated to take approximately 30 minutes. Nets would only be used during daylight hours and individual net deployment scenarios would occur over the course of a 48-hour window. Nets would be connected to and constantly monitored by the support vessels, which would hold static nets in place and move nets depending on the testing activity.

Table 3.0-24 shows the number and location of wires, cables, and nets expended during proposed training and testing activities.

Table 3.0-24: Number and Location of Wires, Cables, and Nets Expended During Training and Testing Activities

Activity Area	Annual # of Training Materials		Annual # of Testing Materials	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Expendable Bathythermograph Wires				
Hawaii Study Area	1,743–2,419	2,419	144–210	210
California Study Area	1,834–3,301	3,301	422–872	872
Transit Corridor	186	186	0	0
Total	**3,763–5,906**	**5,906**	**566–1,082**	**1,082**
Fiber Optic Cables				
Hawaii Study Area	30–36	36	360–372	372
California Study Area	113–126	126	564–576	576
Total	**143–162**	**162**	**924–948**	**948**

Table 3.0-24: Number and Location of Wires, Cables, and Nets Expended During Training and Testing Activities (continued)

Activity Area	Annual # of Training Materials		Annual # of Testing Materials	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Guidance Wires				
Hawaii Study Area	354	354	224–349	349
California Study Area	183–187	187	266–434	434
Total	**537–541**	**541**	**490–783**	**783**
Sonobuoy Wires				
Hawaii Study Area	5,674–10,282	10,282	17,279–19,297	19,297
California Study Area	11,437–16,259	16,259	30,602–34,456	34,456
Total	**17,292–26,722**	**26,722**	**47,881–53,753**	**53,753**
Nets				
California Study Area	0	0	40	40
Total	**0**	**0**	**40**	**40**

3.0.3.3.5.2 Decelerators/Parachutes

Decelerators/parachutes used during training and testing activities are classified into four different categories based on size: small, medium, large, and extra-large (Table 3.0-25). Both small- and medium-sized decelerators/parachutes are made of cloth and nylon, many with weights attached to their short attachment lines to speed their sinking. At water impact, the decelerator/parachute assembly is expended and sinks away from the unit. The decelerator/parachute assembly may remain at the surface for 5–15 seconds before the decelerator/parachute and its housing sink to the seafloor, where it becomes flattened (Environmental Sciences Group, 2005). Once settled on the bottom the canopy may temporarily billow if bottom currents are present.

Table 3.0-25: Size Categories for Decelerators/Parachutes Expended During Training and Testing Events

Size Category	Diameter (feet)	Associated Activity
Small	1.5–6	Air-launched sonobuoys, lightweight torpedoes, and unmanned aircraft systems (UASs) (drag decelerator/parachute)
Medium	19	Illumination flares
Large	30–50	UASs (main decelerator/parachute)
Extra-large	82	UASs (main decelerator/parachute)

Large and extra-large decelerators/parachutes are also made of cloth and nylon, with suspension lines of varying lengths (large: 40–70 ft. in length [with up to 28 lines per decelerator/parachute]; extra-large: 82 ft. in length [with up to 64 lines per decelerator/parachute]). Some aerial targets also use a small drag parachute (6 ft. in diameter) to slow their forward momentum prior to deploying the larger primary decelerator/parachute. Unlike the small- and medium-sized decelerators/parachutes, UAS decelerators/parachutes do not have weights attached and may remain at the surface or suspended in the water column for some time prior to eventual settlement on the seafloor.

Table 3.0-21 shows the number and location of decelerator/parachutes expended during proposed training and testing activities.

3.0.3.3.6 Ingestion Stressors

This section describes the ingestion stressors introduced into the water through military training and testing and the relative magnitude and location of these activities in order to provide the basis for analysis of potential impacts on resources in the remainder of Chapter 3. To assess the ingestion risk of materials expended during training and testing, the Navy examined the characteristics of these items (such as buoyancy and size) for their potential to be ingested by marine animals in the Study Area. The Navy expends the following types of materials that could become ingestion stressors during training and testing in the Study Area: non-explosive practice munitions (small- and medium-caliber), fragments from high-explosive munitions, and MEM other than munitions (fragments from targets, chaff, flare casings, plastic end caps, pistons, and some decelerators/parachutes. Other MEM such as targets, large-caliber projectiles, intact training and testing bombs, guidance wires, empty 55-gallon drums (used as targets), sonobuoy tubes, and marine markers are too large for marine organisms to consume and are eliminated from further discussion regarding ingestion.

Solid metal materials, such as small-caliber projectiles or fragments from high-explosive munitions, sink rapidly to the seafloor. Lighter plastic items may be caught in currents and gyres or entangled in floating kelp and could remain in the water column for hours to weeks or indefinitely before sinking (e.g., plastic end caps [from chaff cartridges] or plastic pistons [from flare cartridges]).

3.0.3.3.6.1 Non-Explosive Practice Munitions

Small- and medium-caliber projectiles include all sizes up to and including those that are 2.25 in. in diameter. Flechettes from some non-explosive rockets are approximately 2 in. in length. Each non-explosive flechette rocket contains approximately 1,180 individual flechettes that are released. These solid metal materials would quickly move through the water column and settle to the seafloor. Table 3.0-18 shows the number and location of non-explosive practice munitions used during proposed training and testing activities.

3.0.3.3.6.2 Fragments from High-Explosive Munitions

Many different types of high-explosive munitions can result in fragments that are expended at sea during training and testing activities.

Types of high-explosive munitions that can result in fragments include torpedoes, neutralizers, grenades, projectiles, missiles, rockets, buoys, sonobuoys, anti-torpedo countermeasures, mines, and bombs. Fragments would result from fractures in the munitions casing and would vary in size depending on the size of the net explosive weight and munition type; typical sizes of fragments are unknown.

Table 3.0-19 shows the number and location of explosives used during training and testing activities that may result in fragments.

3.0.3.3.6.3 Military Expended Materials

Several different types of other materials are expended at sea during training and testing activities.

Table 3.0-26 shows the number and location of targets used during proposed training and testing activities that may result in fragments. Table 3.0-21 shows the number and location of chaff, flares, chaff/flare components, and small-size decelerators/parachutes expended during proposed training and testing activities.

Table 3.0-26: Number and Location of Targets Expended During Training and Testing Activities That May Result in Fragments

Activity Area	Annual # of Training Targets		Annual # of Testing Targets	
	Alternative 1	Alternative 2	Alternative 1	Alternative 2
Air Targets				
Hawaii Study Area	203–229	229	28	28
California Study Area	392–417	417	354–498	498
Transit Corridor	5	5	0	0
Total	**600–651**	**651**	**382–526**	**526**
Mine Shapes				
Hawaii Study Area	6	6	173	173
California Study Area	20–22	22	270–302	302
Transit Corridor	1	1	0	0
Total	**27–29**	**29**	**443–475**	**475**
Surface Targets				
Hawaii Study Area	190–228	228	22–23	23
California Study Area	449–545	545	94–125	125
Transit Corridor	7–24	24	0	0
Total	**646–797**	**797**	**116–148**	**148**

3.0.4 Standard Operating Procedures

For military readiness activities to be effective, personnel must be able to safely use their sensors, platforms, weapons, and other devices to their optimum capabilities and as intended for use in missions and combat operations. The Action Proponents have developed standard operating procedures through decades of experience to provide for safety and mission success. Because they are essential to safety and mission success, standard operating procedures are part of the Proposed Action and are considered in the Chapter 3 environmental analysis for applicable resources. Standard operating procedures recognized as providing a benefit to public safety or environmental resources are described in Table 3.0-27.

Table 3.0-27: Standard Operating Procedures

Procedure Focus	Procedure Description	Benefit
Airspace and sea space deconfliction	• Temporary Notices to Airmen or Local Notices to Mariners to alert the public to stay clear of the area based on event locations and the activities involved. • Some locations, such as those where explosive bombing activities routinely occur, have a standing Local Notice to Mariners.	Deconfliction also allows for safe separation from non-participants within established commercial air traffic routes, commercial shipping lanes, and areas used for recreational activities.
Safety distances applied to all hazardous activities	• Safe distances from divers during active sonar and in-water explosives based on U.S. Navy Dive Manual (U.S. Department of the Navy, 2016b). • Safety distances for the use of electromagnetic energy are specified in Department of Defense Instruction 6055.11 (U.S. Department of Defense, 2021) and Military Standard 464D (U.S. Department of Defense, 2020) as the standard safety buffers for in-water energy to protect military divers.	Ensures that explosives and sonar activities are conducted well clear of divers.
Laser safety	• Laser systems are approved for fielding by the Action Proponents' Laser Safety Review Board or equivalent. • The approval process includes adding procedural requirements to ensure public safety. • Only properly trained and authorized personnel operate high-energy lasers within designated areas.	Reduces the risk of inadvertently exposing people or marine resources to high-energy lasers.
In-water explosive safety	• In-water explosive activities are scheduled to occur in areas located away from popular recreational dive sites, primarily for human safety. • Most explosive events are conducted during daylight hours. • Weapon firing activities that involve small boats deploying or retrieving targets are typically conducted in Beaufort Sea state number 4 conditions or better to ensure safe operating conditions for the small boat operators.	Greater visibility around the detonation site reduces the risk of endangering people or marine species during in-water explosives detonations.

Table 3.0-27: Standard Operating Procedures (continued)

Procedure Focus	Procedure Description	Benefit
Cable installation	• Prior to in-water construction, the Navy would issue a Notice to Mariners alerting boaters to avoid areas of installation activity. • Vessels engaged in installation would contain sorbent booms and pads for use in the unlikely event of a fuel spill, and would adhere to all Navy and Coast Guard requirements regarding the containment, cleanup, and reporting of spills. • To prevent any potential impacts to abalone during cable anchoring activities in the Southern California Range Complex, divers would not place an anchor or the cable between the anchors within 3 ft. of any abalone species. • Any lighting associated with the Proposed Action would be directed downward to minimize the illumination of surrounding areas.	Helps deconflict inadvertent vessel interactions to enhance safety and minimize work stoppage. Reduces harm to the marine environment in the unlikely event of a fuel spill by cable-laying vessels. Reduces potential for harm to abalone species. Downward facing lighting reduces effects to marine birds that could be in the vicinity.
Invasive species	• All physical contact and disturbance to the benthos and any invasive species present shall be prevented whenever possible. • Any equipment, gear, or material used in water with known invasive species, shall be dried for 48 hours before moving to an uncontaminated area. • No movement/removal of benthos substrate, water, or invasive species itself from a known invasive species infested area to an uncontaminated area shall take place. Any removal of substrate or invasive species shall be properly disposed of so that it cannot spread to uncontaminated areas. • In-water equipment will be locally sourced thus reducing the risk of introducing non-native species. If any equipment must be brought to the project site from outside the Hawaiian Islands region, then the appropriate prevention measures (e.g., wash-down or	Prevents and/or minimizes the risk of invasive species introductions and spread.

Table 3.0-27: Standard Operating Procedures (continued)

Procedure Focus	Procedure Description	Benefit
	hull cleaning triple flush procedures) will be included in the work plan. • Ballast water exchange during Military Readiness activities will comply with the Navy's Environmental Readiness Program Manual (OPNAV M-5090.1). • Military Readiness activities will be consistent with installation INRMPs designed to ensure, to the maximum extent possible, aquatic invasive species are not introduced into near-shore environments or bodies of water on or adjacent to the installation (OPNAV M-5090.1). • For the California Study Area, the Navy will comply, to the maximum extent possible, with the National Oceanic and Atmospheric Administration Caulerpa Control Protocol (National Marine Fisheries Service, 2021). • All Navy and USCG vessels undergo routine inspections and periodic hull cleanings. • Prior to entering port, Navy and USCG vessels undergo inspections as part of the ships' pest control program.	
Visibility requirements during aircraft activities	• Aircrew are not authorized to deploy ordnance through extensive cloud cover where visual clearance for non-participants is not possible. The two exceptions to this requirement are (1) when operating in the open ocean, clearance for non-participating aircraft and vessels through radar surveillance is acceptable; and (2) when the officer conducting the exercise or civilian equivalent accepts responsibility for the safeguarding of airborne and surface traffic.	Enables aircrews to visually clear the target area of any people or marine species prior to ordnance release.
Bird avoidance	• Aircrew make every attempt to avoid large flocks of birds to reduce the safety risk involved with a potential bird strike. Since 2011, the Navy has required that all Navy flying units report all bird strikes through the	Reduces the risk of aircraft bird strikes.

Table 3.0-27: Standard Operating Procedures (continued)

Procedure Focus	Procedure Description	Benefit
	Web-Enabled Safety System Aviation Mishap and Hazard Reporting System.	
Aircraft sonic booms	• As a general policy for aircraft, aircrew do not intentionally generate sonic booms below 30,000 ft. of altitude unless over water and more than 30 miles from inhabited land areas or islands.	Reduces noise impacts on civilian personnel and property.
Additional aircraft procedures	• Aircraft will fly in accordance with Federal Aviation Administration Regulations (Part 91, General Operating and Flight Rules, Annex 2 Rules of the Air to the Convention of International Civil Aviation) or with due regard for the safety of all air traffic, which govern such flight components as operating near other aircraft, right-of-way rules, aircraft speed, and minimum safe altitudes. These rules include the use of tactical training and maintenance test-flight areas, arrival and departure routes, and airspace restrictions as appropriate to help control air operations. • Unmanned aircraft systems are operated in accordance with Federal Aviation Administration air traffic organization policy.	Improves safety during all training and testing activities involving aircraft.
Safe vessel operation	• Vessels are required to operate in accordance with applicable navigation rules, including Inland Waters Navigation Rules (33 Code of Federal Regulations section 83.01 et seq.) and International Regulations for Preventing Collisions at Sea (72 COLREGS). These rules and regulations were formalized in the Convention on the International Regulations for Preventing Collisions at Sea (1972) and implemented through the International Navigational Rules Act of 1977 (33 United States Code sections 1601–1608). Applicable navigation requirements specified in the Inland Navigation Rules include, but are not limited to, Rule 5 (Lookouts) and Rule 6 (Safe Speed). These rules require	These procedures ensure that all Navy and Coast Guard vessels operate consistently with civilian and commercial vessels, which reduce potential conflicts between underway vessels. Reduced speeds also allow Navy and Coast Guard vessels to see and avoid marine species more easily.

Table 3.0-27: Standard Operating Procedures (continued)

Procedure Focus	Procedure Description	Benefit
	that vessels, at all times, proceed at a safe speed so proper and effective action can be taken to avoid collision and so vessels can be stopped within a distance appropriate to the prevailing circumstances and conditions. • Surface ships transit at speeds that are optimal for fuel conservation, to maintain ship schedules, and to meet mission requirements. Vessel captains use the totality of the circumstances to ensure the vessel is traveling at appropriate speeds in accordance with navigation rules. Depending on the circumstances, this may involve adjusting speeds during periods of reduced visibility or in certain locations. • The Action Proponents also avoid known navigation hazards that appear on nautical charts, such as submerged wrecks and obstructions. • With limited exceptions (e.g., amphibious vessels operating in designated locations, bottom-crawling vehicles), manned vessels and unmanned vehicles avoid contact with the seafloor as a standard collision avoidance procedure to prevent damage to the platforms.	
Lookouts	• Lookouts may be positioned on surface vessels, aircraft, piers, or the shore. • Lookouts positioned on U.S. Navy surface vessels (including surfaced submarines) will be solely dedicated to visually observing their assigned sectors. Lookouts on vessels with limited crew may fulfill additional duties. For example, a Lookout on a small boat may also be responsible for navigation or personnel supervision. • Underway surface ships operated by or for the Action Proponents have personnel assigned to stand watch at	Lookouts monitor their assigned sectors for any indication of danger to the ship and the personnel on board, such as a floating or partially submerged object or piece of debris, periscope, surfaced submarine, wisp of smoke, flash of light, or surface disturbance. As a standard collision avoidance procedure for surface vessels, Lookouts also monitor for marine mammals that have the potential to be in the direct path of the vessel.

Table 3.0-27: Standard Operating Procedures (continued)

Procedure Focus	Procedure Description	Benefit
	all times (day and night) for safety of navigation, collision avoidance, range clearance, and man-overboard precautions. • Personnel on underway small boats (e.g., crewmembers responsible for navigation) fulfill similar watch standing responsibilities to those positioned on surface ships. Standard watch personnel, also referred to as "Lookouts," include officers, enlisted personnel, and civilians operating in similar capacities. • Following two ship collisions in 2017 that killed 17 Sailors, the Action Proponents undertook a review of surface ship staffing, training, and personnel effectiveness. As a result, the Action Proponents added additional Lookouts to Navy watch teams for certain surface ship classes, increased the amount of time that Lookouts spend in bridge simulators, and developed watch rotations that align with the body's natural circadian rhythms. Personnel are trained in accordance with the U.S. Navy Lookout Training Handbook or equivalent to use correct scanning procedures while monitoring assigned sectors, to estimate the relative bearing, range, position angle, and target angle of sighted objects, and to rapidly communicated accurate sighting reports. The handbook was updated in 2022 to include a more robust chapter on environmental compliance, mitigation, and marine species observation tools and techniques (NAVEDTRA 12968-E). Watch teams may use radios to communicate with other ships operating in the vicinity to coordinate safe maneuvering. After sunset and prior to sunrise, Lookouts employ night visual search techniques, which could include the use of night vision devices. • A Lookout in an aircraft is typically an existing crewmember such as a pilot or Flight Officer whose	

Table 3.0-27: Standard Operating Procedures (continued)

Procedure Focus	Procedure Description	Benefit
	primary duty is navigation or other mission-essential tasks.	
Pile driving	• Due to pile driving system design and operation, the Navy performs soft starts during impact installation of each pile to ensure proper operation of the diesel impact hammer. During a soft start, the Navy performs an initial set of strikes (three, three-blow sets) from the impact hammer at reduced energy before it can be operated at full power and speed. Each three-blow set will be separated by at least 30 seconds. The energy reduction of an individual hammer cannot be quantified because it varies by individual driver.	This standard operating procedure benefits marine mammals, sea turtles, and fish because soft starts may "warn" these resources and cause them to move away from the sound source before impact pile driving increases to full operating capacity.
Unmanned vehicle procedures	• Unmanned surface vehicles or unmanned underwater vehicles that operate autonomously may have embedded sensors designed for avoidance of large objects. For example, select unmanned vehicles have sensors, such as a forward-looking sonar (FLS), to perform obstacle avoidance. The FLS makes detections at a sufficient range for the onboard processor to determine if there is a need for an avoidance maneuver. If there is a need for an avoidance maneuver, the onboard vehicle control system would insert a new maneuver (in place of the currently executing activity) and continue to introduce new maneuvers if detections continue to be made. There are a number of possible maneuvers that could be implemented, from adjusting heading to stopping or hovering the vehicle. • As an additional standard collision avoidance procedure during specific stages of training or testing (e.g., during an initial training and testing phases), manned support vessels may escort unmanned surface vehicles and unmanned underwater vehicles. Lookouts	Reduces the risk of an unmanned vehicle striking a civilian or commercial vessel or a marine species.

Table 3.0-27: Standard Operating Procedures (continued)

Procedure Focus	Procedure Description	Benefit
	on the support vessels may use radios to communicate with other vessels operating in the vicinity to coordinate safe maneuvering (e.g., communicating the positioning and safety distances for avoiding collisions with unmanned vehicles). • As a standard collision avoidance procedure for in-water devices towed by surface vessels (or by unmanned surface vehicles or unmanned underwater vehicles under positive control by manned support vessels), the Navy searches the intended path of the towed in-water device for floating debris, concentrations of floating vegetation, floating objects, or animals with potential to obstruct, tangle, or damage the device.	

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3.1 Air Quality and Climate Change

AIR QUALITY AND CLIMATE CHANGE SYNOPSIS

The Action Proponents considered the stressors to air quality and climate change that could result from the action alternatives within the Study Area. The following conclusions have been reached for the Preferred Alternative (Alternative 1):

Air Quality

- The effects on air quality from implementation of the Preferred Alternative would be less than significant.
- Criteria Air Pollutants: The increase in emissions of criteria pollutants resulting from activities in the Study Area would not cause a violation or contribute to an ongoing violation of the National or state Ambient Air Quality Standards.
- Hazardous Air Pollutants (HAP): Mobile sources would emit negligible amounts of hazardous air pollutants intermittently over a large area. The increase in HAP emissions is not expected to contribute to human health risks from HAP exposure in areas where public presence is expected.

Climate Change

Greenhouse Gases: While greenhouse gas emissions generated by military readiness activities alone would not be enough to cause global warming, in combination with past and future emissions from all other sources, they would contribute incrementally to the global warming that produces the adverse effects of climate change.

3.1.1 Introduction

This section describes the air quality in the Study Area and analyzes the potential effects of the proposed military readiness activities on this resource area. It also presents greenhouse gas (GHG) emissions that could result from the implementation of the action alternatives within the Study Area. Appendix G of this EIS/OEIS contains supplemental information for the air quality and GHG emissions analysis.

3.1.2 Clean Air Act

Congress passed the Clean Air Act (CAA) in 1970 and its amendments in 1977 and 1990 to improve air quality and reduce air pollution, set regulatory limits on air pollutants, and ensure basic health and environmental protection from air pollution. The CAA applies to U.S. land mass and coastal waters within 3 NM of shore.

3.1.2.1 Criteria Pollutants and Ambient Air Quality Standards

Under the CAA, the U.S. Environmental Protection Agency (USEPA) establishes National Ambient Air Quality Standards (NAAQS) to protect public health and welfare. NAAQS that have been established for the following six major pollutants of concern are called “criteria pollutants”: carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), and particulate matter (with an aerodynamic size less than or equal to 10 microns [PM_{10}] and with an aerodynamic size less than or equal to 2.5 microns [$PM_{2.5}$]).

Criteria air pollutants are classified as either primary or secondary pollutants based on how they are formed in the atmosphere. Primary air pollutants are emitted directly into the atmosphere from the source of the pollutant. Secondary air pollutants are those formed through atmospheric chemical reactions that usually involve primary air pollutants (or pollutant precursors) and normal constituents of the atmosphere. For example, ozone is a secondary pollutant that is formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors (volatile organic compounds, nitrogen oxides [NO_x], and suspended PM_{10}). Some criteria air pollutants, including PM_{10} and $PM_{2.5}$, are a combination of primary and secondary pollutants.

Areas that exceed a standard are designated as "nonattainment" for that pollutant, while areas that meet a standard are in "attainment" for that pollutant. An area may be nonattainment for some pollutants and attainment for others simultaneously. Areas classified as attainment, after being designated as nonattainment, may be reclassified as maintenance areas subject to maintenance plans showing how the area will continue to meet federal air quality standards. Nonattainment areas for some criteria pollutants are further classified, depending upon the severity of their air quality problem. Classifications include marginal, moderate, serious, severe, and extreme.

The CAA sections 111 and 112 allow USEPA to transfer primary implementation and enforcement authority for most of the federal standards to state, local, or tribal regulatory agencies. These agencies' authority to implement the CAA requirements is through USEPA-approved State Implementation Plans (SIPs), such as in most California Air Districts; Tribal Implementation Plan; or by delegation, such as in State of Hawaii's Prevention of Significant Deterioration (PSD) authority to issue PSD permits.

States may establish ambient air quality standards (AAQS) more stringent than the NAAQS. Table 3.1-1 presents the National and state AAQS.

Table 3.1-1: National and State Ambient Air Quality Standards

Pollutant	Averaging Time	NAAQS		California AAQS[(1)]	Hawaii AAQS
		Primary	Secondary	Concentration	Concentration
CO	8-Hour	9 ppm (10 mg/m^3)	-	9.0 ppm (10 mg/m^3)	5 mg/m^3 (4.4 ppm)
	1-Hour	35 ppm (40 mg/m^3)		20 ppm (23 mg/m^3)	10 mg/m^3 (9 ppm)
Pb	30-Day Average	-	-	1.5 $\mu g/m^3$	-
	Calendar Quarter	-	-	-	1.5 $\mu g/m^3$
	3-Month Rolling Average	0.15 $\mu g/m^3$	0.15 $\mu g/m^3$	-	-
NO_2	Annual Average	0.053 ppm (100 $\mu g/m^3$)	0.053 ppm (100 $\mu g/m^3$)	0.030 ppm (57 $\mu g/m^3$)	70 $\mu g/m^3$ (0.04 ppm)
	1-Hour	0.100 ppm (188 $\mu g/m^3$)	-	0.18 ppm (339 $\mu g/m^3$)	-
O_3	1-Hour	-		0.09 ppm (180 $\mu g/m^3$)	-
	8-Hour	0.070 ppm[(2)]	Same as Primary Standard	0.070 ppm (137 $\mu g/m^3$)	157 $\mu g/m^3$ (0.08 ppm)
SO_2	Annual Arithmetic Mean	-	-	-	80 $\mu g/m^3$ (0.03 ppm)
	24-Hour	-	-	0.04 ppm (105 $\mu g/m^3$)	365 $\mu g/m^3$ (0.14 ppm)
	3-Hour	-	1300 $\mu g/m^3$ (0.5 ppm)	-	1,300 $\mu g/m^3$ (0.5 ppm)
	1-Hour	75 ppb (196 $\mu g/m^3$)	-	0.25 ppm (655 $\mu g/m^3$)	-

Table 3.1-1: National and State Ambient Air Quality Standards (continued)

Pollutant	Averaging Time	NAAQS		California AAQS(1)	Hawaii AAQS
		Primary	Secondary	Concentration	Concentration
PM_{10}	24-Hour	150 µg/m^3	150 µg/m^3	50 µg/m^3	150 µg/m^3
	Annual Arithmetic Mean	-	-	20 µg/m^3	50 µg/m^3
$PM_{2.5}$	24-Hour	35 µg/m^3	35 µg/m^3	-	-
	Annual Arithmetic Mean	9 µg/m^3	15 µg/m^3	12 µg/m^3	-
Hydrogen Sulfide	1-Hour	-		0.03 ppm (42 µg/m^3)	35 µg/m^3 (25 ppb)
Sulfates	24-Hour			25 µg/m^3	-
Visibility Reducing Particles	8-Hour			In sufficient amount to produce an extinction coefficient of 0.23 per km due to particles.	-
Vinyl chloride	24-Hour			0.01 ppm (26 µg/m^3)	-

Sources: (U.S. Environmental Protection Agency, 2024f), last updated February 7, 2024. (California Air Resources Board, 2024); (State of Hawaii Department of Health, 2015)

(1) California standards for ozone, carbon monoxide (except 8-hour Lake Tahoe), sulfur dioxide (1 and 24 hour), nitrogen dioxide, and particulate matter (PM_{10}, $PM_{2.5}$, and visibility reducing particles), are values that are not to be exceeded. All others are not to be equaled or exceeded. California ambient air quality standards are listed in the Table of Standards in Section 70200 of Title 17 of the California Code of Regulations.

(2) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O_3 standards are not revoked and remain in effect for designated areas. Additionally, some areas may have certain continuing implementation obligations under the prior revoked 1-hour (1979) and 8-hour (1997) O3 standards.

3.1.2.2 General Conformity Rule

Section 176(c)(1) of the CAA, commonly known as the General Conformity Rule, requires federal agencies to ensure that their actions conform to applicable implementation plans for achieving and maintaining the NAAQS for criteria pollutants for nonattainment and maintenance areas. General Conformity Rule applies to federal activities on U.S. land mass and coastal waters within 3 NM of shore. Federal actions are required to conform with the approved State Implementation Plan for those areas of the U.S. designated as nonattainment or maintenance areas for any criteria air pollutants and/or their precursors under the CAA (40 CFR Parts 51 and 93 Subpart B). The purpose of the General Conformity Rule is to ensure that applicable federal activities do not cause or contribute to new violations of the NAAQS, do not worsen existing violations of the NAAQS, and attainment of the NAAQS is not delayed.

A conformity evaluation must be completed for every applicable federal action that generates emissions in a nonattainment or maintenance area to determine and document whether a proposed action complies with the General Conformity Rule.

3.1.2.3 Hazardous Air Pollutants

In addition to the six criteria pollutants, the USEPA currently designates 188 substances as HAPs under the federal CAA. HAPs are air pollutants known or suspected to cause cancer or other serious health effects, or adverse environmental and ecological effects (U.S. Environmental Protection Agency, 2024e). HAP emissions are typically one or more orders of magnitude smaller than concurrent emissions of criteria air pollutants. NAAQS are not established for these pollutants; however, the USEPA has developed National Emissions Standards for Hazardous Air Pollutants (40 CFR parts 61 and 63) that limit emissions of HAPs from specific stationary sources and Mobile Source Air Toxics rules that reduce HAPs emitted by mobile sources, such as cars and trucks. These emissions control standards are intended to achieve the maximum degree of reduction in emissions of the HAPs, taking into consideration the cost of emissions control, non-air-quality health and environmental effects, and energy requirements. To assess risk from exposure to toxics, USEPA has tabulated long-term (chronic) and short-term (acute) dose-response assessments that could be used for risk assessments of hazardous air pollutants (U.S. Environmental Protection Agency, 2024b).

3.1.3 California Ambient Air Quality Standards and Toxic Air Contaminants

The State of California has identified four additional pollutants for ambient air quality standards: visibility-reducing particles, sulfates, hydrogen sulfide, and vinyl chloride. As shown in Table 3.1-1, the California Air Resources Board has also established the more stringent California AAQS. These additional pollutants are not analyzed in this EIS because they are not anticipated to be emitted by any emission source from the Proposed Action.

Section 39655 of the California Health and Safety Code defines a toxic air contaminant (TAC) as "an air pollutant which may cause or contribute to an increase in mortality or an increase in serious illness, or which may pose a present or potential hazard to human health." The California Air Resources Board has formally identified over 200 substances and groups of substances as TACs, including Particulate Emissions from Diesel-Fueled Engines (Diesel PM). In addition, federal HAPs are considered TACs in California under the air toxics program pursuant to section 39657 (b) of the California Health and Safety Code.

3.1.4 Hawaii Ambient Air Quality Standards

As shown in Table 3.1-1, the State of Hawaii has also established AAQS for the six criteria pollutants and a state standard for hydrogen sulfide. Hydrogen sulfide was not analyzed in this EIS because it is not emitted by any emission source from the Proposed Action.

3.1.5 Greenhouse Gases

The USEPA specifically identified carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride as GHGs (U.S. Environmental Protection Agency, 2009a) (74 FR 66496). These gases influence global climate by trapping heat in the atmosphere that would otherwise escape to space. Increased concentrations of these gases due to human activities is the primary cause of global warming observed over the last 70 years and contributes significantly to climate change (National Resource Council, 2020). GHGs have varying global warming potential (GWP). GWP is a measure of how much energy the emissions of 1 ton of a gas absorb over a given period of time (usually 100 years), relative to the emissions of 1 ton of CO_2 (U.S. Environmental Protection Agency, 2024g). The reference gas for GWP is CO_2; therefore, CO_2 has a GWP of 1. Other common GHGs that result from human activity include CH_4, which is estimated to have a GWP of 27–30 over 100 years; N_2O, which has a GWP of 273. CO_2; and to a lesser extent, CH_4 and N_2O, which are generated from stationary combustion sources as well as vehicles, aircraft, and vessels. High GWP gases include GHGs that are used in refrigeration/cooling systems, such as chlorofluorocarbons and hydrofluorocarbons.

Currently, there are no regulatory thresholds of significance for GHG emissions; however, the CEQ has released interim guidance on when and how federal agencies should consider GHG emissions and climate change in NEPA analyses (Council on Environmental Quality, 2023). The guidance emphasizes that when conducting climate change analyses in NEPA reviews, agencies should consider the following: (1) the potential effects of a proposed action on climate change, including by assessing both GHG emissions and reductions from the proposed action; and (2) the effects of climate change on a proposed action and its environmental effects.

The guidance states that federal agencies should quantify the reasonably foreseeable direct and indirect GHG emissions of their proposed actions and reasonable alternatives (as well as the No Action Alternative). The guidance also recommends that agencies provide additional context for GHG emissions. (Council on Environmental Quality, 2023).

3.1.6 EO 12114 – Environmental Effects Abroad of Major Federal Actions

EO 12114, issued on January 4, 1979, applies to coastal waters and foreign lands beyond 12 NM of the U.S. coastline. The analysis focuses on actions that significantly affect the environment of a foreign nation that is not involved in the action; and actions that significantly affect the environment of a foreign nation by producing an emission or effluent, which is prohibited or strictly regulated by federal law, in the U.S., because its toxic effects on the environment create a serious public health risk.

3.1.7 Approach to Analysis

The air quality impact evaluation requires three separate analyses: the CAA General Conformity Analysis, which applies to U.S. land mass and coastal waters within state waters limit (i.e., 3 NM); an analysis under NEPA, and an analysis under EO 12114. Effects of air pollutants emitted by the proposed military readiness activities in the Pacific Ocean, bays, and inland locations in U.S. shore activities and territorial seas (i.e., up to 12 NM from the coast) are assessed under NEPA. Effects of air pollutants emitted by military readiness activities outside of U.S. territorial seas are evaluated as required under EO 12114.

Criteria pollutants and HAPs emitted more than 3,000 ft. above ground level (AGL) are considered to be above the atmospheric inversion layer and, therefore, do not affect ground-level air quality (U.S. Environmental Protection Agency, 1992). These emissions thus do not affect the concentrations of criteria air pollutants and HAPs in the lower atmosphere, measured at ground-level monitoring stations, upon which federal, state, and local regulatory decisions are based. Greenhouse gas emissions are calculated for all altitudes.

3.1.7.1 General Conformity Evaluation

The General Conformity Evaluation is separate and distinct from the NEPA Analysis. Criteria pollutants emitted by military readiness activities in the Pacific Ocean, bays, and inland locations in U.S. state waters (i.e., up to 3 NM from the coast) are quantified and compared to the applicable thresholds specified in the General Conformity Rule to ensure that the Proposed Action does not interfere with the State or local agency's plan to achieve the NAAQS in nonattainment and maintenance areas.

The first step in the Conformity Evaluation is a Conformity Applicability Analysis and involves calculating the total non-exempt direct and indirect emissions associated with the action. If there is no current activity (the proposed action is completely new), then the sum of the non-exempt direct and indirect emissions equals the net change in emissions. If the action is a change from a current level of emissions, then the current level is defined as the baseline that future emissions are evaluated against. The net change, then, is the difference between the emissions associated with the action and the baseline emissions. The net change may be positive, negative, or zero. The emissions thresholds that trigger the conformity requirements are called *de minimis* levels. The net change calculated for the direct and indirect emissions are compared to the *de minimis* levels. If the net change in emissions does not exceed *de minimis* thresholds, then a General Conformity Determination is not required and the proposed action is presumed to conform to the State Implementation Plan. If the net change in emissions equals or exceeds the *de minimis* conformity applicability threshold values, a formal Conformity Determination must be prepared to demonstrate conformity with the approved State Implementation Plan.

The Navy Guidance for Compliance with the CAA General Conformity Rule, section 4.1, states that a Record of Non-Applicability must be prepared if the proposed action is subject to the Conformity Rule, but is exempt because it fits within one of the exemption categories listed under 40 CFR part 93 Subpart B, because the action's projected emissions are below the *de minimis* conformity applicability threshold values, or is presumed to conform (U.S. Department of the Navy, 2013). The *de minimis* levels for nonattainment and maintenance pollutants are shown in Table 3.1-2.

Table 3.1-2: *De Minimis* Thresholds for General Conformity Determinations

Pollutant	Nonattainment or Maintenance Area Type	*de minimis* Threshold (TPY)
Ozone (VOC or NO_X)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (NO_X)	Marginal and moderate nonattainment inside an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
CO, SO_2 and NO_2	All nonattainment and maintenance	100
PM_{10}	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
$PM_{2.5}$[(1)]	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
Lead (Pb)	All nonattainment and maintenance	25

Source: U.S. Environmental Protection Agency (2024c)
[(1)] $PM_{2.5}$ precursors are sulfur dioxide, oxides of nitrogen, volatile organic compounds, and ammonia.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, NO_2 = nitrogen dioxide,
PM_{10} = particulate matter ≤ 10 microns in diameter, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter,
SO_2 = sulfur dioxide, SO_X = sulfur oxides, TPY = tons per year, VOC = volatile organic compound

3.1.7.2 National Environmental Policy Act

Analysis of health-based air quality effects under NEPA includes estimates of total direct and indirect criteria air pollutants and HAPs emissions for all training and testing activities where aircraft, missiles, or targets operate at or below the 3,000 ft. AGL inversion layer or that involve vessels in U.S. territorial seas (within 12 NM). The NEPA analysis encompasses effects, including CAA and HAPs, within 12 NM from coastline. Total direct and indirect emissions consider all emission increases and decreases that are reasonably foreseeable and are possibly controllable. The analysis considers the future emissions in the area with the action versus the future emissions without the action (i.e., the Baseline Condition/Affected Environment).

3.1.7.3 Executive Order 12114

The analysis of health-based air quality effects under EO 12114 includes emissions estimates of only those activities in which aircraft, missiles, or targets operate at or below 3,000 ft. AGL, and that involve vessels outside of U.S. territorial seas (>12 NM from the coast).).

3.1.8 Air Quality Effect Analysis Framework

Emission sources and the approach used to estimate emissions under Alternative 1 and Alternative 2 in the air quality analysis are based on information from Navy subject matter experts and established training and testing requirements. The data were used to estimate the numbers and types of aircraft, surface ships and vessels, submarines, and munitions (i.e., potential sources of air emissions) that would be involved in training and testing activities under each alternative. The analysis focused on the net increase in emissions that would result from the increased or new activities under two action alternatives compared to the current number of activities. For the SOCAL Range Complex, the SSTC, and the PMSR, the current number of activities are based on the Preferred Alternatives that were evaluated in the 2018 HSTT and 2022 PMSR EIS/OEISs. The current level of activities for the NOCAL Range Complex was estimated. Appendix G contains the basis for emission calculations.

The NOCAL Range Complex consists of two separate areas located offshore of central and northern California, one northwest of San Francisco and the other southwest of Monterey Bay. Both components of the NOCAL Range Complex are located at least 12 NM from shore and extend from the ocean surface to at least 45,000 ft. altitude, which is well above the 3,000 ft. AGL where criteria pollutants and emissions are analyzed under NEPA. GHG emissions are calculated for all altitudes.

Once the emissions are quantified for each alternative, the air quality effect analysis provides a qualitative discussion of effects of the estimated emissions on air quality. These effects may include, but are not limited to, risks to populations resulting from the exposure to HAPs, and changes in ambient concentrations for criteria pollutants and their effects on attaining the AAQS. Based on magnitude of emissions, location and initial dispersion of emissions, duration of exposure, meteorological conditions, wind patterns, buoyancy of pollutants, and other relevant factors, anticipated effects are determined qualitatively.

Emission sources and the approach to estimating emissions are described in Appendix G.

3.1.9 Affected Environment

The affected environment provides the context for evaluating the effects of the proposed military readiness activities on air quality.

3.1.9.1 Region of Influence

The region of influence for air quality is a function of the type of pollutant, emission rates of the pollutant source, proximity to other emission sources, and local and regional meteorology. For inert pollutants (all pollutants other than PM_{10}, $PM_{2.5}$, ozone, and their precursors), the region of influence is generally limited to a few miles downwind from the source but could extend farther downwind depending on existing conditions, magnitude of emissions, and expected plume size and location. Ozone and its precursors, NO_x and volatile organic compound emissions, can travel hundreds of miles on air currents, forming ozone far from the original emissions sources (U.S. Environmental Protection Agency, 2022b). Therefore, the region of influence for air quality under CAA and NEPA includes the Study Area up to 12 NM from the coastline, as well as adjoining land areas several miles inland, which may from time to time be downwind from emission sources associated with the Proposed Action. The region of influence for EO 12114 includes coastal waters and foreign lands beyond 12 NM of the U.S. coastline.

3.1.9.2 Receptors

Identification of receptors, including sensitive receptors, is part of describing the existing air quality environment. Sensitive receptors are individuals in residential areas, schools, parks, hospitals, or other sites who are more susceptible to adverse effects of exposure to air pollutants. On the oceanic portions of the Study Area, crews of commercial vessels and recreational users of the Pacific Ocean could encounter the air pollutants generated by the Proposed Action. Few such individuals are expected to be present and the duration of substantial exposure to these pollutants is limited because the areas are cleared of nonparticipants before event commencement.

The study also evaluates effects on potential receptors within the affected military installations that are not associated with the Proposed Action. These receptors may include military housing residents, daycares and schools, restaurants, and workers within the facility not part of the Proposed Action.

3.1.9.3 Meteorological Conditions and Topography of the Study Area

Pollution dispersion in the air is influenced by meteorological conditions, such as temperature, wind speed and wind direction, and atmospheric stability. Details regarding meteorological conditions and topography of the Study Area are described in Appendix G.

3.1.9.3.1 Hawaii

Winds offshore the Hawaiian Islands are predominantly from the north, northeast, and east at 10 to 20 miles per hour. Air temperatures are moderate and vary slightly by season, ranging from about 70 to 80 degrees Fahrenheit. (Western Regional Climate Center, 2016). The prevailing winds could quickly disperse air pollutants in the region. Frequent rainfall on windward sides of the islands can remove atmospheric dust and other air pollutants. During periods of light and variable winds, typically from the southeast, south, or southwest, local air pollutant concentrations may temporarily increase and volcanic organic gases emissions from the Island of Hawaii may temporarily affect downwind Hawaiian islands.

3.1.9.3.2 Southern and Central California

One of the main influences on meteorology is a semi-permanent high-pressure system (the Pacific High) in the eastern Pacific Ocean. This high-pressure cell maintains clear skies in Southern California for much of the year. When the Pacific High moves south during the winter, this pattern changes and low-pressure centers migrate into the region, causing widespread precipitation.

The Pacific High influences the large-scale wind patterns of California. The predominant regional wind directions are westerly and west-southwesterly during all four seasons. Surface winds typically are from the west (onshore) during the day and from the east (offshore) at night; this diurnal wind pattern is dominant in winter but is weak or absent in summer, when onshore winds may occur both day and night. Along the coast, average wind speeds are low at night, increase during morning hours to a midday peak, then decrease through the afternoon.

Central California wind and temperature patterns are influenced by the proximity to the Pacific Ocean. In Monterey, prevailing winds along the coast often come from the west or northwest, as they are influenced by the cool marine air from the Pacific Ocean. Average wind speeds can vary but are often moderate. Stronger winds may occur during certain weather conditions or seasons. Monterey generally experiences mild temperatures due to its coastal location. Summers tend to be cool, with average high temperatures ranging from the 60s to low 70s Fahrenheit. Winters are also mild, with average high temperatures in the 50s Fahrenheit.

3.1.9.3.3 Northern California

The wind speed and direction in Northern California can vary depending on the specific location, time of year, and weather patterns. Along the coast, in areas such as San Francisco, prevailing winds often come from the west or northwest. These winds are influenced by the cool marine air from the Pacific Ocean. Wind speeds along the coast can vary but are often moderate.

3.1.9.3.4 Wind Roses

Figure 3.1-1 depicts a wind rose for data collected from December 2018 to December 2023 by the weather station (PHNL) located at Daniel K. Inouye International Airport and the relative location within the activity area. Figure 3.1-2, Figure 3.1-3, and Figure 3.1-4 present wind roses for the same time frame for Kauai, Southern Califonia, and Central California, respectively. Figure 3.1-5 presents the wind rose for Northern California. The Northern California wind roses are for locations that are close to the southern part of the NOCAL Range Complex where vessel activities would occur. Full page wind roses are provided in Appendix G.

Winds and currents in the Pacific Ocean flow predominantly from East to West. Above the equator Pacific Ocean trade winds blow from the northeast. An example of the prevailing wind direction and intensity in the Pacific Ocean is presented in Appendix G.

3.1.9.4 Existing Air Quality

Air quality in offshore ocean areas is generally better than the air quality of adjacent onshore areas because there are few or no large stationary sources of HAPs or criteria air pollutants offshore. Much of the air pollutants found in offshore areas are transported there from adjacent land areas by low-level offshore winds, so concentrations of criteria air pollutants generally decrease with increasing distance from land. There is some transfer of pollutants, known as Trans-Pacific transport of Asian pollutants, whereby East Asian pollution is transported across the Pacific Ocean from Asia to North America, especially during springtime. No criteria air pollutant or HAP monitoring stations are located in offshore areas; therefore, air quality in the Study Area must be inferred from the air quality in adjacent land areas where air pollutant concentrations are monitored.

3.1.9.4.1 Hawaii

Figure 3.1-6 presents the Hawaii Range Complex within the Hawaii Study Area. Nearly all the training and testing activities in the Hawaii Study Area take place within the Hawaii Range Complex, generally centered around the Island of Hawaii and the islands of Kauai, Oahu, and Niihau.

State of Hawaii Department of Health Clean Air Branch is responsible for air pollution control in the state. Air quality in Hawaii is generally good, because the small number of major stationary sources located where their exhaust plumes are immediately transported above the ocean away from land mass. Monitored air pollutant concentrations are generally well below State of Hawaii or federal air quality standards. With the exception of short-term SO_2 measurements recorded in 2023 near volcanic activity, none of the air quality monitoring stations in Hawaii recorded criteria air pollutant concentrations that exceeded the AAQS (State of Hawaii Department of Health, 2016). Detailed existing air quality information for the Hawaii Study Area is provided in Appendix G.

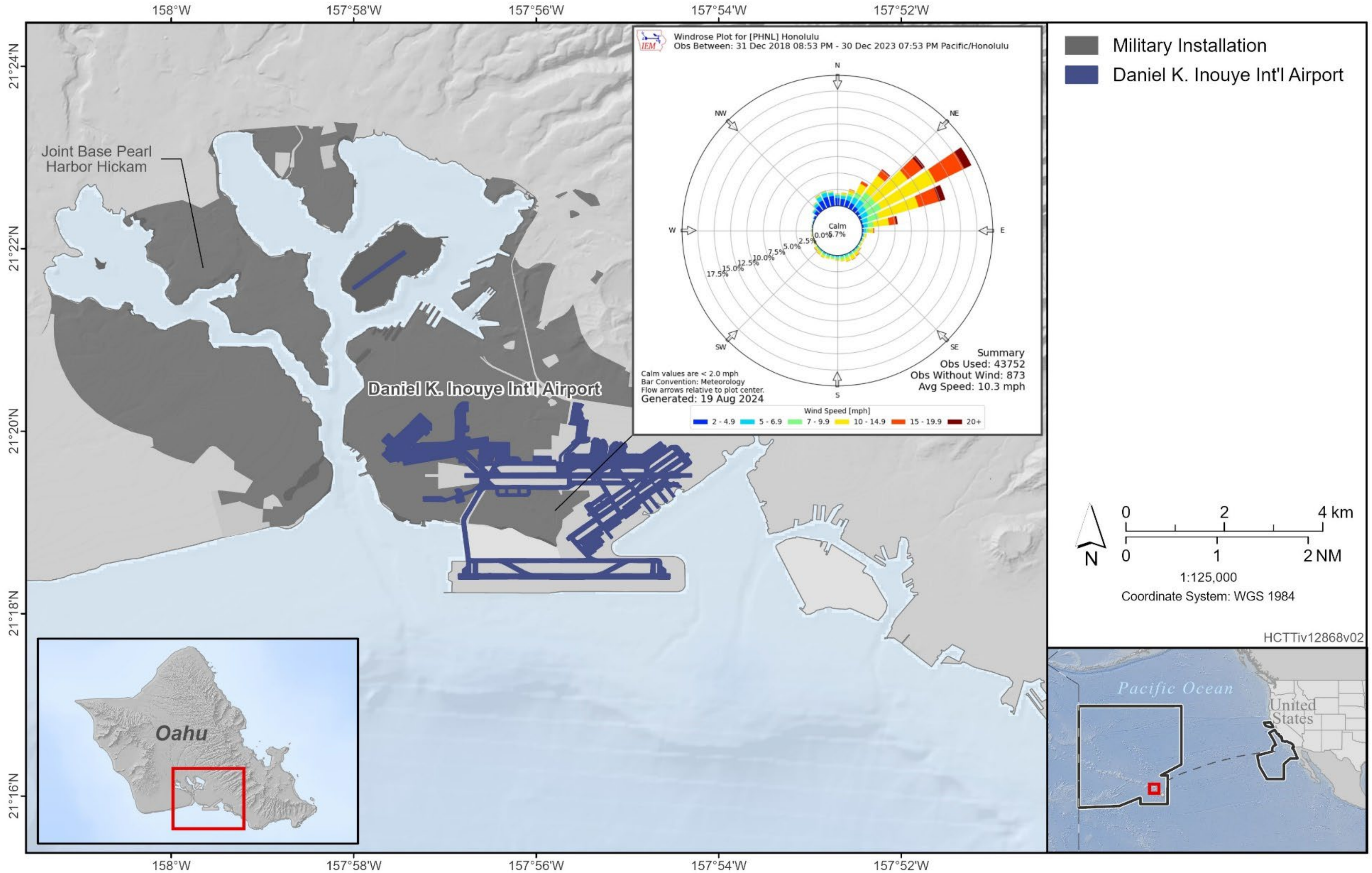

Figure 3.1-1: Location of Honolulu PHNL Weather Station Wind Rose Data Relative to Activity Areas

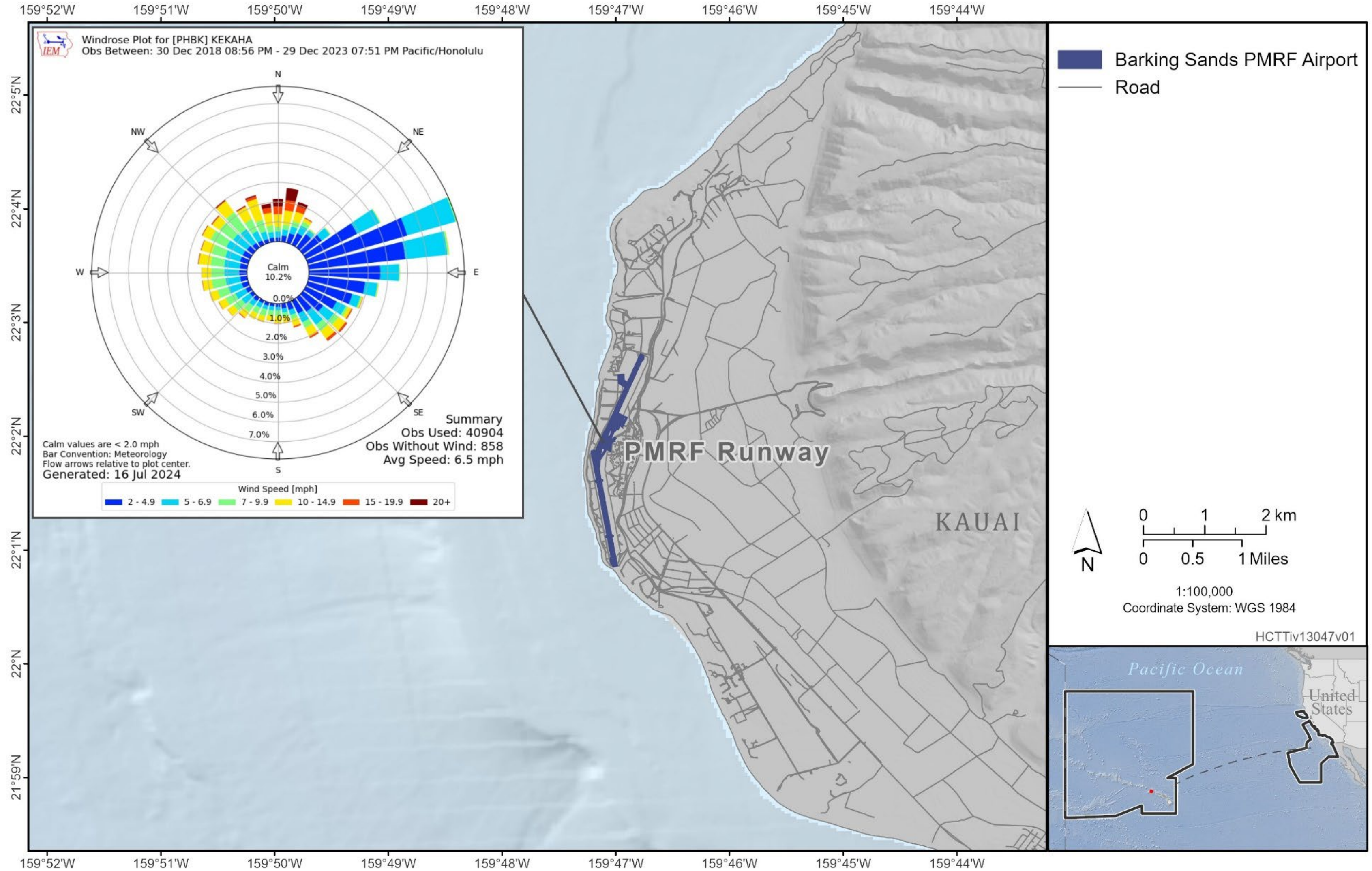

Figure 3.1-2: Location of Kauai PMRF Airfield Weather Station Wind Rose Data Relative to Activity Areas

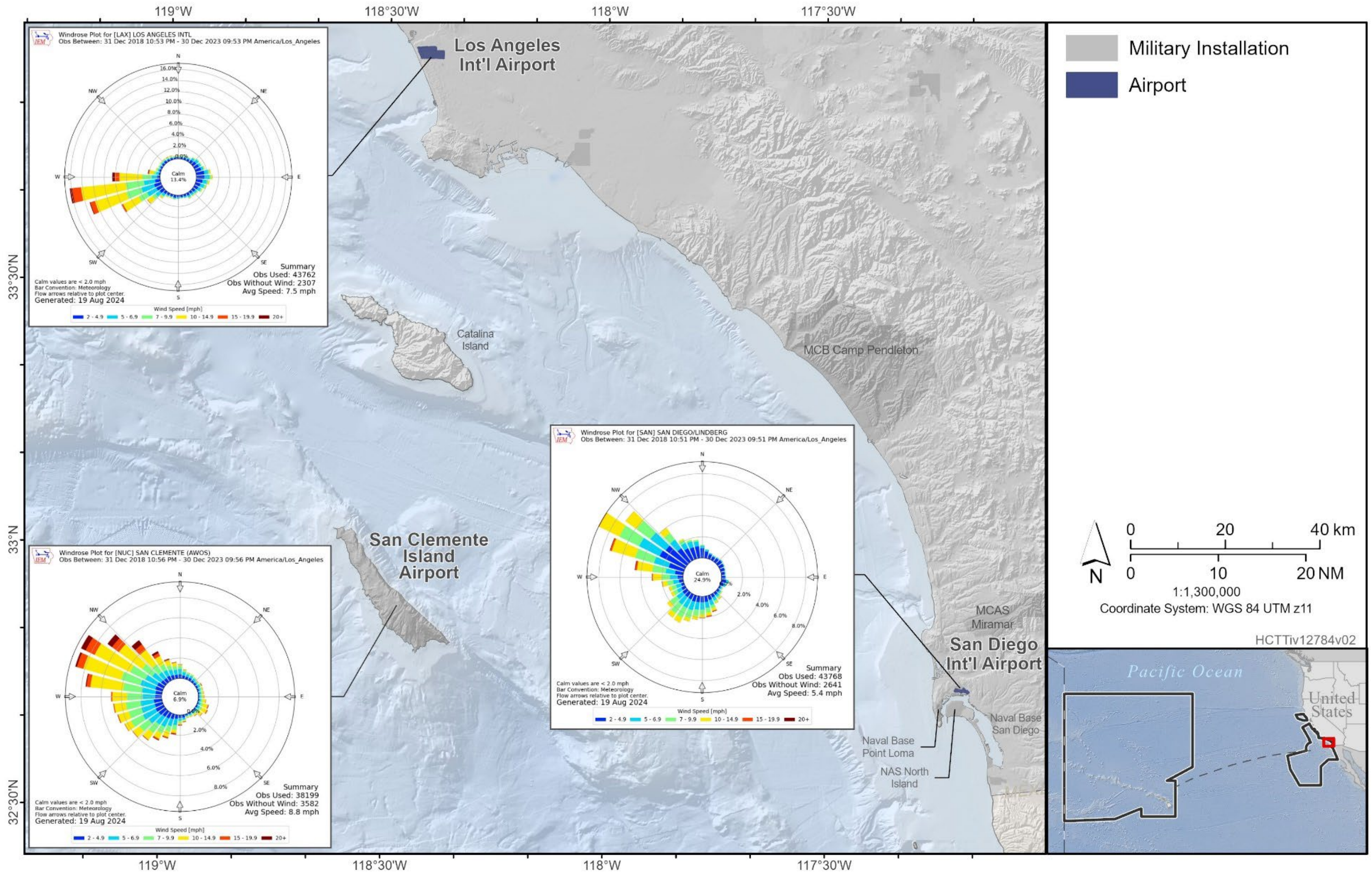

Figure 3.1-3: Location of Southern California Wind Rose Data and Weather Stations Relative to Activity Areas

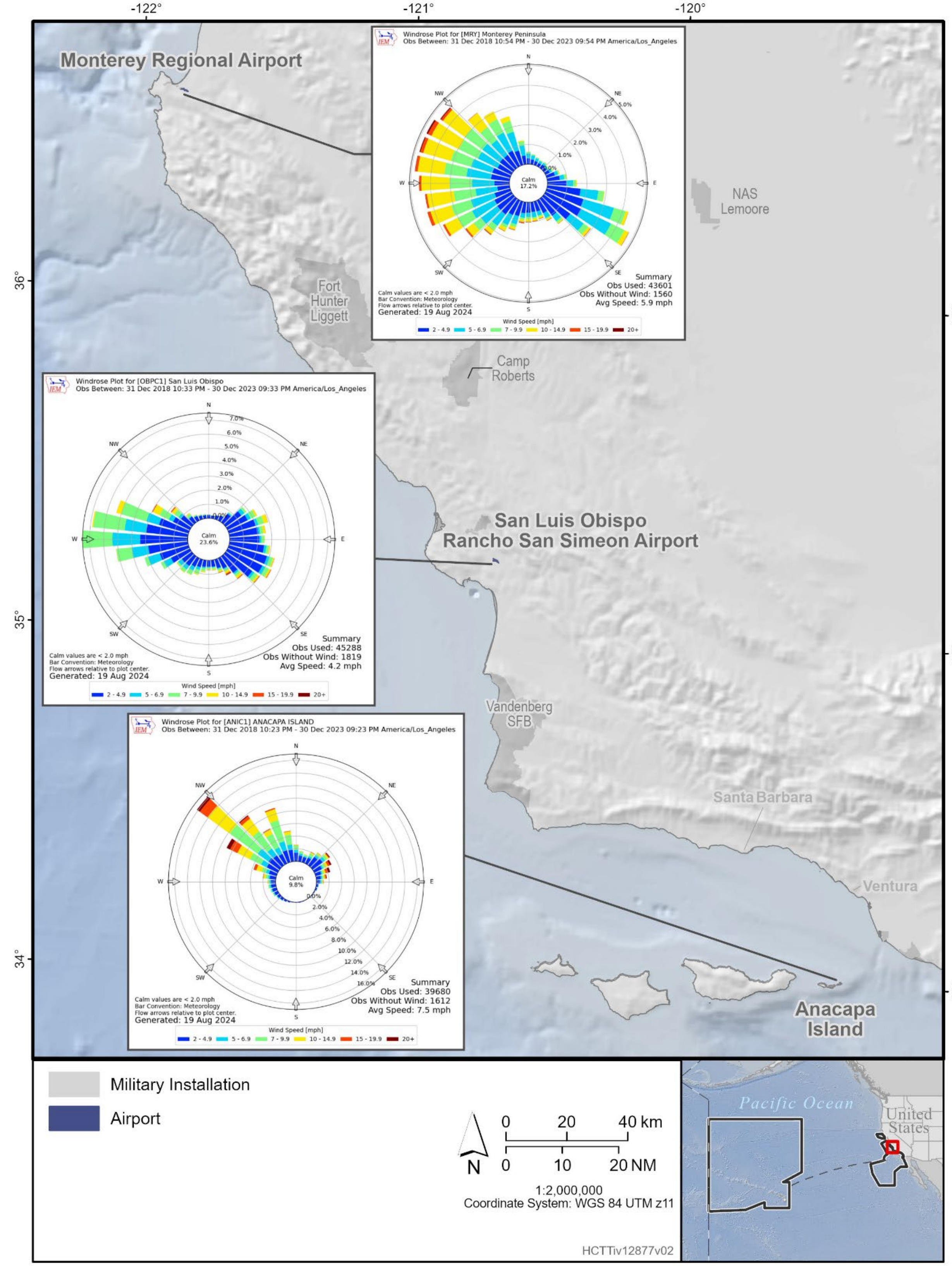

Figure 3.1-4: Location of Central California Wind Rose Data Relative to Activity Areas

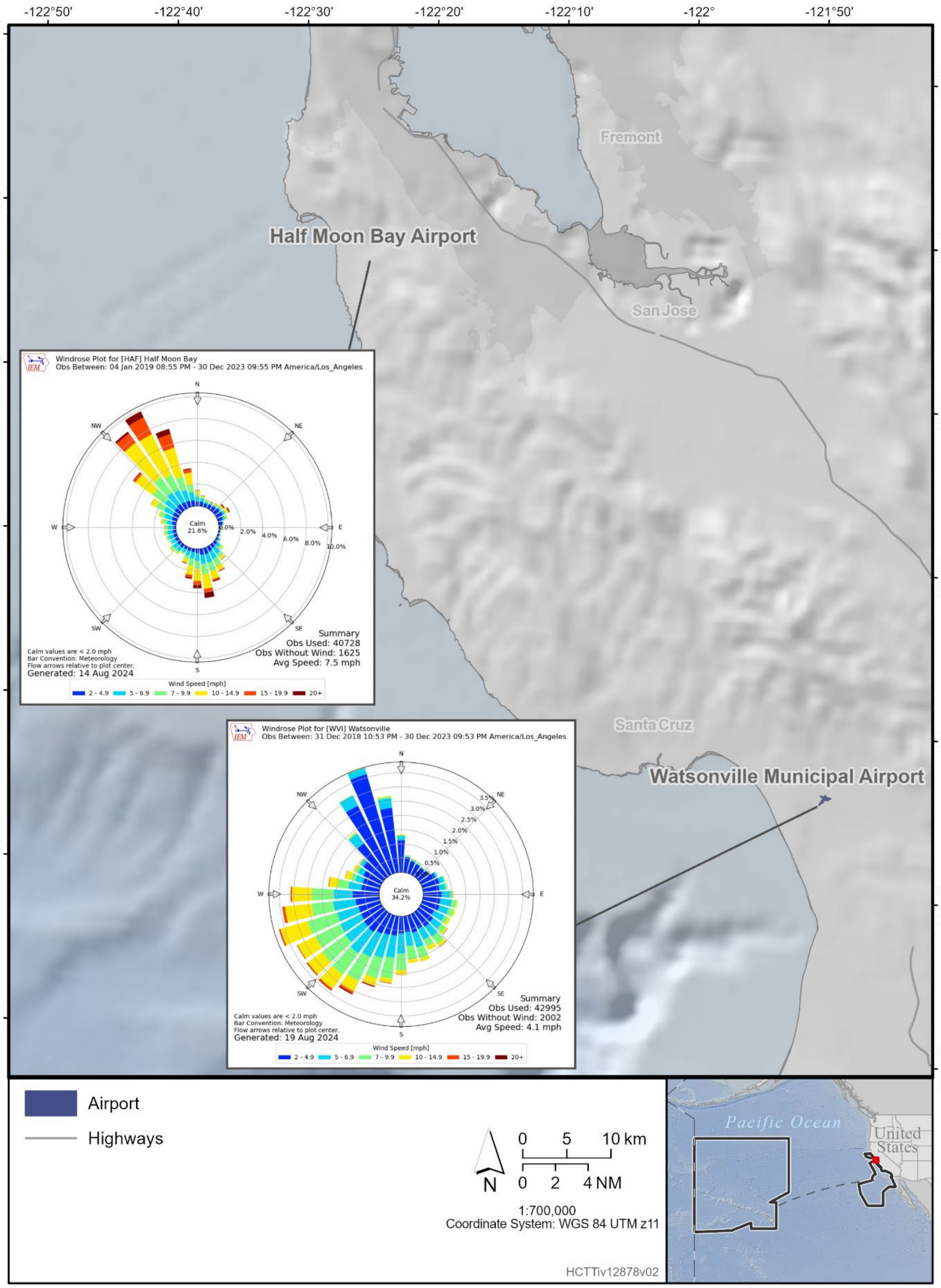

Figure 3.1-5: Location of Northern California Wind Rose Data Relative to Activity Areas

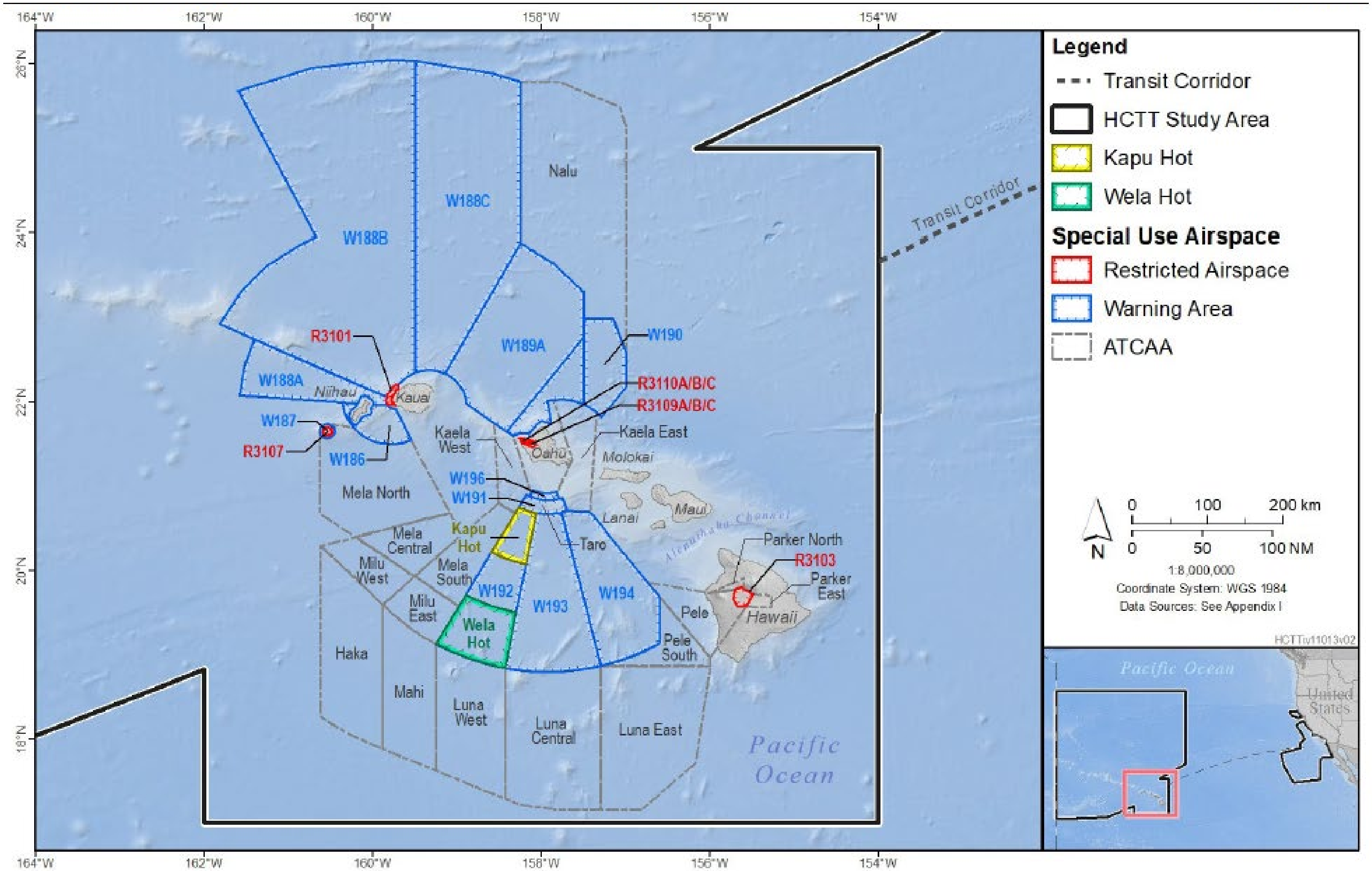

Figure 3.1-6: Hawaii Range Complex

3.1.9.4.2 California Study Area

Table 3.1-3 identifies the NAAQS attainment status of each California air basin and county within the California Study Area. The San Francisco Bay Area and North Coast Air Basins are not affected by emissions from the proposed alternatives, as explained in Section 3.1.9.4.3 and are not included in this table.

Table 3.1-3: NAAQS attainment status of California Counties within the California Study Area

Air Quality Basin	Air Quality District	County/Area	NAAQS Attainment Status
South Coast Air Basin	South Coast Air Quality Management District	Los Angeles County	Extreme nonattainment area for ozone (eight-hour average concentration), a CO maintenance area, a maintenance area for PM_{10}, and a serious non-attainment area for $PM_{2.5}$.
		Orange County	
San Diego Air Basin	San Diego Air Pollution Control District (APCD)	San Diego County	Severe nonattainment area for the 2008 and 2015 ozone (eight-hour average concentration)
South Central Coast Air Basin	Ventura County APCD	Ventura County	Serious nonattainment area for the 2008 and 2015 ozone (eight-hour average concentration)
	Santa Barbara County APCD	Santa Barbara County	In attainment for all NAAQS
	San Luis Obispo County APCD	San Luis Obispo County	Marginal nonattainment area for the 2008 and 2015 ozone (eight-hour average concentration)
North Central Coast Air Basin	Monterey Bay Air Resources District	Monterey County	In attainment for all NAAQS
		Santa Cruz County	In attainment for all NAAQS
		San Benito County	In attainment for all NAAQS

Figure 3.1-7 presents a map of the air basins in the California Study Area. As shown in the figure, many coastal southern, central, and northern California air districts are within the proposed HCTT Study Area. The proposed alternatives do not generate emissions in the San Francisco Bay Area and North Coast Air Basins.

3.1.9.4.2.1 South Coast Air Basin

South Coast Air Basin (SCAB) is classified as an extreme non-attainment area for ozone (eight-hour average concentration) NAAQS, a CO maintenance area, a maintenance area for NO_2, a maintenance area for PM_{10}, and a serious non-attainment area for $PM_{2.5}$. SCI is located within this air basin. Detailed existing air quality information for the SCAB is provided in Appendix G.

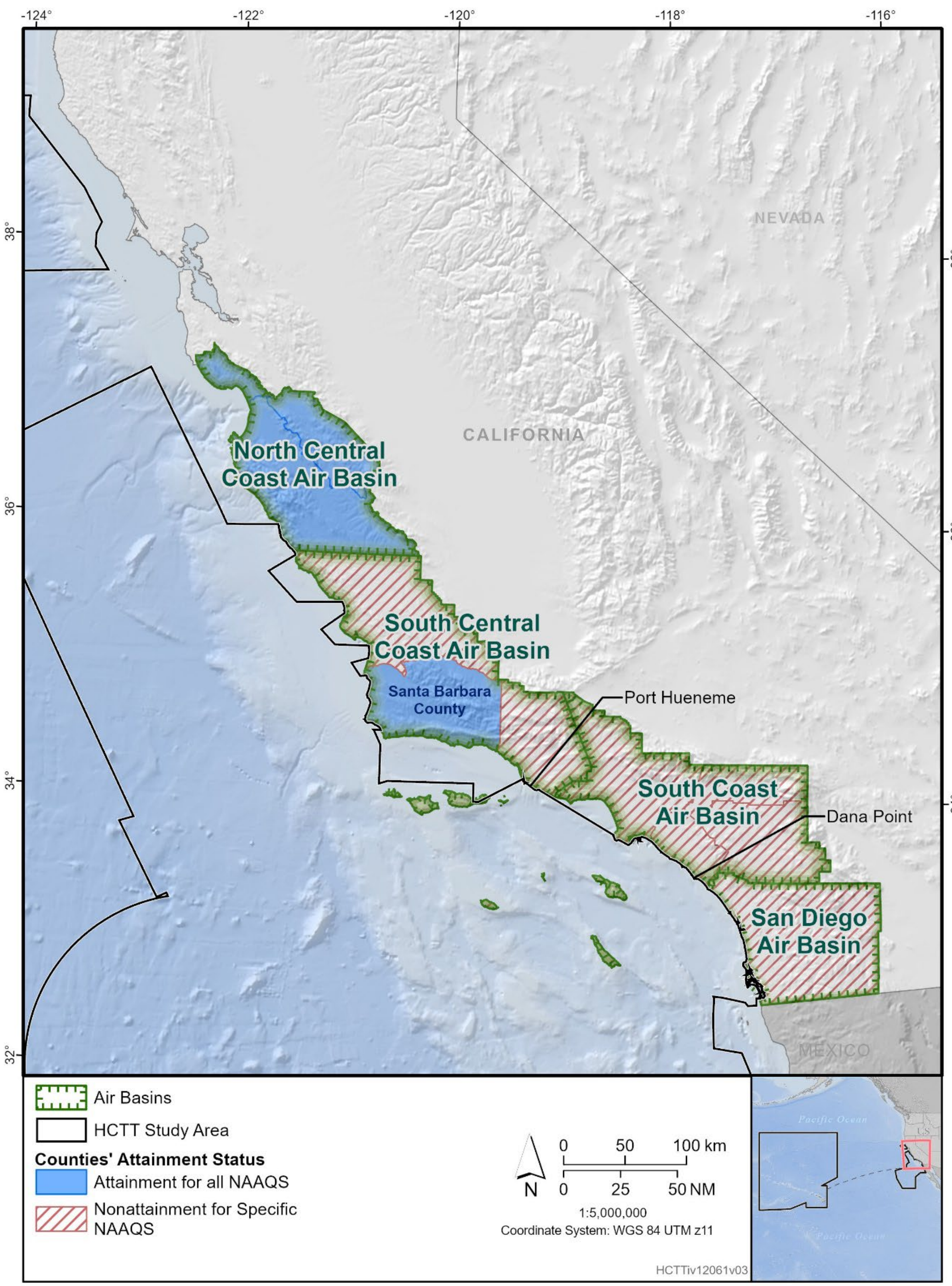

Figure 3.1-7: California Air Basins Within the HCTT Study Area

3.1.9.4.2.2 San Diego Air Basin

The San Diego Air Basin is classified as a severe non-attainment area for the 2008 and 2015 ozone (eight-hour average concentration) NAAQS. Detailed existing air quality information for the San Diego Air Basin, including the San Diego Portside Environmental Justice Neighborhoods[1], is provided in Appendix G.

3.1.9.4.2.3 South Central Coast Air Basin

Ventura County is in the South Central Coast Air Basin, along with Santa Barbara and San Luis Obispo Counties. PMSR activities over land and within coastal waters are within this air basin. PMSR supports training, testing, and evaluation of a wide variety of weapons, ships, aircraft, and specialized systems, as well as Department of Defense, Homeland Defense, foreign military sales, and commercial/private sector programs. The test range also includes portions of Naval Base Ventura County (NBVC) Point Mugu, NBVC Port Hueneme (pile driving), and SNI. The at-sea areas around SNI and Santa Barbara Island are within the Study Area. NBVC Point Mugu and NBVC Port Hueneme are located within the ozone serious nonattainment area of Ventura County Air Pollution Control District (VCAPCD). Santa Barbara Island is in the Santa Barbara County Air Pollution Control District, which is in attainment with all the NAAQS. SNI is designed as an unclassifiable area with respect to NAAQS. Detailed existing air quality information for the South Central Coast Air Basin is provided in Appendix G.

3.1.9.4.3 North Central Coast Air Basin

The NOCAL Range Complex consists of two separate areas located offshore of central and northern California, one northwest of San Francisco and the other southwest of Monterey Bay. The northern part is primarily used for aircraft activities that occur above 3,000 ft. No vessel activities, other than vessel transit in the area, are proposed in the northern area. Therefore, only the criteria and HAP emissions for activities in the southwest of Monterey Bay are analyzed in this EIS/OEIS. These activities fall under the North Central Coast Air Basin (NCCAB), which is composed of Monterey, Santa Cruz, and San Benito counties. Existing air quality information for the North Central Coast Air Basin is provided in Appendix G.

3.1.9.4.4 Hawaii-California Transit Corridor

The Transit Corridor connects the Hawaii Study Area and the California Study Area, which is approximately 2,000 NM away. Typical Navy ship transit time between the Study Areas is five to seven days. Air quality in the Transit Corridor, which is more remote from major stationary sources of air pollutants than either NOCAL, SOCAL, or the Hawaii Range Complex, is unknown but is expected to be of better quality than either of these areas. Activities within the Transit Corridor involve the movement of ships and aircraft to training and testing areas. Emissions associated with vessel activities will be quantified to analyze the air quality effects.

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[1] The Portside Community of Environmental Justice Neighborhoods, which consists of the neighborhoods of Barrio Logan, west National City, Logan Heights, and Sherman Heights, was formed as part of California Assembly Bill 617. This bill requires community-focused and community-driven action to reduce air pollution and improve public health in communities that experience disproportionate burdens from exposure to air pollutants. A Community Emissions Reduction Plan (CERP) was adopted in 2021 that includes strategies to reduce air pollution emissions and community exposure to air pollution in the community.

3.1.9.5 Greenhouse Gas Emissions

The USEPA specifically identified carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride as greenhouse gases (U.S. Environmental Protection Agency, 2009a) (74 FR 66496). Carbon dioxide, methane, and nitrous oxide occur naturally in the atmosphere and are exacerbated by human activities. These gases influence global climate by trapping heat in the atmosphere that would otherwise escape to space. The heating effect of these gases is considered the probable cause of global warming observed over the last 50 years (U.S. Environmental Protection Agency, 2009a) and contributes significantly to climate change.

3.1.10 Environmental Consequences

Under the No Action Alternative, the proposed military readiness activities would not be conducted. Therefore, baseline conditions of the existing environment for air quality and greenhouse gas emissions would either remain unchanged or would improve slightly after the current military readiness activities cease. As a result, the No Action Alternative is not analyzed further within this section.

This section evaluates how and to what degree the activities described in Chapter 2 potentially affect air quality within the Study Area. The air quality stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors applicable to air quality in the Study Area are analyzed below:

- Criteria Air Pollutants
- HAPs

The following effects are evaluated:

- Changes in ambient concentrations for criteria pollutants and their effects on compliance with the AAQS
- Potential risks to populations resulting from the exposure to HAPs

As noted in Section 3.0.2, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in 40 CFR section 1501.3(d). Air quality stressors (criteria air pollutants and HAPs) could have a reasonably foreseeable adverse effect; thus, requiring a significance determination.

Stressors are considered to have a significant effect on the human environment based on an examination of the context of the action and the intensity of the effect. In the present instance, the effects of criteria air pollutants and HAPs on air quality would be considered significant if (1) the measurable or anticipated degree of change would be substantial and highly noticeable compared to existing conditions; (2) effects would contribute to an exceedance of a NAAQS; and (3) exposure to hazardous air pollutants would cause significant and unacceptable health effects to populations, including sensitive receptors.

In this analysis, the increase in criteria air pollutant and HAP emissions were estimated for vessels, aircraft, and munitions relative to the current activity levels. For each alternative, emissions estimates were developed by sub-region of the Study Area and other training and testing locations and totaled for the Study Area.

The effects of air emissions for each alternative are categorized by region (e.g., by range complex or testing range) so that differences in background air quality, ambient conditions, atmospheric circulation patterns, regulatory requirements, and receptors, including sensitive receptors, can be addressed. An overall estimate of increase in air pollutant emissions for military readiness activities in the Study Area under each alternative is also provided.

For the SOCAL Range Complex, SSTC, and PMSR, current activities are based on the Preferred Alternatives that were analyzed previously in the 2018 HSTT and 2022 PMSR EIS/OEISs. Current activities for the NOCAL Range Complex and Transit Corridor were estimated. Details of the emission estimates, including activity levels and assumptions, are provided in Appendix G.

3.1.10.1 Effects from Air Emissions under Alternative 1

Alternative 1 reflects a representative year of training and testing to account for the natural fluctuations of training cycles, testing programs, and deployment schedules that generally limit the maximum level of training and testing from occurring for the reasonably foreseeable future.

Table 3.1-4 presents the total estimated increase in emissions under Alternative 1 within the Study Area and includes all emissions generated, regardless of proximity to the coastline. The majority of these emission increases occur beyond state waters, with much of emissions in most areas occurring beyond the state water boundaries.

Table 3.1-4: Annual increase in Criteria Air Pollutant Emissions from Military Readiness Activities Occurring within the HCTT Study Area, Alternative 1[1]

Scenario	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Training	281	827	34	3	63	62
Testing	-6	1	-0.7	2	11	11
Range Modernization and Sustainment	1.1	14	0.4	1.0	0.4	0.4
Total Military Readiness Activities	277	842	33	6	74	73

[1] Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides (precursor to $PM_{2.5}$), TPY = tons per year, VOC = volatile organic compounds

3.1.10.1.1 General Conformity Analysis under Alternative 1 in Areas Designated Nonattainment or Maintenance

Emissions that occurs within 3 NM of nonattainment or maintenance areas are subject to the CAA General Conformity evaluation. For this evaluation, the net emission increases associated with each alternative are compared to the General Conformity *de minimis* thresholds for nonattainment or maintenance areas.

The entire State of Hawaii is in attainment of the NAAQS for all criteria air pollutants. Therefore, a General Conformity Evaluation is not required for those elements of the Proposed Action that occur in Hawaii State waters. Similarly, the near shore military readiness activities within the southern portion of the NOCAL Range Complex occur within attainment areas. As such, a General Conformity Evaluation is not required for those elements of the Proposed Action that occur in this region.

3.1.10.1.1.1 Southern California Areas Designated Nonattainment or Maintenance

The SCAB is classified as an extreme non-attainment area for ozone (eight-hour average concentration) NAAQS, a maintenance area for the 1-Hour (35 parts per million [ppm]) and 8-Hour (9 ppm) CO NAAQS, a maintenance area for the annual NO_2 NAAQS, a maintenance area for the 1987 24-hour PM_{10}, and a serious non-attainment area for the 2006 24-Hour (35 μg/m^3) and the 2012 Annual (12.0 μg/m^3) $PM_{2.5}$ NAAQS.

Table 3.1-5 presents the estimated annual emissions increase, within 0–3 NM, for proposed activities under Alternative 1 as compared to the current level of nearshore activities. The net annual emissions increases are compared with the applicable General Conformity Rule *de minimis* thresholds. As shown in Table 3.1-5, estimated annual emission increases for all pollutants are below applicable General Conformity *de minimis* levels. A General Conformity Determination is not required, and a Record of Non-Applicability (Appendix G) has been prepared and presented in Appendix G.

Table 3.1-5: Estimated Net Change in Annual Criteria Air Pollutant Emissions from Military Readiness Activities in the South Coast Air Basin (Within 3 NM), Alternative 1[1]

Source	Emissions Increase by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Net Change in Emissions from all Sources	7.6	5.4	0.5	0.6	0.3	0.2
De Minimis Threshold	100	10	10	70	100	70

[1] Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding.

Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides (precursor to $PM_{2.5}$), TPY = tons per year, VOC = volatile organic compounds

The San Diego Air Basin is classified as a severe non-attainment area for ozone (eight-hour average concentration) NAAQS.

Table 3.1-6 presents the estimated annual emissions increase, within 0–3 NM, for proposed activities under Alternative 1 as compared to the current level of nearshore activities. The net annual emissions increases are compared with the applicable General Conformity Rule *de minimis* thresholds. As shown in Table 3.1-6, estimated annual emission increases for all pollutants are below applicable General Conformity *de minimis* levels. A General Conformity Determination is not required, and a Record of Non-Applicability (Appendix G) has been prepared and presented in Appendix G.

Table 3.1-6: Estimated Net Change in Annual Criteria Air Pollutant Emissions from Military Readiness Activities in the San Diego Air Basin (Within 3 NM), Alternative 1[1]

Source	Emissions Increase by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Net Change in Emissions from all Sources	21	13	1	0.3	5	5
De Minimis Threshold	N/A	25	25	N/A	N/A	N/A

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

3.1.10.1.1.2 South Central Coast Air Basin Designated Nonattainment or Maintenance

Portions of the California Study Area, including PMSR and Port Hueneme, are located within the VCAPCD serious ozone nonattainment area. Table 3.1-7 presents the estimated annual emissions increase, within 0–3 NM, for proposed activities under Alternative 1 as compared to the current level of nearshore activities. The net annual emissions increases are compared with the applicable General Conformity Rule *de minimis* thresholds. As shown in Table 3.1-7, estimated annual emission increases for all pollutants are below applicable General Conformity *de minimis* levels. A General Conformity Determination is not required, and a Record of Non-Applicability (Appendix G) has been prepared and presented in Appendix G.

Table 3.1-7: Estimated Net Change in Annual Criteria Air Pollutant Emissions from Military Readiness Activities in the South Central Coast Air Basin (Within 3 NM), Alternative 1[1]

Source	Emissions Increase by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Net Change in Emissions from all Sources	2	10	0.3	0.03	0.4	0.4
De Minimis Threshold	N/A	50	50	N/A	N/A	N/A

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

3.1.10.1.2 National Environmental Policy Act Impacts from Criteria Pollutants and HAPs Under Alternative 1

3.1.10.1.2.1 NEPA Impacts from Criteria Pollutants and HAPs Under Alternative 1 in the State of Hawaii

Table 3.1-8 presents the estimated increase in criteria pollutant emissions within 12 NM for proposed activities under Alternative 1 as compared to the current level of activities. The annual increase in emissions is compared to the 2020 annual emissions, in tons per year, reported for Honolulu County (see Appendix G).

Table 3.1-8: Estimated Net Change in Annual Criteria Air Pollutant Emissions from Military Readiness Activities in the State of Hawaii (Within 12 NM), Alternative 1[1]

Source	Emissions Increase by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	12	32	1	1	9	9
Vessel	35	258	11	0	8	8
Munitions	0.5	0.0	0.0	0.0	0.1	0.1
Range Modernization and Sustainment	0.3	3.9	0.1	0.3	0.1	0.1
Net Change in Emissions from all Sources	48	295	12	2	17	17
Honolulu County Air Emissions for 2020, TPY	77,700	20,652	37,295	11,446	14,553	4,369
Percent of Existing Emissions	0.06%	1.43%	0.03%	0.02%	0.12%	0.40%

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

Table 3.1-8 presents the estimated annual increase in emissions of HAPs of concern within 12 NM for proposed activities under Alternative 1 as compared to the current level of activities. Emissions are compared to the 2020 Honolulu County HAP emissions.

Table 3.1-9: Estimated Net Change in Annual Hazardous Air Pollutants of Concern Emissions from Military Readiness Activities in the State of Hawaii (Within 12 NM), Alternative 1[1]

HAP	Net Change in Emissions, Aircraft (TPY)	Net Change in Emissions, Vessel (TPY)	Net Change in Emissions, Total (TPY)	2020 Honolulu County Emissions (TPY)	Percent of 2020 Emissions
Methanol	0.020	--	0.020	1,157	0.002%
Toluene	0.007	0.021	0.028	885	0.003%
Formaldehyde	0.134	0.450	0.584	555	0.105%
Xylenes (Mixed Isomers)	0.005	0.015	0.020	577	0.003%
Acetaldehyde	0.046	0.103	0.150	358	0.042%
2,2,4-Trimethylpentane	0.000	0.075	0.075	260	0.029%
Hexane	0.000	0.029	0.029	252	0.012%
Ethyl Benzene	0.002	--	0.002	127	0.001%

[1] Individual values may not add exactly to total values due to rounding.
Notes: TPY = tons per year

As shown in Table 3.1-8, the increase in criteria pollutant emissions within 12 NM is relatively small compared to the existing emissions. Depending on the location of these activities and time of year, winds would disperse emissions from the military readiness activities away from the coastal land masses at frequencies similar to those shown in the wind roses presented in Appendix G. During periods when winds would transport emissions into coastal areas, the substantial transport distance and resulting dispersion of these emissions would produce negligible to minor increases of air pollutant concentrations near onshore locations.

Similarly, Table 3.1-9 shows that the increase in HAP emissions, within 12 NM, is negligible compared to the current level of HAP emissions in Honolulu County. Due to the low HAP emissions, occurring infrequently and given the distance to downwind receptors, emissions are not expected to contribute to human health risks from HAP exposure in areas where public presence is expected.

3.1.10.1.2.2 NEPA Impacts from Criteria Pollutants and HAPs Under Alternative 1 in the South Coast Air Basin

Table 3.1-10 presents the estimated increase in criteria pollutant emissions within 12 NM for proposed activities under Alternative 1 as compared to the current level of activities. The net change in emissions is also presented in tons per day and compared to the 2020 total SCAB daily emissions.

Table 3.1-10: Estimated Net Change in Annual Criteria Air Pollutant Emissions from Military Readiness Activities in the South Coast Air Basin (Within 12 NM), Alternative 1[1]

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	-0.3	0.3	-0.1	-0.1	-1	-1
Vessel	13	33	1.5	0.8	0.4	0.4
Munitions	2	0.2	--	--	0.4	0.3
Range Modernization and Sustainment	0	3	0.1	0.2	0.1	0.1
Net Change in Emissions from all Sources, TPY	15	37	2	1	0.3	0.2
Net Change in Emissions from all Sources, TPD	0.041	0.101	0.004	0.003	0.001	0.000
SCAB Air Emissions for 2020, TPD	1,973	361	562	17	219	87
Percent of Existing Emissions	0.002%	0.028%	0.001%	0.016%	0.000%	0.001%

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SCAB = South Coast Air Basin, SO_X = sulfur oxides, TPD = tons per day, TPY = tons per year, VOC = volatile organic compounds

Table 3.1-8 presents the estimated annual increase in emissions of HAPs of concern within 12 NM for proposed activities under Alternative 1 as compared to the current level of activities. Emissions are compared to the 2020 SCAB HAP emissions (see Appendix G).

Table 3.1-11: Estimated Net Change in Annual Hazardous Air Pollutants of Concern Emissions from Military Readiness Activities in the South Coast Air Basin (Within 12 NM), Alternative 1[1]

Pollutant	Net Change in Emissions, Aircraft (TPY)	Net Change in Emissions, Vessel (TPY)	Net Change in Emissions, Total (TPY)	2020 SCAB Emissions (TPY)	Percent of 2020 Emissions
Methanol	-0.002	--	-0.002	5,974	-0.00003%
Toluene	-0.001	0.003	0.003	4,717	0.0001%
Formaldehyde	-0.011	0.066	0.055	4,402	0.0013%
Xylenes (Mixed Isomers)	0.000	0.002	0.002	3,459	0.0001%
Acetaldehyde	-0.004	0.015	0.011	2,830	0.0004%
Benzene	-0.001	0.007	0.006	1,572	0.0004%
Hexane	--	0.004	0.004	1,258	0.0003%
2,2,4-Trimethylpentane	--	0.011	0.011	943	0.0012%
Ethylbenzene	-0.0001	--	-0.0001	629	-0.00002%

Individual values may not add exactly to total values due to rounding.
Notes: SCAB = South Coast Air Basin, TPY = tons per year

As shown in Table 3.1-10, the increase in criteria pollutant emissions within 12 NM is negligible compared to the existing emissions. Depending on the location of these activities and time of year, winds would disperse emissions from the military readiness activities away from the coastal land masses at frequencies similar to those shown in the wind roses presented in Appendix G. During periods when winds would transport emissions into coastal areas, the substantial transport distance and resulting dispersion of these emissions would produce negligible to minor increases of air pollutant concentrations near onshore locations.

Similarly, Table 3.1-11 shows that the increase in HAP emissions, within 12 NM, is negligible compared to the current level of HAP emissions within SCAB. Therefore, due to negligible HAP emissions, occurring infrequently and given the distance to downwind receptors, emissions are not expected to contribute to human health risks from HAP exposure in areas where public presence is expected.

3.1.10.1.2.3 NEPA Impacts from Criteria Pollutants and HAPs Under Alternative 1 in the San Diego Air Basin

Table 3.1-12 presents the estimated increase in criteria pollutant emissions within 12 NM for proposed activities under Alternative 1 as compared to the current level of activities. The net change in emissions is also presented in tons per day and compared to the 2020 total SCAB daily emissions.

Table 3.1-12: Estimated Net Change in Annual Air Pollutant Emissions from Military Readiness Activities in the San Diego Air Basin (Within 12 NM), Alternative 1[1]

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	11	8	1	1	6	6
Vessel	27	50	2	0.02	1	1
Munitions	1	0.1	--	--	0.2	0.1
Range Modernization and Sustainment	0.004	0.052	0.000	0.004	0.002	0.002
Net Change in Emissions from all Sources, TPY	38	59	3	1	8	8
Net Change in Emissions from all Sources, TPD	0.105	0.161	0.008	0.001	0.021	0.021
SDAB Air Emissions for 2020, TPD	501	88	191	3	95	31
Percent of Existing Emissions	0.02%	0.18%	0.004%	0.05%	0.02%	0.07%

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SDAB = San Diego Air Basin, SO_X = sulfur oxides, TPD = tons per day, TPY = tons per year, VOC = volatile organic compounds

Table 3.1-13 presents the estimated annual increase in emissions of HAPs of concern within 12 NM for proposed activities under Alternative 1 as compared to the current level of activities. Emissions are compared to the 2020 SDAB HAP emissions (Appendix G).

Table 3.1-13: Estimated Net Change in Annual Hazardous Air Pollutants of Concern Emissions from Military Readiness Activities in the San Diego Air Basin (Within 12 NM), Alternative 1[1]

Pollutant	Net Change in Emissions, Aircraft (TPY)	Net Change in Emissions, Vessel (TPY)	Net Change in Emissions, Total (TPY)	2020 SDAB Emissions (TPY)	Percent of 2020 Emissions
Methanol	0.019	--	0.019	2,337	0.001%
Toluene	0.007	0.004	0.011	1,423	0.0007%
Formaldehyde	0.127	0.082	0.209	1,423	0.0147%
Xylenes (Mixed Isomers)	0.005	0.003	0.007	1,118	0.0007%
Acetaldehyde	0.044	0.019	0.063	813	0.0077%
Benzene	0.017	0.009	0.026	508	0.0052%
2,2,4-Trimethylpentane	0.000	0.014	0.014	305	0.0045%
Hexane	--	0.005	0.005	305	0.0017%
Ethylbenzene	0.002	--	0.002	203	0.0009%

[1] Individual values may not add exactly to total values due to rounding.
Notes: SDAB = San Diego Air Basin, TPY = tons per year

As shown in Table 3.1-12, the increase in criteria pollutant emissions within 12 NM is small or negligible compared to the existing emissions. Depending on the location of these activities and time of year, winds would disperse emissions from the military readiness activities away from the coastal land masses at frequencies similar to those shown in the wind roses presented in Appendix G. During periods when winds would transport emissions into coastal areas, the substantial transport distance and resulting dispersion of these emissions would produce negligible to minor increases of air pollutant concentrations near onshore locations.

Similarly, Table 3.1-13 shows that the increase in HAP emissions, within 12 NM, is negligible compared to the current level of HAP emissions within SCAB. Due to negligible HAP emissions, occurring infrequently and given the distance to downwind receptors, emissions are not expected to contribute to human health risks from HAP exposure in areas where public presence is expected.

3.1.10.1.2.4 Effects from Criteria Pollutants and HAPs Under Alternative 1 on the Portside Community

Table 3.1-14 compares the estimated increase in criteria pollutant emissions within 3 NM and 12 NM for proposed activities under Alternative 1 to the 2018 emissions baseline emissions published for the Portside Community (Appendix G). As shown, the estimated increase in emissions is relatively small compared to the 2018 Portside Community emissions, especially for emission increases within 3 NM. Any increases in volatile and inorganic HAP/TAC emissions would be at least an order of magnitude lower than VOC and $PM_{2.5}$ emission increases, resulting in negligible HAP/TAC emission increases relative to the current emissions. Due to the expected low emissions occurring infrequently and given the distance to downwind receptors within the Portside Community, emissions are not expected to cause significant and unacceptable health effects to the Portside Community, including sensitive receptors.

Table 3.1-14: Comparison of the Net Change in Annual Air Pollutant Emissions from Military Readiness Activities in the San Diego Air Basin to the 2018 Portside Community Emissions, Alternative 1

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Portside Community Emission, 2018	--	1,462	1,248	--	728.1	193.9
Net Change in Emissions from all Sources (within 3 NM)	20.8	13.4	1.2	0.3	4.7	4.6
Percent of Portside Community Emissions	--	0.9%	0.1%	--	0.6%	2.4%
Net Change in Emissions from all Sources (within 12 NM)	38.2	58.8	2.9	0.5	7.6	7.5
Percent of Portside Community Emissions	--	4.0%	0.2%	--	1.0%	3.9%

Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

NEPA Impacts from Criteria Pollutants and HAPs Under Alternative 1 in the South Central Coast Air Basin

Table 3.1-15 presents the estimated increase in criteria pollutant emissions within 12 NM for proposed activities under Alternative 1 as compared to the current level of activities. The net change in emissions is also presented in tons per day and compared to the 2020 total South Central Coast Air Basin daily emissions.

Table 3.1-15: Estimated Net Change in Annual Air Pollutant Emissions from Military Readiness Activities in the South Central Coast Air Basin (Within 12 NM), Alternative 11

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	1	1	0	0	1	1
Vessel	7	33	1	0	1	1
Munitions	2	0	0	0	1	1
Net Change in Emissions from all Sources, TPY	11	34	1	0	2	2
Net Change in Emissions from all Sources, TPD	0.03	0.09	0.004	0.0002	0.01	0.01
South Central Coast Air Basin Air Emissions for 2020, TPD	450	43	266	4	66	32
Percent of Existing Emissions	0.01%	0.22%	0.001%	0.005%	0.01%	0.02%

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPD = tons per day, TPY = tons per year, VOC = volatile organic compounds

Table 3.1-16 presents the estimated annual increase in emissions of HAPs of concern within 12 NM for proposed activities under Alternative 1 as compared to the current level of activities. Emissions are compared to the 2020 South Central Coast Air Basin HAP emissions (Appendix G).

Table 3.1-16: Estimated Net Change in Annual Hazardous Air Pollutants of Concern Emissions from Military Readiness Activities in the South Central Coast Air Basin (Within 12 NM), Alternative 1[1]

Pollutant	Net Change in Emissions, Aircraft (TPY)	Net Change in Emissions, Vessel (TPY)	Net Change in Emissions, Total (TPY)	2020 SCCAB Emissions (TPY)	Percent of 2020 Emissions
Methanol	0.002	--	0.002	7,537	0.000%
Formaldehyde	0.013	0.054	0.067	2,029	0.0033%
Acetaldehyde	0.004	0.012	0.017	1,449	0.0012%
Toluene	0.001	0.003	0.003	870	0.0004%
Xylenes (Mixed Isomers)	0.000	0.002	0.002	580	0.0004%
Benzene	0.002	0.006	0.008	290	0.0027%
2,2,4-Trimethylpentane	--	0.009	0.009	290	0.0031%
Hexane	--	0.004	0.004	290	0.0012%
Ethylbenzene	0.000	--	0.000	145	0.0001%

[1] Individual values may not add exactly to total values due to rounding.
Notes: TPY = tons per year

As shown in Table 3.1-15, the increase in criteria pollutant emissions within 12 NM is small or negligible compared to the existing emissions. Depending on the location of these activities and time of year, winds would disperse emissions from the military readiness activities away from the coastal land masses at frequencies similar to those shown in the wind roses presented in Appendix G. During periods when winds would transport emissions into coastal areas, the substantial transport distance and resulting dispersion of these emissions would produce negligible to minor increases of air pollutant concentrations near onshore locations.

Similarly, Table 3.1-16 shows that the increase in HAP emissions, within 12 NM, is negligible compared to the current level of HAP emissions within SCAB. Due to negligible HAP emissions occurring infrequently and given the distance to downwind receptors, emissions are not expected to contribute to human health risks from HAP exposure in areas where public presence is expected.

3.1.10.1.2.5 NEPA Impacts from Criteria Pollutants and HAPs Under Alternative 1 in the North Central Coast Air Basin

Table 3.1-17 presents the estimated increase in criteria pollutant emissions within 12 NM for proposed activities under Alternative 1 as compared to the current level of activities. The net change in emissions is also presented in tons per day and compared to the 2020 total North Central Coast Air Basin daily emissions.

Table 3.1-17: Estimated Net Change in Annual Air Pollutant Emissions from Military Readiness Activities in the North Central Coast Air Basin (Within 12 NM), Alternative 1[1]

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	0.08	0.20	0.01	0.01	0.06	0.06
Vessel	1	3	0.17	-0.05	0.06	0.06
Munitions	0.2	0.0	0.0	0.000	0.006	0.005
Net Change in Emissions from all Sources, TPY	1	3	0.2	0.0	0.1	0.1
Net Change in Emissions from all Sources, TPD	0.0025	0.0084	0.0005	-0.0001	0.0003	0.0003
North Central Coast Air Basin Air Emissions for 2020, TPD	728	36	191	4	100	57
Percent of Existing Emissions	<0.001%	0.02%	<0.001%	<0.001%	<0.001%	0.001%

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPD = tons per day, TPY = tons per year, VOC = volatile organic compounds

Table 3.1-18 presents the estimated annual increase in emissions of HAPs of concern within 12 NM for proposed activities under Alternative 1 as compared to the current level of activities. Emissions are compared to the 2020 North Central Coast Air Basin HAP emissions (Appendix G).

Table 3.1-18: Estimated Net Change in Annual Hazardous Air Pollutants of Concern Emissions from Military Readiness Activities in the North Central Coast Air Basin (Within 12 NM), Alternative 1[1]

Pollutant	Net Change in Emissions, Aircraft (TPY)	Net Change in Emissions, Vessel (TPY)	Net Change in Emissions, Total (TPY)	2020 NCCAB Emissions (TPY)	Percent of 2020 Emissions
Methanol	0.0001	--	0.0001	7,537	0.000001%
Formaldehyde	0.001	0.007	0.008	2,029	0.0001%
Acetaldehyde	0.0003	0.002	0.002	1,449	0.00003%
Acrolein	0.0002	0.0003	0.000	870	0.00003%
Naphthalene	--	0.005	0.005	580	0.0003%
Benzene	0.0001	0.001	0.001	290	0.00005%
Toluene	0.00004	0.0004	0.0004	290	0.00002%
Xylenes (Mixed Isomers)	0.00003	0.0002	0.0003	290	0.00002%
1,3-Butadiene	0.0001	--	0.0001	145	0.00001%

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: NCCAB: North Central Coast Air Basin, TPY = tons per year

As shown in Table 3.1-17, the increase in criteria pollutant emissions within 12 NM is negligible compared to the existing emissions. Depending on the location of these activities and time of year, winds would disperse emissions from the military readiness activities away from the coastal land masses at frequencies similar to those shown in the wind roses presented in Appendix G. During periods when winds would transport emissions into coastal areas, the substantial transport distance and resulting dispersion of these emissions would produce negligible to minor increases of air pollutant concentrations near onshore locations.

Similarly, Table 3.1-18 shows that the increase in HAP emissions, within 12 NM, is negligible compared to the current level of HAP emissions within SCAB. The negligible HAP emissions, occurring infrequently and given the distance to downwind receptors, emissions are not expected to contribute to human health risks from HAP exposure in areas where public presence is expected.

3.1.10.1.3 Executive Order 12114 Impacts from Criteria Pollutants and HAPs Under Alternative 1 Greater than 12 NM from Shore

Table 3.1-19 presents the estimated total annual emission increase beyond 12 NM under Alternative 1. Approximately 50 percent of emission increases would occur in distances greater than 12 NM offshore. Natural mixing is expected to substantially disperse pollutants before they reach the coastal land mass. No significant effects on air quality are anticipated to occur as a result of criteria pollutants emissions from activities beyond territorial activities.

Table 3.1-19: Estimated Net Change in Annual Air Pollutant Emissions from Military Readiness Activities Greater than 12 NM, Alternative 1[1]

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	17	65	2	2	11	11
Vessel	113	359	14	0	8	8
Munitions	32	1	0	0	26	25
Range Modernization and Sustainment	0.4	4.6	0.1	0.3	0.1	0.1
Net Change in Emissions from all Sources, TPY	161	429	15	3	46	45

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.

Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

3.1.10.1.3.1 Summary of Effects from Criteria Pollutants and HAPs Under Alternative 1

While criteria air pollutants emitted in the Study Area may be transported ashore, they would not affect the attainment status of the relevant air quality control regions, because (1) the increase emissions from the proposed change in military readiness activities are small or negligible compared to the existing emissions in each region, and (2) the pollutants are substantially dispersed during transport. Similarly, the increase in HAP emissions is negligible compared to the HAP emissions in each region. With the small amount of HAP emissions occurring infrequently and given the distance to downwind receptors, emissions are not expected to cause significant and unacceptable health effects to populations, including sensitive receptors. The criteria air pollutants emitted over non-territorial waters within the Study Area would be dispersed over vast areas of open ocean and thus would not have a measurable impact on environmental resources in those areas. Net emission increases within nonattainment or maintenance areas in the Study Area are below the applicable General Conformity Rule *de minimis* thresholds. Therefore, air quality impacts would be less than significant as a result of implementation of Alternative 1.

3.1.10.2 Effects from Air Emissions under Alternative 2

Alternative 2 reflects the maximum number of training activities that could occur within a given year and assumes that the maximum level of activity would occur every year over a seven-year period. This alternative would also include higher levels of annual testing of certain systems to support expedited delivery of these systems to the fleet.

Table 3.1-20 presents the total estimated increase in emissions under Alternative 2 within the Study Area and includes all emissions generated, regardless of proximity to the coastline. The majority of these emissions increases occur beyond state waters, with much of emissions in most areas occurring beyond the state water boundaries.

Table 3.1-20: Annual Criteria Air Pollutant Emissions from Military Readiness Activities Occurring within the HCTT Study Area, Alternative 2

Activity	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Training	379	1,015	40	6	70	69
Testing	5	27	1	3	17	17
Range Modernization and Sustainment	1	14	0	1	0.4	0.4
Total Military Readiness Activities	384	1,042	41	8	87	86

Notes: CO = carbon monoxide, NO_x = oxides of nitrogen, VOC = volatile organic compounds, SO_x = sulfur oxides, PM_{10} = particulate matter less than or equal to 10 microns in aerodynamic diameter, $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in aerodynamic diameter, tpy = tons per year

3.1.10.2.1 General Conformity Analysis under Alternative 2 in Areas Designated Nonattainment or Maintenance

3.1.10.2.1.1 Southern California Areas Designated Nonattainment or Maintenance

Table 3.1-21 presents the estimated annual emissions increase, within 0-3 NM, for proposed activities under Alternative 2 as compared to the current level of nearshore activities. The net annual emissions increases are compared with the applicable General Conformity Rule *de minimis* thresholds. As shown in Table 3.1-21, estimated annual emission increases for all pollutants are below applicable General Conformity *de minimis* levels. A General Conformity Determination is not required, and a Record of Non-Applicability (Appendix G) has been prepared and presented in Appendix G.

Table 3.1-21: Estimated Net Change in Annual Criteria Air Pollutant and Precursors Emissions from Military Readiness Activities in the South Coast Air Basin (Within 3 NM), Alternative 2[1]

Source	Emissions Increase by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Net Change in Emissions from all Sources	9.2	9.2	0.7	0.7	0.9	0.8
De Minimis Threshold	100	10	10	70	100	70

[1] Table includes criteria pollutant precursors (e.g., VOC). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides (precursor to $PM_{2.5}$), TPY = tons per year, VOC = volatile organic compounds

Table 3.1-22 presents the estimated annual emissions increase, within 0-3 NM, for proposed activities within San Diego Air Basin under Alternative 2 as compared to the current level of nearshore activities. The net annual emissions increases are compared with the applicable General Conformity Rule *de minimis* thresholds. As shown in Table 3.1-22, estimated annual emission increases for all pollutants are below applicable General Conformity *de minimis* levels. A General Conformity Determination is not required, and a Record of Non-Applicability has been prepared and is presented in Appendix G.

Table 3.1-22: Estimated Net Change in Annual Criteria Air Pollutant and Precursors Emissions from Military Readiness Activities in the San Diego Air Basin (Within 3 NM), Alternative 2[1]

Source	Emissions Increase by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Net Change in Emissions from all Sources	24	22	1	0.4	6	6
De Minimis Threshold	N/A	25	25	N/A	N/A	N/A

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

3.1.10.2.1.2 South Central Coast Air Basin Designated Nonattainment or Maintenance

Portions of PMSR are located within the VCAPCD serious ozone nonattainment area. Table 3.1-23 presents the estimated annual emissions increase, within 0-3 NM, for proposed activities under Alternative 2 as compared to the current level of nearshore activities. The net annual emissions increases are compared with the applicable General Conformity Rule *de minimis* thresholds. As shown in Table 3.1-23, estimated annual emission increases for all pollutants are below applicable General Conformity *de minimis* levels. A General Conformity Determination is not required, and a Record of Non-Applicability (Appendix G) has been prepared and presented in Appendix G.

Table 3.1-23: Estimated Net Change in Annual Criteria Air Pollutant and Precursors Emissions from Military Readiness Activities in the South Central Coast Air Basin (Within 3 NM), Alternative 2[1]

Source	Emissions Increase by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Net Change in Emissions from all Sources	2	10	0.3	0.03	0.4	0.4
De Minimis Threshold	N/A	50	50	N/A	N/A	N/A

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

3.1.10.2.2 National Environmental Policy Act Impacts from Criteria Pollutants and HAPs Under Alternative 2

3.1.10.2.2.1 NEPA Impacts from Criteria Pollutants and HAPs Under Alternative 2 in the State of Hawaii

Table 3.1-24 presents the estimated increase in criteria pollutant emissions within 12 NM for proposed activities under Alternative 2 as compared to the current level of activities. The annual increase in emissions is compared to the 2020 annual emissions, in tons per year, reported for Honolulu County (see Appendix G).

Table 3.1-24: Estimated Net Change in Annual Criteria Air Pollutant and Precursors Emissions from Military Readiness Activities in the State of Hawaii (Within 12 NM), Alternative 2[1]

Source	Emissions Increase by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	13	34	1	1	10	10
Vessel	37	265	11	0	8	8
Munitions	0.500	0.021	0.000	0.000	0.075	0.053
Range Modernization and Sustainment	0.31	3.88	0.10	0.29	0.10	0.10
Total Net Change in Emissions from all Sources	51	302	12	2	18	18
Honolulu County Air Emissions for 2020, TPY	77,700	20,652	37,295	11,446	14,553	4,369
Percent of Existing Emissions	0.07%	1.46%	0.03%	0.02%	0.12%	0.41%

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

As shown in Table 3.1-24, the increase in criteria pollutant emissions within 12 NM is relatively small compared to the existing emissions. Depending on the location of these activities and time of year, winds would disperse emissions from the military readiness activities away from the coastal land masses at frequencies similar to those shown in the wind roses presented in Appendix G. During periods when winds would transport emissions into coastal areas, the substantial transport distance and resulting dispersion of these emissions would produce negligible to minor increases of air pollutant concentrations near onshore locations.

Similar to Alternative 1, the increase in HAP emissions, within 12 NM, is expected to be negligible compared to the current level of HAP emissions in Honolulu County. The low HAP emissions, occurring infrequently and given the distance to downwind receptors, emissions are not expected to contribute to human health risks from HAP exposure in areas where public presence is expected.

3.1.10.2.2.2 NEPA Impacts from Criteria Pollutants and HAPs Under Alternative 2 in the South Coast Air Basin

Table 3.1-25 presents the estimated increase in criteria pollutant emissions within 12 NM for proposed activities under Alternative 2 as compared to the current level of activities. The net change in emissions is also presented in tons per day and compared to the 2020 total SCAB daily emissions.

Table 3.1-25: Estimated Net Change in Annual Criteria Air Pollutant and Precursors Emissions from Military Readiness Activities in the South Coast Air Basin (Within 12 NM), Alternative 2[1]

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	1	2	0	0	0	0
Vessel	17	42	2	1	1	1
Munitions	2	0.2	0.0	0.0	0.4	0.3
Range Modernization and Sustainment	0	3	0	0	0	0
Net Change in Emissions from all Sources	20	47	2	1	1	1
SCAB Air Emissions for 2020, TPD	0.054	0.128	0.005	0.003	0.003	0.003
Percent of Existing Emissions	1,973	361	562	17	219	87
Net Change in Emissions from all Sources	0.003%	0.035%	0.001%	0.019%	0.002%	0.004%

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.

Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SCAB = South Coast Air Basin, SO_X = sulfur oxides, TPD = tons per day, TPY = tons per year, VOC = volatile organic compounds

Similar to Alternative 1, the increase in HAP emissions, within 12 NM, is expected to be negligible compared to the current level of HAP emissions within SCAB. The negligible HAP emissions occurring infrequently and given the distance to downwind receptors, emissions are not expected to contribute to human health risks from HAP exposure in areas where public presence is expected.

3.1.10.2.2.3 NEPA Impacts from Criteria Pollutants and HAPs Under Alternative 2 in the San Diego Air Basin

Table 3.1-26 presents the estimated increase in criteria pollutant emissions within 12 NM for proposed activities under Alternative 2 as compared to the current level of activities. The net change in emissions is also presented in tons per day and compared to the 2020 total SCAB daily emissions.

Table 3.1-26: Estimated Net Change in Annual Air Pollutant Emissions from Military Readiness Activities in the San Diego Air Basin (Within 12 NM), Alternative 2[1]

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	13	10	1	1	8	8
Vessel	31	61	2	0	1	1
Munitions	1	0.1	0.0	0.0	0.2	0.1
Range Modernization and Sustainment	0.004	0.05	0.0004	0.004	0.002	0.0016
Net Change in Emissions from all Sources, TPY	44	71	3	1	9	9
Net Change in Emissions from all Sources, TPD	0.121	0.196	0.009	0.002	0.025	0.025
SDAB Air Emissions for 2020, TPD	501	88	191	3	95	31
Percent of Existing Emissions	0.02%	0.22%	0.005%	0.07%	0.03%	0.08%

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.

Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPD = tons per day, TPY = tons per year, VOC = volatile organic compounds

As shown in Table 3.1-26, the increase in criteria pollutant emissions within 12 NM is small or negligible compared to the existing emissions. Depending on the location of these activities and time of year, winds would disperse emissions from the military readiness activities away from the coastal land masses at frequencies similar to those shown in the wind roses presented in Appendix G. During periods when winds would transport emissions into coastal areas, the substantial transport distance and resulting dispersion of these emissions would produce negligible to minor increases of air pollutant concentrations near onshore locations.

Similar to Alternative 1, the increase in HAP emissions, within 12 NM, is expected to be negligible compared to the current level of HAP emissions within SDAB. The negligible HAP emissions occurring infrequently and given the distance to downwind receptors, emissions are not expected to contribute to human health risks from HAP exposure in areas where public presence is expected.

3.1.10.2.2.4 Effects from Criteria Pollutants and HAPs Under Alternative 2 on the Portside Community

Table 3.1-27 compares the estimated increase in criteria pollutant emissions within 3 NM and 12 NM for proposed activities under Alternative 2 to the 2018 emissions baseline emissions published for the Portside Community (Appendix G). As shown, the estimated increase in emissions is relatively small compared to the 2018 Portside Community emissions, especially for emission increases within 3 NM. Any increases in volatile and inorganic HAP/TAC emissions would be at least an order of magnitude lower than VOC and $PM_{2.5}$ emission increases, resulting in negligible HAP/TAC emission increases relative to the current emissions. Due to negligible increase in HAP/TAC, emissions occurring infrequently and given the distance to downwind receptors within the Portside Community, emissions are not expected to cause significant and unacceptable health effects to the Portside Community, including sensitive receptors.

Table 3.1-27: Comparison of the Net Change in Annual Air Pollutant Emissions from Military Readiness Activities in the San Diego Air Basin to the 2018 Portside Community Emissions, Alternative 2

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Portside Community Emission, 2018	--	1,462	1,248	--	728.1	193.9
Net Change in Emissions from all Sources (within 3 NM)	24	22	1	0	6	6
Percent of Portside Community Emissions	--	1.5%	0.1%	--	0.8%	2.9%
Net Change in Emissions from all Sources (within 12 NM)	44	71	3	1	9	9
Percent of Portside Community Emissions	--	4.9%	0.3%	--	1.2%	4.6%

Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

3.1.10.2.2.5 NEPA Impacts from Criteria Pollutants and HAPs Under Alternative 2 in the South Central Coast Air Basin

Table 3.1-28 presents the estimated increase in criteria pollutant emissions within 12 NM for proposed activities under Alternative 2 as compared to the current level of activities. The net change in emissions is also presented in tons per day and compared to the 2020 total South Central Coast Air Basin daily emissions.

Table 3.1-28: Estimated Net Change in Annual Air Pollutant Emissions from Military Readiness Activities in the South Central Coast Air Basin (Within 12 NM), Alternative 2[1]

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	1	2	0	0	1	1
Vessel	8	35	1	0	1	1
Munitions	2	0.0	0.0	0.0	0.8	0.6
Net Change in Emissions from all Sources, TPY	12	37	1	0	3	2
Net Change in Emissions from all Sources, TPD	0.03	0.10	0.004	0.0004	0.01	0.01
South Central Coast Air Basin Air Emissions for 2020, TPD	450	43	266	4	66	32
Percent of Existing Emissions	0.01%	0.24%	0.002%	0.01%	0.01%	0.02%

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPD = tons per day, TPY = tons per year, VOC = volatile organic compounds

As shown in Table 3.1-28, the increase in criteria pollutant emissions within 12 NM is small or negligible compared to the existing emissions. Depending on the location of these activities and time of year, winds would disperse emissions from the military readiness activities away from the coastal land masses at frequencies similar to those shown in the wind roses presented in Appendix G. During periods when winds would transport emissions into coastal areas, the substantial transport distance and resulting dispersion of these emissions would produce negligible to minor increases of air pollutant concentrations near onshore locations.

Similar to Alternative 1, the increase in HAP emissions, within 12 NM, is expected to be negligible compared to the current level of HAP emissions within the South Central Coast Air Basin. Therefore, due to negligible HAP emissions, occurring infrequently and given the distance to downwind receptors, emissions are not expected to contribute to human health risks from HAP exposure in areas where public presence is expected.

3.1.10.2.2.6 NEPA Impacts from Criteria Pollutants and HAPs Under Alternative 2 in the North Central Coast Air Basin

Table 3.1-29 presents the estimated increase in criteria pollutant emissions within 12 NM for proposed activities under Alternative 2 as compared to the current level of activities. The net change in emissions is also presented in tons per day and compared to the 2020 total North Central Coast Air Basin daily emissions.

As shown in Table 3.1-29, the increase in criteria pollutant emissions within 12 NM is negligible compared to the existing emissions. Depending on the location of these activities and time of year, winds would disperse emissions from the military readiness activities away from the coastal land masses at frequencies similar to those shown in the wind roses presented in Appendix G. During periods when winds would transport emissions into coastal areas, the substantial transport distance and resulting dispersion of these emissions would produce negligible to minor increases of air pollutant concentrations near onshore locations.

Table 3.1-29: Estimated Net Change in Annual Air Pollutant Emissions from Military Readiness Activities in the North Central Coast Air Basin (Within 12 NM), Alternative 2[1]

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	0	0	0	0	0	0
Vessel	1	4	0	0	0	0
Munitions	0.2	0.0	0.0	0.0	0.0	0.0
Net Change in Emissions from all Sources, TPY	2	4	0	0	0	0
Net Change in Emissions from all Sources, TPD	0.0042	0.0121	0.0006	0.0000	0.0004	0.0004
North Central Coast Air Basin Air Emissions for 2020, TPD	728	36	191	4	100	57
Percent of Existing Emissions	0.0006%	0.03%	0.0003%	0.001%	0.0004%	0.001%

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.

Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPD = tons per day, TPY = tons per year, VOC = volatile organic compounds

Similar to Alternative 1, the increase in HAP emissions, within 12 NM, is expected to be negligible compared to the current level of HAP emissions within the North Central Coast Air Basin. Therefore, due to negligible increase in HAP emissions, occurring infrequently and given the distance to downwind receptors, emissions are not expected to contribute to human health risks from HAP exposure in areas where public presence is expected.

3.1.10.2.3 Executive Order 12114 Impacts from Criteria Pollutants and HAPs Under Alternative 2 Greater than 12 NM from Shore

Table 3.1-30 presents the estimated total annual emission increase beyond 12 NM under Alternative 2. Approximately 50 percent of emission increases would occur in distances greater than 12 NM offshore. Natural mixing is expected to substantially disperse pollutants before they reach the coastal land mass. No significant effects on air quality are anticipated to occur as a result of criteria pollutants emissions from activities beyond territorial activities.

Table 3.1-30: Estimated Net Change in Annual Air Pollutant Emissions from Military Readiness Activities Greater than 12 NM, Alternative 2[1]

Source	Emissions by Air Pollutant (TPY)					
	CO	NO_X	VOC	SO_X	PM_{10}	$PM_{2.5}$
Aircraft	26	83	3	3	19	19
Vessel	193	502	19	1	11	11
Munitions	32	1	0	0	26	25
Range Modernization and Sustainment	0.4	4.6	0.1	0.3	0.1	0.1
Net Change in Emissions from all Sources, TPY	252	590	22	5	56	55

[1] Table includes criteria pollutant precursors (e.g., volatile organic compounds). Individual values may not add exactly to total values due to rounding.
Notes: CO = carbon monoxide, NO_X = nitrogen oxides, $PM_{2.5}$ = particulate matter ≤ 2.5 microns in diameter, PM_{10} = particulate matter≤ 10 microns in diameter, SO_X = sulfur oxides, TPY = tons per year, VOC = volatile organic compounds

3.1.10.2.3.1 Summary of Impacts from Criteria Pollutants and HAPs Under Alternative 2

While criteria air pollutants emitted in the Study Area may be transported ashore, they would not affect the attainment status of the relevant air quality control regions, because (1) the increase emissions from the proposed change in military readiness activities are small or negligible compared to the existing emissions in each region, and (2) the pollutants are substantially dispersed during transport. Similarly, the increase in HAP emissions is negligible compared to the HAP emissions in each region. With the small amount of HAP emissions occurring infrequently and given the distance to downwind receptors, emissions are not expected to cause significant and unacceptable health effects to populations, including sensitive receptors. The criteria air pollutants emitted over non-territorial waters within the Study Area would be dispersed over vast areas of open ocean and thus would not have a measurable impact on environmental resources in those areas. Net emission increases within nonattainment or maintenance areas in the Study Area are below the applicable General Conformity Rule *de minimis* thresholds. Therefore, although the increase in criteria pollutants and HAPs emissions is greater under Alternative 2 than Alternative 1, the air quality impacts would be less than significant as a result of implementation of Alternative 2.

3.1.10.3 Greenhouse Gas Emissions and Climate Change

Activities conducted as part of the Proposed Action would involve mobile sources using fossil fuel combustion as a source of power. Additionally, the expenditure of munitions could generate greenhouse gas emissions. Greenhouse gas emissions, depending on type, can persist in the atmosphere for extended periods of time, from 12 years for methane to up to 200 years for carbon dioxide. While the emissions generated by testing and training activities alone would not be enough to cause global warming, in combination with past and future emissions from all other sources, they would contribute incrementally to the global warming that produces the adverse effects of climate change.

The increase in greenhouse gas emissions for each alternative was calculated for all altitudes using emissions factors provided by the U.S. Navy for aircraft and vessels and published by the USEPA for munitions. Greenhouse gas emissions are summarized in Table 3.1-31. These data show that Alternatives 1 and 2 would result in increases in GHG emissions within the Study Area compared to the current level of activities. GHG emissions from either action alternative would incrementally contribute to future climate change, some effects of which are identified below.

Table 3.1-31: Estimated increase in Annual Greenhouse Gas Emissions from Military Readiness Activities in the Hawaii-California Training and Testing Study Area

Alternative	Annual Increase in CO_2-Equivalent Emissions CO_2 Eq. (in Metric Tons/Year)
Alternative 1	583,053
Alternative 2	693,366

Note: CO_2 Eq. = carbon dioxide equivalent

The CEQ has released interim guidance on when and how federal agencies should consider GHG emissions and climate change in NEPA analyses (Council on Environmental Quality, 2023). The guidance emphasizes that when conducting climate change analyses in NEPA reviews, agencies should consider the following: (1) the potential effects of a proposed action on climate change, including by assessing both GHG emissions and reductions from the proposed action; and (2) the effects of climate change on a proposed action and its environmental impacts.

The guidance also recommends that agencies provide additional context for GHG emissions, in most circumstances through the use of the best available social cost of GHG estimates to help decision-makers and the public make comparisons, evaluate the significance of the proposed action and alternatives, and better understand the tradeoff between alternatives. Agencies can also provide accessible comparisons or equivalents to help the public and decision makers understand GHG emissions in more familiar terms. For example, the estimated increase in GHG emissions from Alternatives 1 and 2 are similar to that of electricity used by 115,069 and 136,840 average U.S. households annually, respectively (U.S. Environmental Protection Agency, 2024d).

To minimize GHG emissions from the action alternatives, the Navy would comply with applicable regulations and GHG policies, and the federal vehicle clean fuels, mileage efficiency, and emissions regulations for mobile sources. The Navy would continue to implement proactive measures to reduce their overall GHG emissions by decreasing the use of fossil fuels and increasing the use of alternative energy sources in accordance with the goals set by EOs, the Energy Policy Acts of 2005 and 2020, and Navy and DoD policies (such as the Navy Climate Action Plan; (U.S. Department of the Navy, 2022). These GHG initiatives are not emission reductions proposed to offset GHG emissions generated by the action alternatives, but rather demonstrate initial responses for the Navy to factor GHG management into Navy proposals and impact analyses.

Climate change could impact implementation of the action alternatives and the adaptation strategies needed to respond to future conditions. For the Study Area, the main effect of climate change is increased storminess and sea level rise, with additional effects documented by climate analyses presented in the Fifth National Climate Assessment (U.S. Global Change Research Program, 2023). Operations by the Navy and USCG have adapted to these changes. However, exacerbation of these conditions in the future could impede proposed activities during extreme events. Regarding sea level rise, the DoD has an active program that develops measures for installations to adapt to this threat and its potential to displace coastal operations and infrastructure (Strategic Environmental Research and Development Program, 2023).

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3.2 Sediments and Water Quality

SEDIMENT AND WATER QUALITY SYNOPSIS

Stressors to sediments and water quality that could result from the Proposed Action within the Study Area were considered, and the following conclusions have been reached for the Preferred Alternative (Alternative 1).

- Explosives and Explosives Byproducts: Military readiness activities would result in releases of explosives and constituent compounds to the marine environment that would remain in the benthic environment, either within the munition or on adjacent substrate depending on the integrity of the undetonated munitions casing and the physical conditions on the seafloor where the munitions reside. Effects on sediment and water quality from unconsumed explosives and constituent chemical compounds would be localized to an area immediately adjacent to the munition. Chemical and physical changes to sediments, as measured by the concentrations of explosives byproduct compounds, may be detectable within a limited radius of the munition but would not result in harmful effects on biological resources or habitats. As such, explosive and explosives byproducts would not have reasonably foreseeable adverse effects on sediment and water quality.
- Metals: Effects on sediment and water quality from expended objects containing metals (e.g., non-explosive munitions) would vary depending on the metal type, locations where the objects are released, and the physical conditions on the seafloor where the metal objects reside. The effects of releases from expended materials with metal components or munitions on sediment and water quality may be measurable within the area adjacent to the metal object, but concentrations would be below applicable regulatory standards or guidelines for adverse effects on biological resources and habitats. As such, metals would not have reasonably foreseeable adverse effects on sediment and water quality.
- Chemicals and Other Materials not Associated with Explosives: Effects from chemicals and other materials not associated with explosives would be both short term and long term, depending on the chemical and the physical conditions (e.g., substrate, temperature, currents) on the seafloor where the source materials reside. Effects would be localized to the immediate area of the source of the chemicals/materials. Chemical and physical changes to sediment and water quality, as measured by the concentrations of contaminants associated with the expended material, would likely be indistinguishable from conditions at reference locations. As such, chemicals and other materials not associated with explosives would not have reasonably foreseeable adverse effects on sediment and water quality.

3.2.1 Introduction

The following sections provide an overview of the characteristics of sediments and water quality in the HCTT Study Area and describe, in general terms, the methods used to analyze potential effects of the Proposed Action on these resources.

Supporting information, including an overview of sediment sources and characteristics in the Study Area, are provided in Appendix C and the methods used to determine effects on sediments and water quality in Appendix F.

3.2.2 Affected Environment

The affected environment provides the context for evaluating the effects of the proposed military readiness activities on sediments and water quality.

3.2.2.1 General Background

Much of the general background has not changed over what was described in the 2018 HSTT and 2022 PMSR EIS/OEISs. The HCTT Study Area differs from the HSTT Study Area in that HCTT includes an expanded SOCAL Range Complex (West Extension and South Extension); special use airspace corresponding to the new extensions; the inclusion of two existing at-sea ranges, PMSR and the NOCAL Range Complex; inclusion of areas along the Southern California coastline from approximately Dana Point to Port Hueneme; and four amphibious approach lanes providing California land access from NOCAL and PMSR. Nearshore areas within the Hawaii Study Area, such as Kaneohe Bay or MCTAB, may be used more frequently or for new military readiness activities, but the geographic boundary of the Hawaii Study Area is unchanged. Updated information for sediments and water quality in these updated areas was included, where feasible. For supporting information on general background, refer to Appendix C.

3.2.2.2 Sediments

Sources for sediment quality rely on the *National Coastal Condition Report (NCCR) IV* (U.S. Environmental Protection Agency, 2012b). This report has not been updated since 2012; however, there is no comparable comprehensive sediment quality information for the Study Area. Since most of the sediment quality data is the same as what was provided in the 2018 HSTT EIS/OEIS, Sections 3.2.2.2 and 3.2.2.3 do not go into extensive detail.

3.2.2.2.1 Sediment Quality in Hawaii Study Area

In the *NCCR IV* (U.S. Environmental Protection Agency, 2012b), estuarine and coastal ocean areas in the USEPA's Hawaii Region were rated good, fair, or poor for sediment quality, which is based on measurements of sediment contaminants and total organic carbon in sediments (no data on sediment toxicity is available for Hawaii). The USEPA rated 74 percent of coastal ocean sediments good, 8 percent fair, and 18 percent poor (Figure 3.2-1). Specifically for contaminants, 83 percent of coastal waters of the Main Hawaiian Islands were rated good, 11 percent were rated fair, and 6 percent were rated poor (U.S. Environmental Protection Agency, 2012b). For detailed description of Hawaii Study Area sediment quality and contaminants refer to the 2018 HSTT EIS/OEIS.

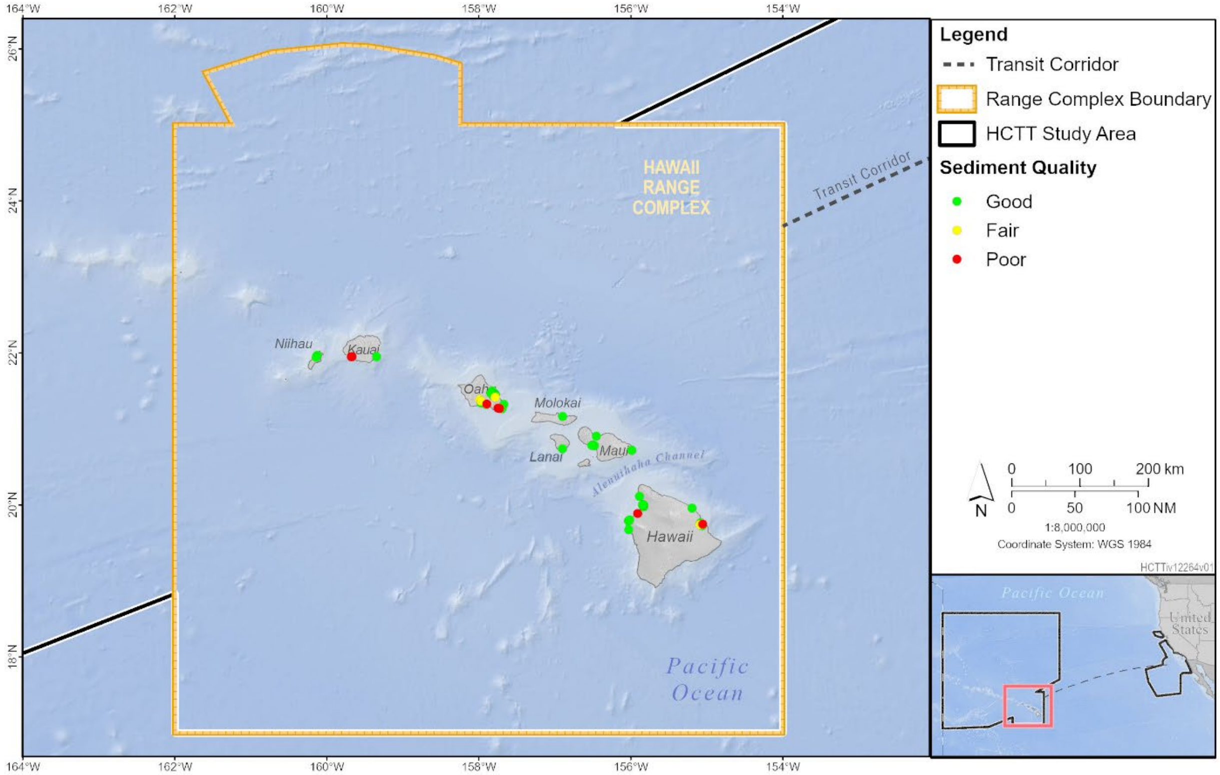

Figure 3.2-1: Sediment Quality in the Hawaii Study Area

3.2.2.2.2 Sediment Quality in California Study Area

In the *NCCR IV* (U.S. Environmental Protection Agency, 2012b), estuarine and coastal ocean areas in the USEPA's West Coast Region, which extends along the entire U.S. West coast were rated good, fair, or poor for sediment contaminants, toxicity, and total organic carbon. Overall, sediment quality was rated fair. For sediment contaminants, the USEPA rated 96 percent of coastal ocean sediments good, 3 percent fair, and <1 percent poor (Figure 3.2-2). Coastal ocean and estuarine waters within the California Study Area, including off San Diego, were rated good for contaminants (U.S. Environmental Protection Agency, 2012b). Higher levels of total organic carbon in sediments can be an indicator of higher concentrations of chemical pollutants and poor sediment quality (U.S. Environmental Protection Agency, 2012b). For detailed description of California Study Area sediment quality and contaminants refer to the 2018 HSTT and 2022 PMSR EIS/OEISs.

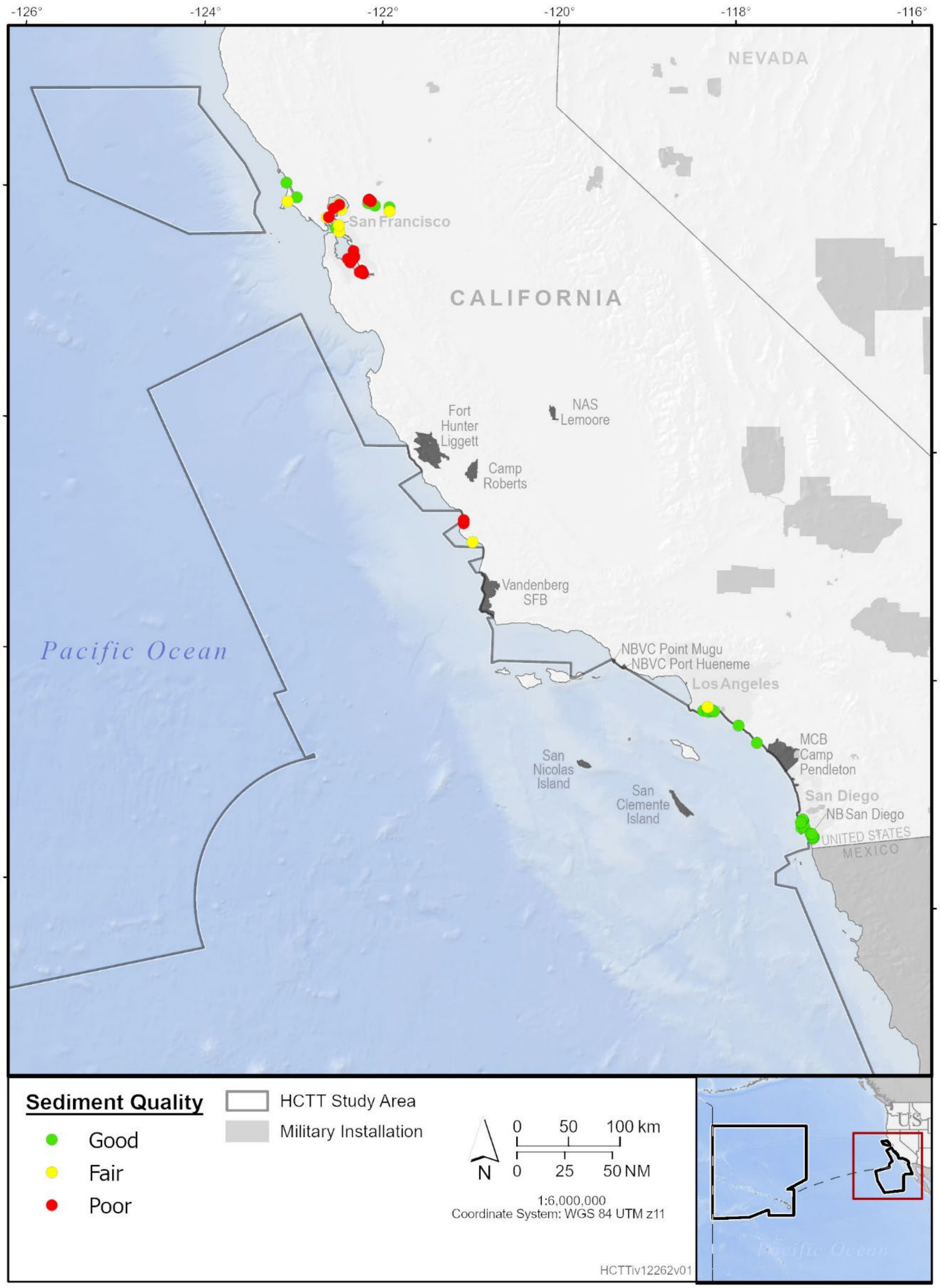

Figure 3.2-2: Sediment Quality in the California Study Area

3.2.2.3 Water Quality

Characterization of water quality within coastal portions of the Study Area are based largely on information and data from the *NCCR IV* (U.S. Environmental Protection Agency, 2012c). This study assesses the normal conditions of water quality (excluding heavy rain events where fecal contamination is almost always higher). This report has not been updated since the 2018 HSTT EIS/OEIS was released, and no additional reports on characterization of water quality have been found to denote updated characterization. Therefore, water quality characterizations included in this EIS/OEIS remain largely unchanged. For this reason, the results of the *NCCR IV* are herein summarized generally; for more detailed analysis, refer to the 2018 HSTT and 2022 PMSR EIS/OEISs.

3.2.2.3.1 Water Quality in the Hawaii Study Area

The offshore waters of the Hawaii Study Area and beyond to the boundaries of the HCTT Study Area are expansive. The area includes nearshore waters and relatively shallow intra-island channels as well as deep offshore waters beyond the U.S. EEZ (i.e., the "high seas"). Small-scale oceanographic processes like coastal upwelling and large-scale features, like the North Equatorial Current, result in the formation of leeward eddies, vertical mixing, and horizontal transport of water from nearshore to offshore areas. Persistent easterly winds have a strong influence on circulation in the upper water column.

Population growth is the primary cause of effects on the coastal water quality of the Hawaiian Islands. The coastal waters of the Hawaiian Islands are affected by different kinds of marine debris, garbage, and solid wastes that deposit toxic chemicals and nutrients in the ocean. In addition to large quantities of marine debris, polychlorinated biphenyls (PCBs) have been deposited in the marine environment because of urbanization (Center for Ocean Solutions, 2009). Urban land use typically results in water quality contaminants such as nitrogen (N), phosphorous, suspended solids, sediments, pesticides, and herbicides, as well as fecal contamination. Agricultural runoff contains the same water quality contaminants as urban runoff, but has higher concentrations of pesticides, herbicides, and sediments (U.S. Environmental Protection Agency, 2012b).

The USEPA manages five ocean disposal sites in the Hawaiian Islands. Sites are located offshore South Oahu, Hilo, Kahului, Nawiliwili, and Port Allen. The South Oahu and Hilo sites are the heaviest used. The USEPA regulates and monitors disposal sites, and have determined the sites do not have significant adverse effects (U.S. Environmental Protection Agency, 2017).

The 2022 State of Hawaii Water Quality Monitoring and Assessment Report evaluated inland and offshore marine waters of the Hawaiian Islands. The parameters evaluated include fecal indicator bacteria, turbidity, chlorophyll *a*, nutrients, total dissolved N, total dissolved phosphorous, total suspended solids, and orthophosphate. In the Hawaiian Islands, 170 of 565 (30 percent) of marine water bodies were assessed. Of those assessed, 157 (92 percent) did not meet water quality standards for one or more of the parameters listed. Turbidity was the leading parameter reducing water quality, and elevated turbidity levels likely resulted from polluted runoff. The second-highest contributing parameter was excess nutrients, and third was higher concentrations of chlorophyll *a* (The Hawaii State Department of Health, 2022). Prior to the 2022 report, a 2012 survey of water and sediment quality in Hawaii was the last comprehensive analysis and is detailed in the 2018 HSTT EIS/OEIS.

The August 2023 wildfires that took place in Lahaina, Maui were tested for potential adverse effects on water quality. As of April 2024, the Hawaii Department of Health determined that the coastal waters of Lahaina are safe for public recreation (State of Hawaii Department of Health, 2024).

Shipboard waste-handling procedures governing the discharge of nonhazardous waste streams have been established for military vessels (64 FR 25134). These categories of wastes include liquids such as "black water" (sewage) and "grey water" (e.g., water from deck drains, showers, dishwashers, laundries), and oily wastes (oil-water mixtures) and solids (garbage). For additional discussion on water quality in the Hawaii Study Area see Appendix C.

3.2.2.3.2 Water Quality in the California Study Area

The waters of the California Study Area are vast and varied and include shallow nearshore waters and coastal bays as well as deep offshore waters beyond the U.S. EEZ. Small- and large-scale oceanographic processes, including coastal upwelling and advection by offshore currents, result in broad vertical mixing throughout the upper water column and horizontal transport of water from nearshore to offshore areas, which maintain generally high water quality levels that meet or exceed criteria set forth by the California Ocean Plan (State of California, 2009) and by the National Ambient Water Quality Criteria (U.S. Environmental Protection Agency, 2012b).

The most recent comprehensive survey of inshore and offshore water quality on the California Coastline is the 2012 NCCR IV. The water quality index for the coastal waters of the West Coast region, extending from Southern California to Canada, is rated good, with 19 percent of the coast rated fair and only 2 percent rated poor (U.S. Environmental Protection Agency, 2012b) (Figure 3.2-3).

Water quality in the California Study Area is strongly affected by human activities in heavily developed Southern California. Urban runoff is the largest source of contaminants in San Diego Bay and along the rest of the Southern California coast, and can transport bacteria, inorganic nutrients, various organic compounds, metals, and debris into downstream or adjacent water bodies.

Nonpoint source runoff is substantial in Southern California, because most rivers are highly modified stormwater conveyance systems that are not connected to sewage treatment systems. When storm events occur, runoff plumes can become large oceanographic features that extend for many miles (Ayad et al., 2020). Along the California coast, land-based chemical pollution, in particular PCBs and dichlorodiphenyltrichloroethane (DDT), affect water quality.

Most of the marine water pollution in the California Study Area results from municipal discharges. In San Diego, untreated wastewater from the Tijuana River, especially during and after rain events, generates runoff plumes that affect water quality in the coastal waters off San Diego (Ayad et al., 2020). The oil and gas industry, however, is a source of water pollution in the northern part of the SOCAL Bight and several active oil platforms are located in this area of the California Study Area. As offshore oil and gas activities continue in Southern California, pollutants may potentially be introduced into the marine environment through oil leaks, accidental spills, discharges of formation water, drill mud, sediment, debris, and sludge, all of which degrade water quality. For example, in 2021, a pipeline failure resulted in more than 126,000 gallons of oil spilling into the Pacific Ocean offshore of Long Beach, California (Migliozzi & Tabuchi, 2021). No oil and gas activities occur in the northern portions of the California Study Area.

Commercial, recreational, and institutional vessels also discharge water pollutants in the California Study Area. Shipboard waste-handling procedures governing the discharge of nonhazardous waste streams have been established for military vessels (64 FR 25134). These categories of wastes include liquids such as "black water" and "grey water," and oily wastes and solids. For additional discussion on water quality in the California Study Area see Appendix C.

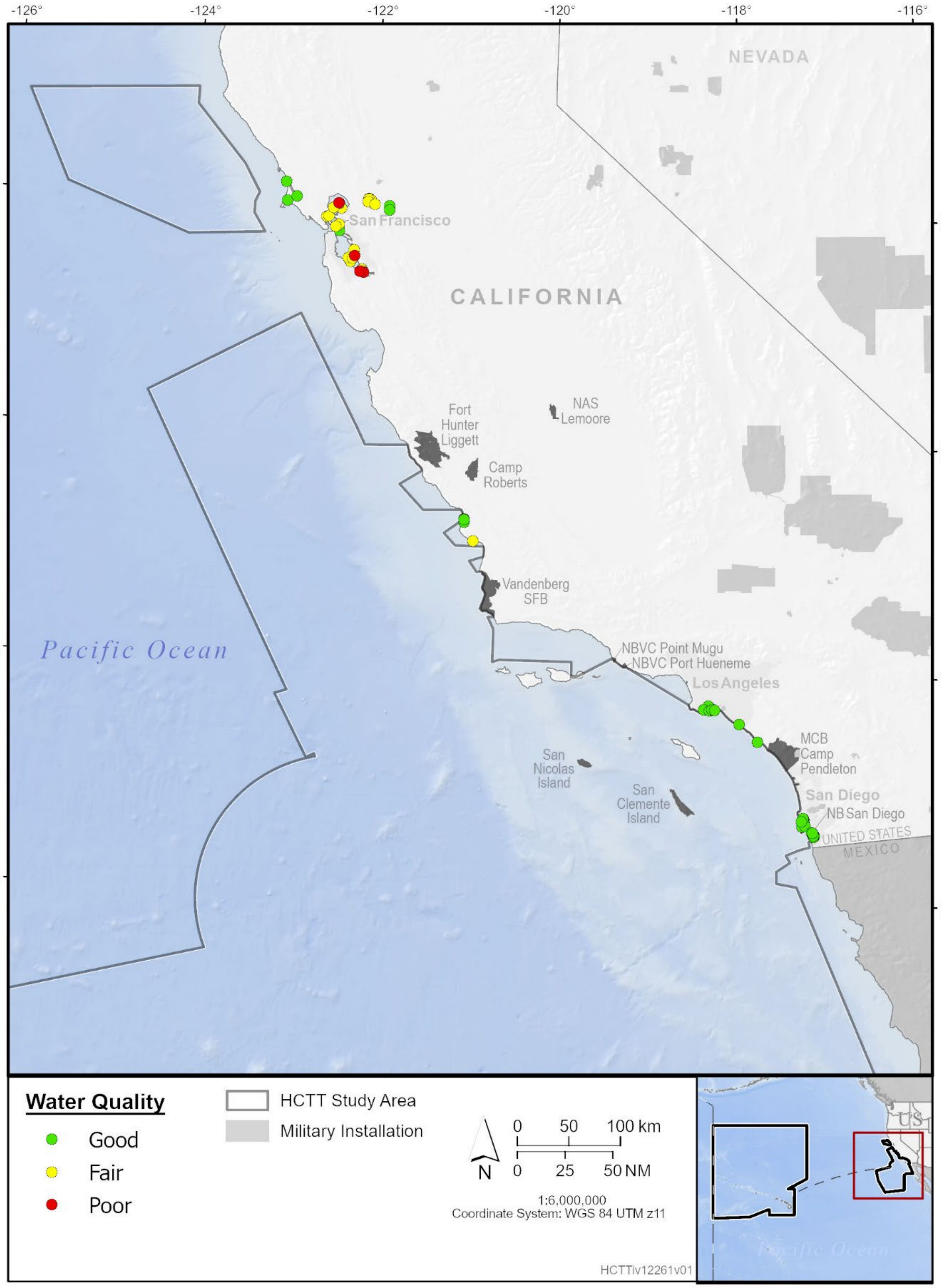

Figure 3.2-3: Water Quality in the California Study Area

3.2.2.3.3 Marine Debris and Water Quality

Marine debris or litter is defined as "any persistent, manufactured, or processed solid material discarded, disposed of, or abandoned in the marine and coastal environment" (Bergmann et al., 2015). Land-based sources of marine debris include public litter, industry, harbors and unprotected landfills and dumps located near the coast, but also sewage overflows, introduction by accidental loss, and extreme events, such as flooding. Litter from land-based sources can be transported to the sea by rivers and runoff or can be blown into the ocean by winds. Ocean-based sources include commercial shipping, both commercial and recreational fishing vessels, military and research fleets, pleasure boats, and offshore installations such as platforms and aquaculture sites. Factors such as ocean current patterns, climate and tides, proximity to urban, industrial and recreational areas, shipping lanes, and fishing grounds also influence the types and amount of litter that are found in the open ocean or along beaches (Galgani et al., 2015).

Plastics, including packaging, fishing nets and pieces thereof, and small pieces of unidentifiable plastic or polystyrene make up the largest proportion of overall litter pollution (Galgani et al., 2015). While plastic debris is ubiquitous in the marine environment, amounts vary widely over regional scales due to factors such as proximity of urban activities, shore and coastal uses, winds, and ocean currents. Plastic debris degrades slowly in the marine environment. One degradation pathway involves breaking into small pieces, called "microplastics". Some persistent organic compounds and metals can adhere to microplastic particles, and subsequent ingestion of these plastic particles by aquatic organisms represents a pathway for contaminant bioaccumulation in the marine food chain (Boerger et al., 2010; Rochman, 2015). A more comprehensive discussion on marine debris in the Study Area in nearshore and offshore areas of Hawaii and California Study Areas is included in Appendix C.

3.2.2.3.4 Climate Change and Water Quality

The most recent (2023) National Climate Assessment (U.S. Global Change Research Program, 2023) concluded that climate change, and, in particular, increasing atmospheric CO_2 levels are altering ocean conditions through three main factors: warming seas; ocean acidification (decreasing pH); and deoxygenation (decreased dissolved oxygen [DO] concentrations). Changes in temperature in the ocean and in the atmosphere alter ocean currents and wind patterns, which influence the seasonality, abundance, and diversity of phytoplankton and zooplankton communities that support ocean food webs. In addition to warming, excess CO_2 in the atmosphere has a direct and independent effect on the chemistry of the ocean. When CO_2 dissolves in seawater, it changes three aspects of ocean chemistry: (1) increases dissolved CO_2 and bicarbonate ions, which are used by algae and plants as the fuel for photosynthesis; (2) increases the concentration of hydrogen (H) ions, acidifying the water; and (3) reduces the concentration of carbonate ions. Carbonate is a critical component of calcium carbonate, which is used by many marine organisms to form their shells or skeletons. All three of these processes—warming, acidification, and deoxygenation—interact with one another and with other stressors in the ocean environment. As carbon emissions drive average temperatures higher and increase ocean acidification, naturally occurring climate cycles will continue, but will result in oceanic conditions that are warmer, acidified, and have generally lower oxygen levels. A major uncertainty is whether these natural cycles will function in the same way under altered climate conditions (Pershing et al., 2018).

3.2.2.3.5 Regulatory Environment

State Standards and Guidelines

State jurisdiction regarding sediments and water quality extends from the low tide line to 3 NM offshore for both California and Hawaii. Federal jurisdiction regarding sediments and water quality extends to 200 NM along the Pacific Coast of the U.S. and Hawaii. Information on the regulatory state and federal standards and guidelines are presented in Appendix C, Section C.1.1.

3.2.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, baseline conditions of the existing environment for sediments and water quality would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section describes and evaluates how and to what degree the activities described in Chapter 2 and Section 3.0.3.3 could potentially affect sediments and water quality within the Study Area.

For sediments and water quality, stressors include:

- Explosives and Explosives Byproducts
- Metals
- Chemicals other than Explosives
- Other Materials

The environmental effect analysis considers standard operating procedures and mitigation measures that would be implemented under Alternative 1 and Alternative 2 of the Proposed Action.

As noted in Section 3.0.2, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in 40 CFR 1501.3(d). Of the stressors analyzed in this section, none have a reasonably foreseeable adverse effect on the human environment, as discussed below.

In addition, a significance determination comparing the alternatives is not required since the stressors for Alternative 1 and 2 are the same, and the stressors would not have reasonably foreseeable adverse effects on sediment and water quality. Overall, adverse effects on sediments and water quality would not be expected due to the dispersed nature of activities, standard operating procedures, and benign composition of materials.

3.2.3.1 Explosives and Explosives Byproducts

Information related to explosives and explosives byproducts as potential stressors to sediment and water quality is summarized in Table 3.2-1. Additional background information is provided in the 2018 HSTT and 2022 PMSR EIS/OEIS.

Table 3.2-1: Explosives and Explosive Byproducts Information Summary

Explosives and Explosives Byproducts Information Summary

• Military readiness activities, such as those associated with the Proposed Action, release explosives and explosives byproducts (i.e., munitions constituents) into the marine environment.
• Munitions constituents are defined in 10 U.S.C. 2710(e)(3) as "[A]ny materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions."
• Explosive fillers contained within munitions used during military readiness activities and their degradation products can enter the environment through high- or low-order detonations.
• In high-order detonations, only a small or residual amount of explosives is released to the environment (U.S. Environmental Protection Agency, 2012a). For a low-order detonation, some unconsumed explosives and residual byproducts remain in the munitions casing with the potential for eventually entering the marine environment.
• Failure and low-order detonation rates for a subset of munition types are listed in Appendix F, Section F.2. A 5% munitions failure rate (i.e., for unexploded munitions) was identified as a reasonable average for all munitions used in the Proposed Action. This failure rate was developed and implemented in the 2018 HSTT EIS/OEIS.
• Typical chemical ingredients (munitions constituents) for military explosives are listed in Appendix F.
• Munitions constituents' persistence in the environment is a key determinant of exposure. In open water environments, munitions constituents dissolve and are released to the overlying water, carried away from the source by currents, readily diluted, and subjected to transformative processes in the water column (Lotufo, 2017).
• Numeric sediment and water quality standards do not exist for munitions constituents in the marine environment. However, (Lotufo et al., 2017) used available acute and chronic toxicity data to derive provisional water and sediment quality criteria for munitions constituents and concluded the following:
  ○ Concentrations of munitions constituents in water and sediment at these sites were largely below detection or were relatively low (e.g., parts per billion), with detectable concentrations being highly localized and typically near (i.e., within 1 meter [m]) of a point source.
  ○ Munitions constituent concentrations drop substantially with distance from the source, such that organisms living farther than 1 m from the source are likely unaffected by munitions constituents present in the water column because actual exposure levels are several orders of magnitude lower than concentrations expected to be toxic to most species (i.e., provisional screening or benchmark levels).
  ○ These conclusions are consistent with those of other studies conducted at military ranges.
• All Sinking Exercises (SINKEXs) are conducted at least 50 nautical miles from shore in waters at least 6,000 feet deep.
• Most activities that expend large high explosive munitions occur well offshore.

3.2.3.1.1 Effects from Explosives and Explosives Byproducts

Training and Testing. The distribution of explosives used in training and testing activities is not uniform throughout the Study Areas. Approximately 30 percent of the explosives are used annually in the Hawaii Study Area, 67 percent used in the California Study Area, and the remaining 3 percent in the HCTT transit corridor. Of all explosive munitions used during training and testing activities, approximately 85 percent in the Hawaii Study Area and 90 percent in the California Study Area would have a net explosive weight of 2.5 lb. or less per munition. Activities are further detailed in Chapter 2 and Appendix A. Although explosive use would increase under both Alternative 1 and 2 across a larger study area, effects on sediments and water quality would be similar as analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs for reasons summarized in Table 3.2-1.

Modernization and Sustainment of Ranges. No explosives would be involved in modernization and sustainment of ranges.

Conclusion. Activities that include explosives and explosives byproducts would not have reasonably foreseeable adverse effects on sediments and water quality for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs. These reasons include the following: (1) most explosives would be consumed during detonation; (2) the frequency of low-order detonations would be low, and therefore the frequency of releases of explosives directly into the water column would be low; (3) the amounts of explosives used would be small relative to the area over which they would be distributed; and (4) residual munitions constituents would be subject to physical, chemical, and biological processes that would degrade, dilute, and disperse the materials to undetectable levels.

3.2.3.2 Metals

Information related to metals as potential stressors to sediment and water quality is summarized in Table 3.2-2. Additional background information is provided in the 2018 HSTT and 2022 PMSR EIS/OEISs, and Appendix F, Section F.2.3.

Table 3.2-2: Metals Information Summary

Metals Information Summary
• Military readiness activities associated with the Proposed Action, would release a variety of metal-containing materials into the marine environment. • Munitions and other items containing metals would be used in the Study Area annually, the bulk of which are small- and medium-caliber projectiles. • The amounts of metals associated with individual munitions vary depending on the design and structural requirements. • Metal surfaces such as munitions casing are susceptible to physical and chemical decomposition when immersed in water. The decomposition process has the potential to leach metals to the environment. However, this is a relatively slow process that is related to the density and surface area of the object and the duration of exposure. • Rates of mass loss vary depending on whether the metal object is exposed or buried, along with other environmental conditions. • Multiple studies have analyzed marine sediment and seawater from various bombing ranges and munitions disposal sites consistently show no discernable effect from munitions to metals concentrations in water or sediment. • At some historically used munitions disposal sites, metal concentrations at various sites were elevated relative to corresponding water quality standards or screening levels, but the relationship to munitions as a possible source was unclear (Barbosa et al., 2023). • Decommissioned vessels used as targets for SINKEXs have been cleaned or remediated for fuel and PCB in accordance with USEPA guidelines.

3.2.3.2.1 Effects from Metals

Training and Testing. The distribution of non-explosive munitions and other expended materials composed of or containing metals that are used in training and testing activities is not uniform throughout the Study Area. Non-explosive munitions are the largest portion of expended objects composed of metal or containing metal components (with the exception of target vessels). Approximately 88 percent of the non-explosive munitions and other expended metals used annually during training and testing activities would be used in the California Study Area, 12 percent in the Hawaii Study Area.

Metals from munitions, vessels and other targets, and other MEM would sink to the seafloor where they would most likely be buried or partially buried in sediments, depending on the type of seafloor substrate. In areas of the Study Area where the offshore substrate is predominantly composed of soft sediments, the likelihood of complete or partial burial of MEM is greater. Although metals from munitions, vessels, and other targets, and MEM would increase under Alternative 1 and 2, effects on sediments and water quality would be similar to the analysis conducted in the 2018 HSTT and 2022 PMSR EIS/OEISs for reasons summarized in Table 3.2-2.

Modernization and Sustainment of Ranges. Metals would not be released into the environment from modernization and range sustainment activities, with the exception of metal anchors for temporary instruments associated with the underwater training range, mine placement, and underwater platforms. However, anchors would become buried over time and would therefore not release measurable amounts of metals into the environment. Underwater platforms and mines used in mine warfare also comprise of metals. Platforms would be installed on the seafloor and mines would be suspended in the water column. However, these platforms and mines would be stationary and remain intact. As such, platforms and mines installed during modernization and range sustainment activities would not release measurable amounts of metals into the environment.

Conclusion. Activities that include the use of metals would not have reasonably foreseeable adverse effects on sediments and water quality for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs. These reasons include the following: (1) metals released through corrosion would be diluted by currents or sequestered in adjacent sediment; (2) elevated concentrations of metals in sediments, if present, would be limited to the immediate area around the expended material; and (3) the areas over which munitions and other metal components would be distributed are large and typically outside of state coastal waters, thereby reducing the potential for activities to contribute to existing impairments in nearshore and estuarine waterbodies.

3.2.3.3 Chemicals other than Explosives

Information related to chemicals other than explosives as potential stressors to sediments and water quality is summarized in Table 3.2-3. Additional background information is provided in the 2018 HSTT and 2022 PMSR EIS/OEISs, and Appendix F, Section F.2.2.

Table 3.2-3: Chemicals Other Than Explosives Information Summary

Chemical Other than Explosives Information Summary
• Military readiness activities, such as those associated with the Proposed Action, would release a variety of chemicals other than explosives into the marine environment, affecting both water quality and sediments. • Chemicals other than explosives are associated with the following military expended material (MEM): o Solid-fuel propellants in missiles and rockets o Otto Fuel II torpedo propellant and combustion byproducts o Chemicals associated with other non-explosive materials, including munitions (2018 HSTT EIS/OEIS, Section 3.2).

Chemical Other than Explosives Information Summary
• Constituents commonly found in the energetics, propellant, and pyrotechnic elements of munitions may also leach from solid components of munitions and release into seawater. • Propellants used by rockets and missiles are typically completely consumed prior to impact of the water surface even if the munition fails to detonate upon impact. • Perchlorates, which make up a large percentage of rocket and missile propellants, are water soluble and any residuals that are not consumed dissolve and are dispersed in surface waters. • Aluminum powder is used as a fuel additive and ranges from 5% to 22% by weight of solid propellant. • Other explosives (e.g., octahydro-1,3,5,7 -tetranitro-1,3,5,7-tetrazocine and hexahydro-1,3,5-trinitro-1,3,5-triazine) may be added, although they usually comprise less than 30% by weight of the propellant. • Otto Fuel II is used as a liquid propellant in torpedoes; it is consumed underwater, and any combustion products would enter the marine environment. All non-explosive torpedoes are recovered after conclusion of activity, which would reduce the amount of residual Otto Fuel II entering the marine environment. • Otto Fuel II combustion byproducts include NO_x, CO, CO_2, N, and methane, (Arai & Chino, 2012). These byproducts occur naturally in the marine environment and are considered non-toxic. Ammonia and hydrogen cyanide, which are also byproducts of Otto Fuel II combustion, can be toxic to marine organisms. • Decommissioned vessels used as targets for SINKEX have been cleaned or remediated for fuel and PCBs in accordance with U.S. Environmental Protection Agency (USEPA) guidelines. • Target vessels used during SINKEX are a potential source of PCBs that may be present. However, the USEPA considers the contaminant levels released during SINKEX to be within the standards of the Marine Protection, Research, and Sanctuaries Act (U.S. Environmental Protection Agency, 2014). • The DoD uses relatively harmless compounds as chemical simulants for chemical and biological warfare agents for the purposes of testing equipment intended to detect their presence. Given the criteria for choosing simulants for use in activities, it is reasonable to conclude that simulants would have no effect on sediment and water quality in the Study Area. Therefore, simulants are not analyzed further in this section.

3.2.3.3.1 Effects from Chemicals Other Than Explosives

Training and Testing. The distribution of munitions that use chemicals other than explosives is not uniform throughout the Study Area. Approximately 67 percent of these munitions are rockets (expending the byproducts of propellant combustion) used in the California Study Area. Missiles make up another 4 percent of these munitions. Effects associated with chemicals other than explosives under Alternative 1 and 2 would not differ greatly from what was analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs for reasons summarized in Table 3.2-3. As such, for properly functioning munitions, chemical, physical changes in sediments or water quality would not be detectable.

Modernization and Sustainment of Ranges. As described in Appendix A, Section A.3.2.4, SOAR modernization activities in the California Study Area include releasing corrosion inhibitor solution from existing conduits. A Vapor Phase Corrosion Inhibitor (VpCl) solution is used in the conduits at a dilution up to 1.5 percent VpCl (98.5 percent potable water). The solution is in a concentrated liquid form and would be mixed with potable water to achieve the desired percent solution. To replace corrosion inhibitor solutions, divers would open the valve on the underwater termination point of each conduit. New corrosion inhibitor solution would be mixed onshore in a large tank and then pumped into the conduits at the cable vaults. The valve at the underwater termination point would be closed once the solution is pumped into the conduit. For three conduits with the solution, approximately 6,160 gallons of solution could be released up to three times in a seven-year permit cycle. For each event, it is estimated this work can be completed in approximately one week during daytime hours. Solutions are effective for approximately 24 months.

The corrosion inhibitor products selected for the Proposed Action are routinely used for this type of application in offshore areas because of their environmentally benign properties. Manufacturer hydrotests of the product as depicted in Holden et al. (2010) have yielded low toxicity levels and waters containing the product remain safe for many species, allowing the product to be discharged according to local specifications.

Conclusion. Activities that include the use of chemicals other than explosives would not have reasonably foreseeable adverse effects on sediments and water quality for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs. These reasons include the following: (1) the size of the area in which expended materials would be distributed is large; (2) most propellant combustion byproducts are benign, while those of concern would be diluted to below detectable levels within a short time; (3) most propellants are consumed during normal operations; (4) most byproducts of Otto Fuel II combustion are naturally occurring chemicals, and most torpedoes are recovered after use, such that any fuel that is not consumed would be recovered along with the torpedo, limiting any direct exposure of sediments and water to Otto Fuel II; (5) the failure rate of munitions using propellants and other combustible materials is low; and (6) most of the constituents of concern are biodegradable by various marine organisms or by physical and chemical processes common in marine ecosystems.

3.2.3.4 Other Materials

Information related to other materials as potential stressors to sediments and water quality is summarized in Table 3.2-4. Additional background information remains unchanged from the 2018 HSTT and 2022 PMSR EIS/OEISs and is provided in Appendix F, Section F.2.4.

Table 3.2-4: Other Materials Information Summary

Other Materials Information Summary
• Military readiness activities would release a variety of other materials to the marine environment.
• These materials potentially could include marine markers and flares, chaff, towed and stationary targets, and miscellaneous components of non-explosives sonobuoys (i.e., passive and acoustic sonobuoys), which contain metals and other materials including plastics, and small decelerator/parachutes.
• These materials and components are either made mainly of non-reactive or slowly reactive materials, such as glass, carbon fibers, and plastics, or break down or decompose into non-toxic byproducts (e.g., rubber, steel, iron, and concrete).
• Most of these other materials would settle to the seafloor where they would (1) be exposed to seawater, (2) be lodged in or covered by seafloor sediments, (3) be encrusted by oxidation products such as rust, (4) be dissolved slowly, or covered by marine organisms, and (5) potentially fill holes used as refuge for marine life
• Plastic components of the other materials may float or descend to the bottom, depending upon their buoyancy, or break into smaller microplastic particles.
• Combustion of red phosphorus produces phosphorus oxides, which have a low toxicity to aquatic organisms.
• Aluminum and iron canisters are expected to be covered by sediment over time, encrusted by chemical corrosion, or covered by marine organisms.
• Flares are usually consumed during flight. Combustion products from flares include magnesium oxide, sodium carbonate, CO^{2}, and water. The bulk of the materials used in flares and marine markers are metals and other chemical compounds that occur naturally in the marine environment and would be dispersed at low concentrations in the water column or would sink to the seafloor (Appendix F, Section F.2.4)

Other Materials Information Summary
• Chaff consists of small, thin glass fibers coated in aluminum that are light enough to remain in the air anywhere from 10 minutes to 10 hours (Farrell & Siciliano, 2004). • Once released, chaff fibers disperse, and the extent of dispersion depends on the altitude and location where it is released, prevailing winds, and meteorological conditions (Spargo, 2007; Spargo et al., 1999). • Chaff is generally resistant to chemical weathering and likely remains in the environment for long periods. The fibers are quickly dispersed by waves and currents. • Chemicals leached from the chaff would be diluted by surrounding seawater, reducing the potential for chemical concentrations to reach levels that can affect sediment quality. • Sonobuoys typically contain both metal and nonmetal components and use lithium batteries. • During battery operation of the sonobuoy, the lithium reaction proceeds nearly to completion prior to battery termination, and only a small number of reactants remain when the battery life ends. These residual materials gradually dissolve or are diluted by currents. • After battery life expires (which takes no more than 8 hours), the sonobuoy scuttles itself and sinks to the bottom. • Some munitions and other military expended material used for military readiness activities contain small amounts of plastic, such as that associated with chaff cartridge end caps and flare pads and pistons. The plastic residuals are not recovered after the munitions are expended.

3.2.3.4.1 Effects from Other Materials

Training and Testing. The distribution of other materials used in training and testing activities would not be uniform throughout the Study Area. Approximately 30 percent of these other expended items would be used annually in the Hawaii Study Area and 70 percent in the California Study Area. For details on the numbers and types of MEM used in the Study Area, refer to Appendix I and Chapter 2. Similar other materials analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs will be entering the study areas under Alternative 1 and 2. Although locations and quantities differ somewhat, the overall effects would be similar to the analysis conducted for reasons summarized in Table 3.2-3.

Modernization and Sustainment of Ranges. Implementation of range sustainment and modernization activities would result in other materials (e.g., fiber optic cables, instruments) that may temporarily suspend soft sediments and increase turbidity levels. However, the levels are not expected to be measurable as the substrate is dominated by hard bottom in these areas, and soft suspended sediments would not be greatly disturbed (Section 3.5). These materials are used regularly and maintained, and would not be expected to degrade over a reasonably foreseeable time.

Conclusion. Activities that include the use of other materials would not have reasonably foreseeable adverse effects on sediments and water quality for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs. These reasons include the following: (1) materials released via breakdown in the ocean would be diluted by currents or sequestered in adjacent sediment; (2) elevated concentrations of materials in sediments, if present, would be limited to the immediate areas around the materials; (3) other materials expended are distributed across a large area outside of state waters, reducing the potential for activities to contribute to existing impairments in nearshore and estuarine water bodies.

3.2.4 Summary of Potential Effects on Sediments and Water Quality

The chemical, physical, or biological changes in sediments and water quality would be minimal and only detectable in the immediate vicinity of munitions. Even in areas where multiple munitions and expended materials are located in close proximity (e.g., munitions disposal sites) chemical degradation products from each source or item are largely isolated from each other. The low failure rate of explosive munitions reduces the likelihood of exposure to explosives materials that remain in intact munitions. Measurable concentrations of contaminants and other chemicals in the marine environment from munitions disposal sites have been shown to be below screening levels or similar to nearby reference areas where munitions are not present. Many components of MEM are inert or corrode slowly over years. Metals that could affect benthic habitat at higher concentrations comprise only a small portion of the alloys used in expended materials, and corrosion of metals in munitions casings and other expended materials is a slow process that allows for dilution. The chemical products from hydrolysis are predominantly naturally occurring chemicals. Elevated concentrations of metals and other chemical constituents in sediments would be limited to small zones adjacent to the munitions or other expended materials and would still most likely remain below screening levels even after years residing on the seafloor. It is also possible that stressors associated with military readiness activities will combine with stressors from non-military activities, particularly in nearshore areas and bays, such as Pearl Harbor, Kaneohe Bay, and San Diego Bay, to exacerbate already affected sediments and water quality. This is qualitatively discussed in Chapter 4.

Although potential effects on sediments and water quality from military readiness activities may occur, they are not expected to be long term or measurable, and therefore adverse effects are not reasonably foreseeable.

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3.3 Vegetation

VEGETATION SYNOPSIS

Stressors to vegetation that could result from the Proposed Action within the Study Area were considered, and the following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Explosives: Explosives could affect vegetation by destroying individuals or damaging parts of individuals; however, there would be no persistent or large-scale effects on the growth, survival, distribution, or structure of vegetation, primarily due to the avoidance of sensitive habitats (e.g., hard bottom/seaweed habitat, seagrass beds) and recovery of relatively small areas of disturbed vegetation. As such, effects would be less than significant.
- Physical Disturbance and Strike: Physical disturbance and strike could affect vegetation by destroying individuals or damaging parts of individuals; however, there would be no persistent or large-scale effects on the growth, survival, distribution, or structure of vegetation. As such, effects would be less than significant.

3.3.1 Introduction

This section provides analysis of potential effects on vegetation found in the Study Area and an introduction to the species.

Vegetation includes diverse taxonomic/ecological groups of marine algae throughout the Study Area, as well as flowering plants in the coastal and inland waters. For this EIS/OEIS analysis, vegetation has been divided into eight groups that encompass taxonomic categories, distributions, and ecological relationships. These groups include blue-green algae (phylum Cyanobacteria), dinoflagellates (phylum Dinophyta), green algae (phylum Chlorophyta), coccolithophores (phylum Haptophyta), diatoms (phylum Ochrephyta), brown algae (phylum Phaeophyta), red algae (phylum Rhodophyta), and vascular plants (phylums Tracheophyta and Spermatophyte) (Table 3.3-1). Furthermore, the analysis considers the distribution of vegetation based on oceanic features and vertical distribution. Open-ocean oceanographic features of the Study Area include the North Pacific Subtropical Gyre and the North Pacific Transition Zone. Additionally, vertical distribution within the water column or the bottom substrate is considered.

Information on the types of vegetation present in the Study Area are summarized below and detailed information provided in Appendix C.

3.3.2 Affected Environment

The affected environment provides the context for evaluating the effects of the proposed military readiness activities on marine vegetation.

3.3.2.1 General Background

The affected environment comprises two major ecosystem types, the open ocean and coastal waters; and two major habitat types, the water column and bottom (benthic) habitat. Vegetation typically grows only in the sunlit portions of the open ocean and coastal waters, referred to as the “photic” or "euphotic" zone, which generally extends to maximum depths of roughly 660 ft. (Lalli & Parsons, 1993). Because depth in most of the open ocean exceeds the euphotic zone, benthic habitat for vegetation is limited primarily to the coastal waters.

The euphotic zones of the water column in the Study Area are inhabited by phytoplankton, single-celled (sometimes filamentous or chain forming), free-floating algae primarily of four groups, including diatoms, blue-green algae, dinoflagellates, and coccolithophores, and non-free-floating algae, such as kelp and various species of benthic macroalgae. Microscopic algae can grow down to depths with only one percent of surface light penetration (Nybakken, 1993).

Vascular plants in the Study Area include seagrasses, cordgrasses, and mangroves, all of which have more limited distributions than algae (which are non-vascular), and typically occur in intertidal or shallow (< 40 ft.) subtidal waters (Green & Short, 2003). The relative distribution of seagrasses is influenced by the availability of suitable substrate occurring in low-wave energy areas at depths that allow sufficient light exposure for growth. Seagrasses as a rule require more light than algae, generally 15–25 percent of surface incident light (Fonseca et al., 1998; Green & Short, 2003). Seagrass species distribution is also influenced by water temperatures (Spalding et al., 2003).

Emergent wetland vegetation of the Study Area is typically dominated by cordgrasses (*Spartina foliosa*), which form dense colonies in salt marshes that develop in temperate areas in protected, low-energy environments on soft substrate, along the intertidal portions of coastal lagoons, tidal creeks or rivers, or estuaries, wherever the sediment is adequate to support plant root development (Mitsch et al., 2009).

In Hawaii, there are three species of seagrasses and at least 204 species of red algae, 59 species of brown algae, and 92 species of green algae. Seaweeds are important in native Hawaiian culture and are used in many foods (Preskitt, 2002, 2010). Red coralline algae and green calcareous (calcium-containing) algae (*Halimeda* species) secrete calcareous skeletons that bind loose sediments in coral reefs in Hawaii (Spalding et al., 2003). There are three kinds of seagrasses in the Hawaii Range Complex, Hawaiian seagrass (*Halophila hawaiiana*), which is only found in Hawaii; paddlegrass (*H. decipiens*), which is found in many parts of the world (National Marine Fisheries Service, 2023), and ditchgrass (*Ruppia maritima*) that is typically found in freshwater, but may be found in brackish water and the upper reaches of estuaries and lower portions of tidal creeks and rivers. While *H. hawaiiana* is found in relatively shallow waters between 0.5 and 4 m depth (NatureServe Explorer, 2023), *H. decipiens* is found subtidally at depth between approximately 6 and 30 m (Kenworthy, 2000). In the Northwestern Hawaiian Islands, beyond the coral reef habitat, algal meadows dominate the terraces and banks at depths of 98.4–131.2 ft. There are approximately 1,740.62 square miles of this type of substrate, an estimated 65 percent of which is covered by algal meadows (Parrish & Boland, 2004). Surveys from 2007 to 2016 generally showed a slightly higher percent cover of macroalgae compared to hard coral in the Northwestern Hawaiian Islands. However, higher percent cover of corals compared to macroalgae was observed along the main Hawaiian Islands (McCoy et al., 2016).

Abbott and Hollenberg (1976) reported 669 species of algae along the California coast, with one species of yellow-brown (Chrysophyta), 72 species of green (Chlorophyta), 137 species of brown (Phaeophyta), and 459 species of red algae (Rhodophyta). Marine vegetation along the California coast is currently represented by more than 700 species and varieties of seaweeds (such as corallines and other red algae, brown algae including kelp, and green algae), seagrasses (Leet et al., 2001; Wyllie-Echeverria & Ackerman, 2003), and canopy-forming kelp species (Wilson, 2002).

Detailed information on the major groups of vegetation in the Study Area is provided in Appendix C.

3.3.2.1.1 General Threats

Environmental stressors on marine vegetation are products of human activities (e.g., industrial, residential, and recreational activities) and natural occurrences (e.g., storms, surf, and tides). Species-specific information is discussed, where applicable, in Sections 3.3.3.2. The cumulative impacts from these threats are analyzed in Chapter 4. General threats on marine vegetation include water quality, discharges from commercial industries, disease and parasites, invasive species, climate change, and marine debris. Detailed information on these threats is provided in Appendix C.

3.3.2.2 Endangered Species Act-Listed Species

No species of vegetation in the Study Area are listed as endangered, threatened, candidate, or proposed under the ESA.

3.3.2.3 Species Not Listed Under the Endangered Species Act

Thousands of vegetation species occur in the Study Area (Table 3.3-1).

Table 3.3-1: Major Groups of Vegetation in the Study Area

Marine Vegetation Groups		Vertical Distribution in the Study Area[2]		
Common Name[1] (Taxonomic Group)	***Description***	***Open Ocean***	***Coastal Waters***	***Bays and Harbors***
Blue-green algae (phylum Cyanobacteria)	Photosynthetic bacteria that are abundant constituents of phytoplankton and benthic algal communities, accounting for the largest fraction of carbon and nitrogen fixation by marine vegetation; existing as single cells or filaments, the latter forming mats or crusts on sediments and reefs.	Water column	Water column, bottom	Water column, bottom
Dinoflagellates (phylum Dinophyta [Pyrrophyta])	Most are single-celled, marine species of algae with two whip-like appendages (flagella). Some live inside other organisms, and some produce toxins that can result in red tide or ciguatera poisoning.	Water column	Water column	Water column
Coccolithophores (phylum Haptophyta [Chrysophyta, Prymnesiophyceae])	Single-celled marine phytoplankton that surround themselves with microscopic plates of calcite. They are abundant in the surface layer and are a major contributor to global carbon fixation.	Water column	Water column	Water column
Diatoms (phylum Ochrophyta [Heterokonta, Chrysophyta, Bacillariophyceae])	Single-celled algae with a cylindrical cell wall (frustule) composed of silica. Diatoms are a primary constituent of the phytoplankton and account for up to 20 percent of global carbon fixation.	Water column	Water column, bottom	Water column, bottom
Green algae (phylum Chlorophyta)	May occur as single-celled algae, filaments, and seaweeds.	Sea surface	Water column, bottom	Water column, bottom

Marine Vegetation Groups		Vertical Distribution in the Study Area[2]		
Common Name[1] (Taxonomic Group)	***Description***	***Open Ocean***	***Coastal Waters***	***Bays and Harbors***
Brown algae (phylum Phaeophyta [Ochrophyta])	Brown algae are large multi-celled seaweeds that form extensive canopies, providing habitat and food for many marine species.	Water column	Water column, bottom	Water column, bottom
Red algae (phylum Rhodophyta)	Single-celled algae and multi-celled large seaweeds; some form calcium deposits.	Water column	Water column, bottom	Water column, bottom
Vascular plants (phylum Tracheophyta, Spermatophyta)	Includes seagrasses, cordgrass, mangroves and other rooted aquatic and wetland plants in marine and estuarine environments, providing food and habitat for many species.	None	Bottom	Bottom

[1]Taxonomic groups are based on Roskov et al. (2015); Ruggiero and Gordon (2015); and the Integrated Taxonomic Information System. Alternative classifications are in brackets [ ]. Phylum and division may be used interchangeably.
[2]Vertical distribution in the Study Area is characterized by open-ocean oceanographic features (North Pacific Subtropical Gyre and North Pacific Transition Zone) or by coastal waters of two large marine ecosystems (California Current and Insular Pacific-Hawaiian).

3.3.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, baseline conditions of the existing environment for vegetation would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section describes and evaluates how and to what degree the activities and stressors described in Chapter 2 and Section 3.0.3.3 potentially affect vegetation known to occur within the Study Area.

The stressors analyzed for vegetation are listed below:

- **explosives** (explosions in water)
- **physical disturbance and strikes** (vessels and in-water devices, MEM, seafloor devices, pile driving)

The environmental effects analysis considers standard operating procedures and mitigation measures that would be implemented under Alternative 1 and Alternative 2 of the Proposed Action.

As stated in Section 3.0.2, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in 40 CFR 1501.3(d). Both in-water explosives, and physical disturbance and strike, could have a reasonably foreseeable adverse effect; thus requiring a significance determination.

A stressor is considered to have a significant effect on the human environment based on an examination of the context of the action and the intensity of the effect. In the present instance, the effects of explosives or physical disturbance and strike would be considered significant if the effects have short-term or long-term changes well outside the limits of natural variability in terms of space; nutritional, physiological, or reproductive requirements within the Study Area. A significant effect finding would be appropriate if vegetation would be degraded over the long term or permanently such that its population in an area would no longer be sustainable.

3.3.3.1 Explosive Stressors

Table 3.3-2 contains a brief summary of background information that is relevant to the analyses of effects from explosive stressors. Detailed background information supporting the explosive stressor analysis is provided in Appendix F. Note that the use of explosives underwater has not been identified among the causes of decline in marine vegetation to date (Appendix C).

Table 3.3-2: Explosive Stressors Summary Information

Substressor	*Information Summary*
Explosions in the water	Explosions produce pressure waves with the potential to cause physical disturbance due to rapid changes in pressure and other physical effects. Charges detonated underwater could remove individuals or relatively small patches of vegetation. • The majority of underwater explosions occur on the surface and typically during the day at offshore locations greater than 3 NM from shore in water depths greater than 100 ft. (30 m), where only floating seaweed would be affected. • Explosions on or near the seafloor occur mostly in estuarine or shallow ocean waters, where much of the benthic vegetation (benthic macroalgae) grows on hard bottom areas and artificial structures. • If floating seaweed or benthic vegetation is in the immediate vicinity of an explosion, the taxa most likely affected are resilient to fragmentation and damage due to lack of vital organs, fast growth rate, and asexual reproduction.

Various types of explosives are used during military readiness activities. The type, number, and location of activities that use explosives are discussed in Chapter 3 and in Appendix A. While surface and near-surface explosives would be used throughout the Hawaii Study Area, underwater explosions would primarily occur in the vicinity of Pearl Harbor and Barbers Point that have been historically used for these activities, as well as at Pearl City Peninsula and Lima Landing in Pearl Harbor (Figure A-12). In the SOCAL Range Complex, underwater detonations would primarily occur in offshore areas, but could occur in San Diego Bay at the Echo location (Figure A-11) and in nearshore areas within the SSTC training lanes and training areas surrounding SCI over sandy bottom.

The potential for an explosion to injure or destroy vegetation would depend on the amount of vegetation present, the number of munitions used, and their net explosive weight. In areas where vegetation and locations for explosions overlap, vegetation on the surface of the water, in the water column, or rooted in the seafloor may be affected.

3.3.3.1.1 Effects from Explosives Under Alternative 1

Training and Testing. Effects on algae near the surface would be localized and temporary and are unlikely to affect the abundance, distribution, or productivity of vegetation. The depths, substrates, and relatively small areas of explosive footprints in comparison to vegetation distributions and total habitat areas in the Study Area indicate relatively little overlap between explosive footprints and the distribution of attached macroalgae and marine vascular plants. Furthermore, most underwater explosions associated with mine warfare take place in soft bottom habitats, and most bottom-placed explosions are detonated in established soft bottom locations. As a result, explosions would have very limited and localized (if any), temporary effects consisting of damage to or the removal of individuals and relatively small patches of vegetation. Vegetation, if present in soft bottom areas where bottom explosives are placed is expected to regrow or recolonize within a fairly short time (less than one year), resulting in no long-term effects on the productivity or distribution of macroalgae or marine vascular plants in those areas.

The effects from explosives during military readiness activities would be minimal disturbances of floating algal mats at the surface and negligible effects to macroalgae from bottom-placed explosives in soft bottom habitat. Areas with special status algal species such as eelgrass beds and kelp forests would be avoided to the greatest extent practicable. Refer to Section 3.5 for the effect of Proposed Action stressors on the abiotic habitat for vegetation.

Modernization and Sustainment of Ranges. Explosives would not be used during modernization and sustainment of ranges; therefore, there would be no explosives effects.

Conclusions. Activities that include the use of in-water explosives under Alternative 1 would result in less than significant effects since (1) the majority of underwater explosions occur on the surface and typically during the day at offshore locations greater than 3 NM from shore in water depths greater than 100 ft., where only floating seaweed would be affected; (2) explosions on or near the seafloor occur mostly in estuarine or shallow ocean waters, where vegetation (benthic macroalgae) is much less abundant compared to hard bottom areas and artificial structures; (3) if floating seaweed or benthic vegetation is in the immediate vicinity of an explosion, the taxa most likely affected are resilient to fragmentation and damage due to lack of vital organs, fast growth rate, and asexual reproduction; (4) most explosions would take place in soft-bottom habitats, and most bottom-placed explosions are detonated in the same established soft bottom locations where explosions would have very limited and localized (if any), temporary effects; and (5) areas with special status algal species such as eelgrass beds and kelp forests would be avoided to the greatest extent practicable. Refer to Section 3.5 for the effect of Proposed Action stressors on the abiotic habitat for vegetation.

3.3.3.1.2 Effects from Explosives Under Alternative 2

The only difference between Alternatives 1 and 2 in explosives use is that the number of explosives used would be greater under Alternative 2 (Table 3.0-9). Even though the number of explosives used in Alternative 2 would be greater than Alternative 1, potential effects on vegetation are not expected to be meaningfully different.

Therefore, the analysis conclusions for explosives used during military readiness activities under Alternative 2 would be the same as Alternative 1 and are consistent with a less than significant determination.

3.3.3.2 Physical Disturbance and Strike Stressors

This section analyzes the potential effects on vegetation of the various types of physical disturbance and strike stressors that may occur during military readiness activities within the Study Area. The evaluation of the effects from physical disturbance and strike stressors on vegetation focuses on proposed activities that may cause vegetation to be damaged by an object that is moving through the water (e.g., vessels and in-water devices), dropped into the water (e.g., MEM), or deployed on the seafloor (e.g., mine shapes, anchors, and fiber-optic cables). Specific locations of activities are given in Appendix A. Wherever appropriate, specific geographic areas of potential effect are identified.

Table 3.3-3 contains a brief summary of background information that is relevant to the analyses of effects from physical disturbance and strike stressors. Detailed information on physical disturbance and strike stressors in general, as well as effects specific to each substressor, is provided in Appendix F. Note that physical disturbance from human activities has been identified among the causes of decline in marine vegetation to date (Appendix C).

Table 3.3-3: Physical Disturbance and Strike Stressors Summary Information

Substressor	Information Summary
Aircraft and aerial targets	Effects on vegetation from aircraft and aerial targets are not applicable and will not be analyzed further in this section.
Vessels and in-water devices	In general, there would be a higher likelihood of vessel and in-water device disturbance or strike in coastal areas than in the open ocean portions of the Study Area because of the concentration of activities and the comparatively higher abundances of vegetation in areas closer to shore (e.g., benthic macroalgae, floating seaweed). • In most cases, vessels and in-water devices would avoid contact with the bottom (and associated vegetation such as eelgrass) per standard operating procedures, unless the vessel/vehicle is designed to touch the bottom (e.g., amphibious vehicles). • Floating seaweed around a passing vessel would be mostly displaced, rather than struck, as water flows around the vessel or device due to its hydrodynamic shape. For the small amount of floating seaweed that is struck, the effect would be minimal; floating seaweed mats can remain floating and regrow despite fragmentation from strikes (Zaitsev, 1971). • In coastal ocean areas, neither vessels nor in-water devices would normally strike benthic macroalgae. The disturbance of seaweeds and other macroalgae by propeller wash would be temporary and negligible; benthic macroalgae in coastal areas is highly resilient to natural disturbances, such as storms and extreme wave action (Mach et al., 2007). In addition, major kelp forests would be avoided as much as practical by small boats. • The potential for vessels to affect vegetation on or near the bottom would occur mostly within nearshore locations. Vegetation in such areas could be affected by sediment disturbance or direct strike during vessel movement in shallow water (e.g., waterborne training, amphibious landings). • Although amphibious vehicles are designed to touch the bottom, they are generally used along ocean beaches and similar high-energy shorelines where the habitat is unsuitable for seagrass. Benthic microalgae that occur in soft bottom habitats associated with dynamic nearshore environments are also highly resilient to disturbance and recovers relatively quickly.
Military expended materials	Military expended material (MEM) deployed over water include a wide range of items that mostly pose a threat to vegetation located where the item settles or moves across the bottom. Before the item is buried or encrusted with marine growth, the effects on vegetation may include crushing directly under the material, abrasion from movement of the material, temporary increases in turbidity around the material, and coverage of the underlying substrate. • Most release of MEM occurs within the confines of established at-sea training and testing areas far from shore, although there is some release of expended materials within nearshore locations (e.g., SCI, off Oahu, and Pacific Missile Range Facility).

Table 3.3-3: Physical Disturbance and Strike Stressors Summary Information (continued)

Substressor	Information Summary
Military expended materials (cont.)	• The most heavily affected areas are offshore, where the potential for effects on benthic macroalgae are relatively low to negligible due to the depth limits of macroalgae growth in the Study Area as well as the dampening effect of water on sinking objects. • The dampening effect of water would reduce the effect of MEM on shallow seafloor habitats that are mostly soft or intermediate substrate vegetated primarily with benthic microalgae. Disturbance of benthic macroalgae on relatively rare hard substrate would be less likely, and the attached vegetation in coastal environments would be resilient to disturbance. • Decelerators/parachutes could cover vegetated habitats and prevent photosynthesis if they landed on the habitats in an open configuration. Prevailing currents and episodic storms would tend to dislodge the material until it is buried in soft substrate or snagged on hard substrate or artificial structures. The potential for expended decelerators/parachutes to drift into shallow, nearshore habitats from at-sea areas would be low. • Munitions and other MEM would be more likely to affect floating seaweed, although the algae are resilient to fragmentation from explosives, which is more damaging than the splash of expended materials. Strikes of floating seaweed would therefore have little effect and would not likely result in the mortality of individual plants.
Seafloor devices	Seafloor devices are either stationary (e.g., mine shapes, anchors, bottom-placed instruments, seafloor cables) or move very slowly along the bottom (e.g., bottom-crawling unmanned underwater vehicles) and mostly pose a threat to vegetation located where the device settles or moves across the bottom before being recovered. Effects may include crushing directly under the seafloor device and temporary increases in turbidity around the device. • Although placement of seafloor devices on bottom structure is avoided to ensure recovery, seafloor devices placed in depths less than about 95 m may inadvertently affect macroalgae attached to hard substrate. A relatively high percentage of suitable hard substrate features macroalgae growth, although the percent coverage is variable in different regions and depths of the Study Area.
Pile driving	Pile driving and removal at Port Hueneme involves both impact and vibratory methods in soft substrate. Pile driving may have the potential to affect soft bottom habitats temporarily during pile driving, removal, and in the short term thereafter. There may also be some negligible loss of algae that colonizes the pilings when they are removed.

Single-celled algae may overlap with physical disturbance or strike stressors, but the effect would be minimal relative to their total population level and extremely high growth rates (Caceres et al., 2013); therefore, they will not be discussed further in this section. Marine vascular plants and macroalgae on the seafloor and on the sea surface are the only types of vegetation that occur in locations where physical disturbance or strike stressors may be encountered. Therefore, only marine vascular plants and macroalgae are analyzed further for potential effects from physical disturbance or strike stressors.

Supporting information on physical disturbance and strike stressors is provided in Appendix F, with the specific effect from each Alternative provided below.

3.3.3.2.1 Vessels and In-Water Devices

A variety of vessels and in-water devices would be used throughout the Study Area during military readiness activities, as described in Chapter 3. Most activities would involve one vessel or in-water device and may last from a few hours to two weeks, but activities may occasionally use two vessels or in-water devices. For this EIS/OEIS, more vessel traffic and in-water device use would occur in in the California Study Area than the Hawaii Study Area (Table 3.0-15).

3.3.3.2.1.1 Effects from Vessel and In-Water Devices Under Alternative 1

Training and Testing. The effects from vessels during military readiness activities would be minimal disturbances of floating algal mats at the surface and macroalgae during amphibious landings, which will only occur at a few predetermined locations. Vessel movements may disperse or injure algae. However, floating algae would likely re-form shortly after the vessel is gone. Areas with special status algal species such as eelgrass beds and kelp forests would be avoided to the greatest extent practicable. As such, eelgrass bed damage is not likely but, if it occurs, the effects would be minor, such as damage from increased turbidity (Moore et al., 1996). Even though there would be a small increase in vessel and in-water device use in the Study Area from Alternative 1 to Alternative 2, the difference would not result in substantive changes to the potential for or types of effects on vegetation.

Modernization and Sustainment of Ranges. No vessels or in-water devices are involved in the proposed Special Use Airspace Modernization. Vessels and in-water devices associated with SOAR Modernization; SWTR Installation; Sustainment of Undersea Ranges; Hawaii and California undersea cable projects; and Installation and Maintenance of Underwater Platforms, Mine Warfare, and Other Training Areas would move very slowly during installation activities (0–3 knots) and would not pose a collision threat to vegetation. Since in-water devices would be placed primarily in soft bottom areas where most marine vegetation does not occur, effects on benthic vegetation would be less than significant.

Conclusion. Activities that include the use of vessels and in-water devices under Alternative 1 would not have a reasonably foreseeable adverse effect on the human environment since floating algae would reform after vessel passage; most vessels and in-water devices would avoid contact with the bottom and associated vegetation; and vessels that intentional contact the bottom, such as amphibious vehicles, are used at ocean beaches and similar high-energy shorelines unsuitable for most marine vegetation.

3.3.3.2.1.2 Effects from Vessel and In-Water Devices Under Alternative 2

The only difference between Alternatives 1 and 2 in use of vessels and in-water devices is that the number of events using vessels or in-water devices would be greater under Alternative 2 (Table 3.0-15). Even though the number of events in Alternative 2 would be greater than Alternative 1, potential effects on vegetation are not expected to be meaningfully different.

Therefore, the use of vessels and in-water devices under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.3.3.2.2 Military Expended Materials

This section analyzes the strike potential to vegetation of the following categories of MEM: (1) all sizes of non-explosive practice munitions; (2) fragments of high-explosive munitions; (3) expended targets; and (4) expended materials other than munitions, such as sonobuoys and miscellaneous accessories (e.g., canisters, endcaps, pistons). See Appendix I for further details on the disturbance footprint for MEM on bottom habitat.

The potential for effects on marine vegetation from MEM would depend on the presence and amount of vegetation and quantity of MEM. Most deposition of MEM occurs within the confines of established activity areas. These areas are largely away from the coastline, and the potential for effects on vegetation is low.

Supporting information, including descriptions of the types of MEM that could affect marine vegetation, is presented in Appendix I.

3.3.3.2.2.1 Effects from Military Expended Materials Under Alternative 1

Training and Testing. Depending on the size and type or composition of the expended materials and where they happen to strike vegetation, individuals could be killed, fragmented, covered, buried, sunk, or redistributed. This type of disturbance would not likely differ from conditions created by waves or rough weather. If enough MEM lands on algal mats, the mats could sink. The likelihood is low that mats would accumulate enough material to cause sinking from military activities, as MEMs are dispersed widely through an activity area. The few algal mats that would prematurely sink would not have an effect on populations. Strikes would have little effect and would not likely result in the mortality of floating algal mats or other algae, although these strikes may injure the organisms that inhabit marine algal mats, such as sea turtles, birds, fishes, and marine invertebrates, if such are inhabiting the mat at the time of strike. In addition, MEM would be the same under Alternatives 1 and 2, so the effects to marine vegetation would be the same.

Modernization and Sustainment of Ranges. No MEM is expected during modernization and sustainment of ranges activities. However, some anchors may not be recovered and would become MEM. Those effects are covered below in the analysis of seafloor devices.

Conclusion. Activities that include the use of MEM under Alternative 1 would result in less than significant effects because (1) the affected area of MEM is very small relative to marine algae distribution, and (2) marine vascular plants overlap with areas where the stressor occurrence is very limited. Visual observation mitigation will be implemented prior to certain activities to observe floating vegetation. If floating vegetation is observed prior to the activity, that specific activity will either be relocated to an area where floating vegetation is not observed in concentrations, or the initial start of the activity will be ceased until the mitigation zone is clear of floating vegetation concentrations (Chapter 5). Based on these factors, potential effects on marine algae and marine vascular plants from MEM are not expected to result in detectable changes in the growth, survival, or propagation of individuals, and are not expected to result in population-level effect.

3.3.3.2.2.2 Effects from Military Expended Materials Under Alternative 2

The only difference between Alternatives 1 and 2 in use of MEM is that the overall quantity of MEM would be greater under Alternative 2 (Tables 3.0-16 through 3.0-19). Even though the quantity of MEM in Alternative 2 would be greater than Alternative 1, potential effects on vegetation are not expected to be meaningfully different.

Therefore, activities that include the use of MEM under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.3.3.2.3 Seafloor Devices

Vegetation on the seafloor may be affected by stationary seafloor devices (e.g., mine shapes, anchors, bottom-placed instruments). In contrast, vegetation on the sea surface such as floating marine algal mats would not likely be affected by seafloor devices and therefore will not be discussed further in this section.

3.3.3.2.3.1 Effects from Seafloor Devices Under Alternative 1

Seafloor devices would be used throughout the Study Area during military readiness activities, as described in Chapter 2. Most seafloor device use would occur in the California Study Area. Seafloor devices use sandy substrates, devoid of marine vegetation, to the greatest extent practicable. Marine plant species found within the relatively shallow waters of the Study Area, including the Hawaii Range Complex and off SCI, are adapted to natural disturbance and recover quickly from storms, as well as from wave and surge action. Bayside marine plant species, such as eelgrass, are found in areas where wave action is minimal. Installation of seafloor devices may affect vegetation in benthic habitats, but the effects would be temporary and would be followed by rapid (i.e., within a few weeks) recovery, particularly in oceanside boat lanes in nearshore waters off San Diego and in designated training areas adjoining SCI. Eelgrass beds show signs of recovery after a cessation of physical disturbance; the rate of recovery is a function of the severity of the disturbance (Neckles et al., 2005). The main factors that contribute to eelgrass recovery include improving water quality and cessation of major disturbance activities (e.g., dredging) (Chavez, 2009). The Navy has used credits from the Navy Region Southwest San Diego Bay Eelgrass Mitigation Bank (Bank) to offset unavoidable eelgrass and other habitat effects from infrastructure projects and testing and training activities in San Diego Bay (U.S. Department of the Navy, 2023).

Training and Testing. Seafloor devices operation during military readiness activities could affect marine vascular plants by physically removing vegetation (e.g., uprooting); crushing vegetation; temporarily increasing the turbidity (sediment suspended in the water) of waters nearby; or shading, which may interfere with photosynthesis. If marine vascular plants are not able to photosynthesize, their ability to produce energy is compromised. Precision anchoring would not occur in mapped eelgrass or kelp locations, which would avoid vegetation that occurs there.

Seafloor device installation in shallow water habitats under Alternative 1 would pose a negligible risk to marine vegetation. Although some species would be expected to revegetate impacted areas within weeks to months, certain seagrass species could take 10 years to recover. Although marine vegetation growth near seafloor devices installed during military readiness activities would be inhibited during recovery, population-level effects are unlikely because of the small, locally affected areas and the low frequency of military readiness activities in these localized areas. Even though there would be a small increase in the number of activities conducted in the California Study Area under Alternative 2 compared to Alternative 1, the increase would not result in substantive changes to the potential for or types of effects on vegetation.

Modernization and Sustainment of Ranges. New range modernization and sustainment activities include installation of undersea cables integrated with hydrophones and underwater telephones. Deployment of fiber optic cables along the seafloor would occur in three locations: south and west of SCI in the California Study Area, to the northeast of Oahu in the Hawaii Study Area, and to the west of Kauai in the Hawaii Study Area. In all locations the installations would occur completely within the water; no land interface would be involved. Cable-laying activities in the California Study Area could disturb marine vegetation when the cable crosses rocky substrate at depths between 65 and 196 ft. (20 and 60 m) for the SWTR Installation. However, it is anticipated that rocky substrate would be avoided to the greatest extent possible throughout the cable corridor to minimize these effects.

Installation and maintenance of underwater platforms, mine warfare training areas, and installation of other training areas involve seafloor disturbance where those activities would take place. Each installation would occur on soft, typically sandy bottom, avoiding rocky substrates.

Conclusion. Activities that include the use of seafloor devices under Alternative 1 would result in less than significant effects because (1) vegetation on the sea surface such as marine algal mats would not likely be affected by seafloor devices; (2) seafloor devices use sandy substrates, devoid of marine vegetation, to the greatest extent practicable; (3) marine plant species found within the relatively shallow waters of the Study Area are adapted to natural disturbance and recover quickly from storms as well as from wave and surge action; and (4) population-level effects are unlikely because of the small, locally affected areas and the low frequency of military readiness activities in these localized areas.

3.3.3.2.3.2 Effects from Seafloor Devices Under Alternative 2

The only difference between Alternatives 1 and 2 in use of seafloor devices is that the number of events using seafloor devices would be greater under Alternative 2 (Table 3.0-20). Even though the number of events in Alternative 2 would be greater than Alternative 1, potential effects on vegetation are not expected to be meaningfully different.

Therefore, activities that include the use of seafloor devices under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.3.3.2.4 Pile Driving

Pile driving and removal would not affect vegetation on the sea surface, such as marine algal mats; therefore, floating vegetation will not be discussed further in this section. Pile driving for Port Damage Repair activities would occur in Port Hueneme harbor in the SOCAL Range Complex.

Pile driving and removal may, however, affect marine vascular plants and seafloor macroalgae at Port Hueneme by physically removing vegetation (e.g., uprooting); crushing vegetation; temporarily increasing the turbidity (sediment suspended in the water) of waters nearby; or shading, which may interfere with photosynthesis. If vegetation is not able to photosynthesize, its ability to produce energy is compromised. However, the intersection of marine macroalgae and marine vascular plants and pile driving is limited, and any suspended sediments would settle in a few days.

3.3.3.2.4.1 Effects from Pile Driving Under Alternative 1

Training and Testing. Pile driving and removal may affect vegetation in benthic habitats, but the effects would be temporary and would be followed by rapid (i.e., within a few weeks) recovery, particularly in areas with sandy bottoms with limited or no benthic vegetation. The effects of pile driving on vegetation would be temporary resuspension of sediment and the possible removal of relatively small amounts of vegetation during pile installation and removal. Pile driving for pier maintenance typically occurs in soft bottom habitats with unconsolidated sediments that would allow pile installation and removal at a fairly rapid pace. Most species would be expected to revegetate impacted areas within weeks to months. Moreover, the locations and potential effects associated with pile driving and removal on marine vegetation would be the same under Alternatives 1 and 2.

Modernization and Sustainment of Ranges. Pile driving would not occur during modernization and sustainment of range activities.

Conclusion. Activities that include pile driving and removal associated with Port Damage Repair under Alternative 1 would result in less than significant effects because (1) vascular marine plant species found within Port Hueneme are adapted to normal changes in sedimentation and (2) population-level effects are unlikely because of the small, locally affected areas and the low frequency of this activity in Port Hueneme.

3.3.3.2.4.2 Effects from Pile Driving Under Alternative 2

There is no difference between Alternatives 1 and 2 in pile driving. Therefore, activities that include pile driving under Alternative 2 would be the same as Alternative 1 and would result in less than significant effects.

3.3.3.3 Secondary Stressors

This section analyzes potential effects on marine vegetation indirectly exposed to stressors. Vegetation may be indirectly affected by suspended sediments and turbidity during military readiness activities.

Section 3.5 considers the effects on abiotic habitats and Section 3.2 considers effects to sediments and water quality from explosives and explosion byproducts, metals, chemicals other than explosives, and other materials (e.g., marine markers, flares, chaff, targets, and miscellaneous components of other materials). An example from that analysis could be an increase in cyanobacteria associated with munitions deposits in marine sediments. Cyanobacteria may proliferate when iron is introduced to the marine environment. This proliferation can affect adjacent habitats by releasing toxins and can create hypoxic conditions. Introducing iron into the marine environment from munitions or infrastructure is not known to cause toxic red tide events; rather, these harmful events are more associated with natural causes (e.g., upwelling) and the effects of other human activities (e.g., agricultural runoff and other coastal pollution) (Hayes et al., 2007). High-order explosions consume most of the explosive material, leaving only small or residual amounts of explosives and combustion products. Many combustion products are common seawater constituents. Explosives byproducts from high-order detonations present no indirect stressors to marine vegetation through sediment or water.

The analysis included in Section 3.2 determined that neither state nor federal standards or guidelines for sediments or water quality would be violated by the No Action Alternative, Alternative 1, or Alternative 2. Because standards for sediment and water quality would not be violated, population-level effects on marine vegetation are not likely to be detectable and are therefore inconsequential. Because these standards and guidelines are structured to protect human health and the environment, and the proposed activities would not violate them, no indirect effects are anticipated on vegetation from the proposed military readiness activities under the No Action Alternative, Alternative 1, or Alternative 2.

Other materials that are re-mobilized after their initial contact with the seafloor (e.g., by waves or currents) may continue to strike or abrade marine vegetation. Secondary physical strike and disturbances are relatively unlikely because most expended materials are denser than the surrounding sediments (e.g., metal) and are likely to remain in place as the surrounding sediment moves. Potential secondary physical strike and disturbance effects may cease when (1) the MEM is too massive to be mobilized by typical oceanographic processes, (2) the MEM becomes encrusted by natural processes and incorporated into the seafloor, or (3) the MEM becomes permanently buried. Although individual organisms could be affected by secondary physical strikes, the viability of populations or species would not be affected.

3.3.4 Combined Stressors

3.3.4.1 Combined Effects of All Stressors Under Alternative 1

Activities that have the potential to affect marine vegetation are widely dispersed, and not all stressors would occur simultaneously in a particular location. The stressors that may affect marine vegetation include explosives, physical disturbances or strikes (e.g., vessels and in-water devices, MEM, seafloor devices), and secondary stressors. The potential for exposure of marine vegetation to multiple stressors would be limited because activities are not concentrated in coastal distributions of these species. The combined effects of all stressors would not be expected to affect marine vegetation populations because (1) activities involving more than one stressor are generally short in duration, (2) such activities are dispersed throughout the Study Area, (3) activities are generally scheduled where previous activities have occurred, and (4) the large resilient populations that are present in the Study Area. Therefore, the combined effects of all stressors under Alternative 1 are consistent with a less than significant determination since the effects on marine vegetation would not have short-term or long-term changes well outside the limits of natural variability in terms of space, nutritional, physiological, or reproductive requirements within the Study Area. Vegetation would not be degraded over the long term or permanently such that its population in an area would no longer be sustainable.

3.3.5 Endangered Species Act Determinations

There are no marine vegetation species listed as endangered, threatened, candidate, or proposed under the ESA in the Study Area.

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3.4 Invertebrates

INVERTEBRATES SYNOPSIS

Stressors to invertebrates that could result from the Proposed Action were considered, and the following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Acoustic: Invertebrates could be exposed to noise from the proposed military readiness activities. However, available information indicates that invertebrate sound detection is primarily limited to low frequency (less than 1 kilohertz) particle motion and water movement that diminishes rapidly with distance from a sound source. The expected effect of noise on invertebrates is correspondingly diminished and mostly limited to offshore surface layers of the water column where only zooplankton, squid, and jellyfish are prevalent mostly at night when military readiness activities occur less frequently. Invertebrate populations are typically lower offshore, where most military readiness activities occur, than nearshore due to the scarcity of habitat structure and comparatively lower nutrient levels. Exceptions occur at nearshore locations where occasional pierside sonar, air gun, or pile driving actions occur near relatively resilient soft bottom or artificial substrate communities. Because the number of individuals affected would be small relative to population numbers, population-level effects are unlikely. As such, effects would be less than significant.
- Explosives: Explosives produce pressure waves that can harm invertebrates in the vicinity of where they typically occur, which is primarily in offshore surface waters. This area is also inhabited by zooplankton, squid, and jellyfish, which are prevalent mostly at night when military readiness activities with explosives do not typically occur. Invertebrate populations are generally lower offshore than nearshore due to the scarcity of habitat structure and comparatively lower nutrient levels. Exceptions occur where explosives are used on the bottom within nearshore waters or near sensitive hard bottom communities. Soft bottom communities are resilient to occasional disturbances. Due to the relatively small number of individuals affected, population-level effects are unlikely. As such, effects would be less than significant.
- Physical Disturbance and Strike: Invertebrates would be unlikely to experience physical disturbance and strike effects from vessels and in-water devices, military expended materials (MEM), seafloor devices, and pile driving. Most risk occurs offshore (where invertebrates are less abundant) and near the surface where relatively few invertebrates occur during the day when actions are typically occurring. Most expended materials are used in locations far from nearshore bottom areas where invertebrates are not the most abundant. Exceptions occur for actions taking place within nearshore waters over primarily soft-bottom communities, such as vessel transits, nearshore vessel training, nearshore explosive ordnance disposal training, operation of bottom-crawling seafloor devices, and pile driving. Invertebrate communities in affected soft bottom areas are naturally resilient to occasional disturbances. Physical disturbance and strike stressors would not have reasonably foreseeable adverse effects on invertebrates.

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- Entanglement: It is unlikely that invertebrates could be entangled by expended materials (e.g., wires, cables, decelerators/parachutes). Most entanglement risk occurs in offshore areas where invertebrates are relatively less abundant. The risk of entangling invertebrates is minimized by the typically linear nature of the expended structures (e.g., wires, cables), although decelerators/parachutes have mesh that could pose a risk to those invertebrates that are large and slow enough to be entangled (e.g., jellyfish). Deep-water coral could also be entangled by drifting decelerators/parachutes, but co-occurrence is highly unlikely given the extremely sparse coverage of corals in the deep ocean. Entanglement stressors would not have reasonably foreseeable adverse effects on invertebrates.
- Ingestion: Expended materials and material fragments pose an unlikely ingestion risk to invertebrates. Most MEM are too large to be ingested, and many invertebrate species are unlikely to consume an item that does not visually or chemically resemble its natural food. Exceptions occur for materials fragmented by explosive charges or weathering, which could be ingested by filter- or deposit-feeding invertebrates. Ingestion of such materials would likely occur infrequently, and only invertebrates located very close to the fragmented materials would potentially be affected. Furthermore, most human-deposited ingestible materials in the ocean originate from non-military sources. Ingestion stressors would not have reasonably foreseeable adverse effects on invertebrates.

3.4.1 Introduction

This section provides analysis of potential effects on marine invertebrates found in the HCTT Study Area and an introduction to the species that occur in the Study Area.

3.4.2 Affected Environment

The affected environment provides the context for evaluating the effects of the proposed military readiness activities on marine invertebrates. Because invertebrates occur in all habitats, activities that interact with the water column or the bottom could potentially affect many species and individuals, including microscopic zooplankton (e.g., invertebrate larvae, copepods, protozoans) that drift with currents, larger invertebrates living in the water column (e.g., jellyfish, shrimp, squid), and benthic invertebrates that live on or in the seafloor (e.g., clams, corals, crabs, worms). Because many benthic animals have limited mobility compared to pelagic species, activities that contact the bottom generally have a greater potential for effect. Activities that occur in the water column generally have less potential for effect due to dilution and dispersion of some stressors (e.g., chemical contaminants), potential drifting of small invertebrates out of an affected area, and the relatively greater mobility of open water invertebrates large enough to actively leave an affected area.

3.4.2.1 General Background

Invertebrates, which are animals without backbones, are the most abundant life form on Earth, with marine invertebrates representing a large, diverse group with approximately 367,000 species described worldwide to date (World Register of Marine Species Editorial Board, 2015). However, it is estimated that most existing species have not yet been described (Mora et al., 2011). The total number of invertebrate species that occur in the Study Area is unknown but is likely to be many thousands. The results of a research effort to estimate the number of marine invertebrate species in various areas identified nearly 6,000 species in the Hawaii Study Area and over 8,000 species in the California Current large marine ecosystem (Fautin et al., 2010). Invertebrate species vary in their use of abiotic habitats. Some populations, especially endangered species, are threatened by human activities and other natural changes.

Marine invertebrates are important ecologically and economically, providing an important source of food, essential ecosystem services (e.g., coastal protection, nutrient recycling, food for other animals, habitat formation), and income from tourism and commercial fisheries (Spalding et al., 2001). The health and abundance of marine invertebrates are vital to the marine ecosystem and the sustainability of the world's fisheries (Pauly et al., 2002). Economically important invertebrate groups that are fished, commercially and recreationally, for food in the United States include crustaceans (e.g., shrimps, lobsters, and crabs), bivalves (e.g., scallops, clams, and oysters), echinoderms (e.g., sea urchins and sea cucumbers), and cephalopods (e.g., squids and octopuses) (Chuenpagdee et al., 2003; Food and Agriculture Organization of the United Nations, 2005; Pauly et al., 2002). Marine invertebrates or the structures they form (e.g., shells and coral colonies) are harvested for many purposes, including jewelry, curios, and the aquarium trade. In addition, some marine invertebrates are sources of chemical compounds with potential medical applications. Natural products have been isolated from a variety of marine invertebrates and have shown a wide range of therapeutic properties, including anti-microbial, antioxidant, anti-hypertensive, anticoagulant, anticancer, anti-inflammatory, wound healing and immune modulation, and other medicinal effects (De Zoysa, 2012; Romano et al., 2022). Information on invasive species and SOPs used by the Navy related to invasive species is presented in Section 3.0.4.

3.4.2.2 Endangered Species Act-Listed Species

Table 3.4-1 presents ESA-listed marine invertebrates in the Study Area, including two abalone species listed as endangered (black abalone [*Haliotis cracherodii*] and white abalone [*H. sorenseni*]) and one sea star proposed as threatened (sunflower sea star [*Pycnopodia helianthoides*]). Detailed information on each ESA-listed species is presented in Appendix C. In addition, one ESA-listed coral species, the Globiceps coral (*Acropora globiceps*), has been reported at French Frigate Shoals in the Northwestern Hawaiian Islands (National Marine Fisheries Service, 2024). This species does not occur in the Hawaii Range Complex, and no military readiness activities would occur in shallow nearshore areas in the Temporary Operating Area where this species has been reported. Therefore, this species will not be analyzed further in this document.

NMFS has identified the overall primary factors contributing to decline of the abalone species, shown in Table 3.4-1 (National Oceanic and Atmospheric Administration Fisheries, 2015). These factors are overharvesting, low population density, loss of genetic diversity, disease, poaching, and natural predation. Lowry et al. (2022) reported that the sunflower sea star faces ongoing threats from sea star wasting syndrome (SSWS) and direct (i.e., physiological) and indirect (i.e., ecological) consequences of anthropogenic climate change. Military readiness activities are not expected to contribute substantially to any of these factors.

Table 3.4-1: Status of Endangered Species Act-Listed Species Within the Study Area

Species Name and Regulatory Status				Presence in Study Area		
Common Name	Scientific Name	Endangered Species Act Status	Critical Habitat Designated	Open Ocean Area/Transit Corridor	California Study Area	Hawaii Study Area
Black abalone	*Haliotis cracherodii*	Endangered	Yes	None	Yes	None
White abalone	*Haliotis sorenseni*	Endangered	No	None	Yes	None
Globiceps coral	*Acropora globiceps*	Threatened	Proposed	None	None	Yes
Sunflower sea star*	*Pycnopodia helianthoides*	Proposed Threatened	No	None	Yes	None

* Final Rule listing the sunflower sea star is expected from the National Marine Fisheries service before the end of 2024.

3.4.2.3 Species Not Listed Under the Endangered Species Act

Thousands of invertebrate species occur in the Study Area. The variety of species spans many taxonomic groups (taxonomy is a method of classifying and naming organisms). Many species of marine invertebrates are commercially or recreationally fished, with several species being managed under the Magnuson-Stevens Fishery Conservation and Management Act.

Marine invertebrates are classified within major taxonomic groups, generally referred to as a phyla. Major invertebrate phyla—those with greater than 1,000 species (Roskov et al., 2015; World Register of Marine Species Editorial Board, 2015)—and the general zones they inhabit in the Study Area are listed in Table 3.4-2. Vertical distribution information is generally shown for adults; the larval stages of most of the species occur in the water column. In addition to the discrete phyla listed, there is a substantial variety of single-celled organisms, commonly referred to as protozoan invertebrates, that represent several phyla (Kingdom Protozoa in Table 3.4-2). Throughout the invertebrates section, organisms may be referred to by their phylum name or, more generally, as marine invertebrates.

Table 3.4-2: Major Taxonomic Groups of Marine Invertebrates in the Study Area

Major Invertebrate Groups[1]		Presence in Study Area[2]	
Common Name (Classification)[3]	Description[4]	Open Ocean	Coastal Waters
Foraminifera, radiolarians, ciliates (Kingdom Protozoa)	Benthic and planktonic single-celled organisms; shells typically made of calcium carbonate or silica.	Water column, bottom	Water column, bottom
Sponges (Porifera)	Mostly benthic animals; sessile filter feeders; large species have calcium carbonate or silica structures embedded in cells to provide structural support.	Bottom	Bottom
Corals, anemones, hydroids, jellyfish (Cnidaria)	Benthic and pelagic animals with stinging cells; sessile corals are main builders of coral reef frameworks.	Water column, bottom	Water column, bottom
Flatworms (Platyhelminthes)	Mostly benthic; simplest form of marine worm with a flattened body.	Water column, bottom	Water column, bottom
Ribbon worms (Nemertea)	Benthic marine worms with an extendable, long tubular-shaped extension (proboscis) that helps capture food.	Water column bottom	Bottom

Table 3.4-2: Major Taxonomic Groups of Marine Invertebrates in the Study Area (continued)

Major Invertebrate Groups[1]		Presence in Study Area[2]	
Common Name (Classification)[3]	**Description[4]**	**Open Ocean**	**Coastal Waters**
Round worms (Nematoda)	Small benthic marine worms; free-living or may live in close association with other animals.	Water column, bottom	Water column, bottom
Segmented worms (Annelida)	Mostly benthic, sedentary to highly mobile segmented marine worms (polychaetes); free-living and tube-dwelling species; predators, scavengers, herbivores, detritus feeders, deposit feeders, and filter or suspension feeders.	Bottom	Bottom
Bryozoans (Bryozoa)	Small, colonial animals with gelatinous or hard exteriors with a diverse array of growth forms; filter feeding; attached to a variety of substrates (e.g., rocks, plants, shells or external skeletons of invertebrates).	Bottom	Bottom
Cephalopods, bivalves, sea snails, chitons (Mollusca)	Soft-bodied benthic or pelagic predators, filter feeders, detritus feeders, and herbivore grazers; many species have a shell and muscular foot; in some groups, a ribbon-like band of teeth is used to scrape food off rocks or other hard surfaces.	Water column, bottom	Water column, bottom
Shrimp, crabs, lobsters, barnacles, copepods (Arthropoda)	Benthic and pelagic predators, herbivores, scavengers, detritus feeders, and filter feeders; segmented bodies and external skeletons with jointed appendages.	Water column, bottom	Water column, bottom
Sea stars, sea urchins, sea cucumbers (Echinodermata)	Benthic animals with endoskeleton made of hard calcareous structures (plates, rods, spicules); five-sided radial symmetry; many species with tube feet; predators, herbivores, detritus feeders, and suspension feeders.	Bottom	Bottom

[1]Major species groups (those with more than 1,000 species) are based on the World Register of Marine Species (World Register of Marine Species Editorial Board, 2015) and Catalogue of Life (Roskov et al., 2015).
[2]Presence in the Study Area includes open ocean areas (North Pacific Gyre and North Pacific Transition Zone) and coastal waters of two large marine ecosystems (California Current and Insular-Pacific Hawaiian). Occurrence on or within seafloor (bottom or benthic) or water column (pelagic) pertains to juvenile and adult stages; however, many phyla may include pelagic planktonic larval stages.
[3]Classification generally refers to the rank of phylum, although Protozoa is a traditionally recognized group of several phyla of single-celled organisms (e.g., historically referred to as Kingdom Protozoa, which is still retained in some references, such as in the Integrated Taxonomic Information System).
[4]benthic = a bottom-dwelling organism associated with seafloor or substrate; planktonic = an organism (or life stage of an organism) that drifts in pelagic (water) environments

Additional information on the biology, life history, and conservation of marine invertebrates can be found in Appendix C.

3.4.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, baseline conditions of the existing environment for marine invertebrates would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section describes and evaluates how and to what degree the activities and stressors described in Chapter 2 and Section 3.0.2.3 potentially affects marine invertebrates known to occur within the Study Area. In addition, invasive marine invertebrates, such as octocorals in Pearl Harbor, are an emerging threat to other marine invertebrate communities. Information on SOPs used by the Navy related to invasive species is presented in Section 3.0.4.

The stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors analyzed for invertebrates are as follows:

- **acoustics** (sonar and other transducers)
- **explosives** (explosions in water)
- **physical disturbance and strikes** (vessels and in-water devices, MEM, seafloor devices, pile driving, cable installation)
- **entanglement** (wires and cables, decelerators/parachutes, nets)
- **ingestion** (MEM)

The analysis considers SOPs and mitigation measures that would be implemented under Alternatives 1 and 2 of the Proposed Action. The standard operating procedures and mitigation that are specific to invertebrates are listed in Table 3.4-3.

As noted in Section 3.0.2, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in 40 CFR 1501.3(d). Of the stressors analyzed in this section, only acoustic and explosive stressors could have a reasonably foreseeable adverse effect; thus requiring a significance determination. Stressors with no reasonably foreseeable adverse effects remain included in this Draft EIS/OEIS to document and support the analysis leading to this conclusion.

A stressor is considered to have a significant effect on the human environment based on an examination of the context of the action and the intensity of the effect. In the present instance, the effects of acoustics or explosives would be considered significant if the impacts have short- or long-term changes well outside the limits of 1) the natural range of variability of species' populations, 2) their habitats, or 3) the natural processes sustaining them within the Study Area. A significant effect finding would be appropriate if invertebrate habitat would be degraded over the long term or permanently such that it could cause the population of a managed species to become stressed, less productive, or unstable.

Table 3.4-3: List of Standard Operating Procedures and Mitigation for Invertebrates

Applicable Stressor	Requirements Summary and Protection Focus	Section Reference
Explosives	The Action Proponents will not detonate any in-water explosives within 350 yards of shallow-water coral reefs.	Section 5.7.1[1]
	The Action Proponents will not detonate any in-water explosives within 350 yards of artificial reefs, biogenic hard bottom, submerged aquatic vegetation, and shipwrecks, except in designated locations where these resources will be avoided to the maximum extent practical.	Section 5.7.2[1]
	The Action Proponents will not (1) set vessel anchors within an anchor swing circle radius that overlaps shallow-water coral reefs (except in designated anchorages) (2) place other seafloor devices within 350 yards of shallow-water coral reefs (3) deploy non-explosive ordnance against surface targets within 350 yards of shallow-water coral reefs	Section 5.7.1[1]
	The Action Proponents will not (1) set vessel anchors within an anchor swing circle radius that overlaps artificial reefs, biogenic hard bottom, submerged aquatic vegetation, and shipwrecks (except in designated anchorages) (2) place other seafloor devices (that are not precisely placed) within 350 yards of artificial reefs, biogenic hard bottom, submerged aquatic vegetation, and shipwrecks (except for vessel anchors, precisely placed seafloor devices, and as described in Section 5.7.2, Table 5-9) (3) place non-explosive seafloor devices directly on artificial reefs, biogenic hard bottom, submerged aquatic vegetation, or shipwrecks	Section 5.7.2[1]

[1] The mitigation was developed to protect specific habitats, which also protects invertebrates that are associated with those habitats.

3.4.3.1 Acoustic Stressors

Table 3.4-4 contains brief summaries of information relevant to the analyses of effects for acoustic substressors (e.g., sonar and other transducers) on invertebrates. Details on the updated information in general, as well as effects specific to each substressor, is provided in Appendix D.

Table 3.4-4: Acoustic Information Summary

Substressor	Information Summary
All acoustic substressors	Most marine invertebrates do not have the capability to sense sound pressure; however, some are sensitive to nearby low-frequency sounds. • Invertebrates detect sound through particle motion, which diminishes rapidly with distance from the sound source. Therefore, the distance at which they may detect a sound is limited. Studies of continuous noise have found statocyst (small organ used for balance and orientation in some marine invertebrates) damage, stress, changes in larval development, masking of biologically relevant sounds, and behavioral reactions in marine invertebrates under generally extreme experimental conditions. • Noise exposure duration in many of the studies was far greater than that expected to occur during infrequent and localized activities.

Table 3.4-4: Acoustic Information Summary (continued)

Substressor	Information Summary
All acoustic substressors (cont.)	• Masking of biologically relevant sounds by sounds generated from human activities could affect behaviors such as larvae settlement, communication, foraging, and predator avoidance. Invertebrates may also grow accustomed (i.e., habituate) to chronically elevated sound from human activities. Some studies indicate the potential for effects on invertebrate larval development and masking resulting from extended exposure. • Recent research regarding the vertical distribution of most pelagic invertebrates suggests they are far below the surface during the daytime and less affected by daytime stressors in surface waters.
Sonar and other transducers	Sonar and other transducers produce continuous, non-impulsive sound in the water column at various frequencies. • Sonar and other transducer use in nearshore locations could expose more benthic invertebrates to higher intensity sounds, but the exposures from mobile platforms would be brief and intermittent and affect mostly pelagic invertebrates very close to the particle motion generated by the transducers. • Sessile species or species with limited mobility located near the activity would be exposed for the entire duration of sonar use at pierside locations. Species with greater mobility could potentially be exposed for shorter durations, depending on the time between testing events and the activity of individual animals. • The limited information available suggests that sessile marine invertebrates repeatedly exposed to sound could experience physiological stress or react behaviorally (e.g., shell closing) but there is also evidence to suggest their population is unaffected.
Air guns	Air guns produce shock waves when pressurized air is released into the water. The results of studies of the effects of seismic air guns on marine invertebrates suggest differences between taxonomic groups and life stages. • Physical injury has not been reported in relatively large crustaceans exposed to seismic air guns at received levels comparable to the source level of air guns operated at full capacity, but one study reported injury and mortality for zooplankton. • Stress response was not found in crabs exposed to air gun noise but was reported for lobsters located near the source (where particle motion was likely detectable). • While behavioral reaction to air guns has not been documented for crustaceans, squid have exhibited startle and alarm responses at various sound levels. • Developmental effects were found for crab eggs and scallop larvae, but not for crab larvae. Air gun use could also result in substrate vibration, which could cause behavioral effects in nearby benthic invertebrates (e.g., shell closing or changes in foraging activity). • Air gun use in offshore areas would be unlikely to affect individuals of pelagic organisms (e.g., jellyfish, squid, and zooplankton) multiple times due to the relative mobility of invertebrates in the water column (passive/drifting and active movement) and the mobile nature of the sound source. • Exposure to air gun shots has not caused mortality, and invertebrates typically recovered from injuries in controlled laboratory settings. • Effects from air guns are highly unlikely and not considered further in this analysis.

Table 3.4-4: Acoustic Information Summary (continued)

Substressor	Information Summary
Pile driving	Pile driving and removal involves both impact and vibratory methods. Impact pile driving produces repetitive, impulsive, broadband sound with most of the energy in lower frequencies where invertebrate sound sensing capability is greater. Vibratory pile removal produces nearly continuous sound at a lower source level. • Available information indicates that invertebrates may respond to particle motion and substrate vibration produced by pile driving and removal. Investigations have found behavioral effects may vary among taxa or species. Most studies were conducted using small experimental tanks, where effects were observed very close to the sound sources. • Effects from vibratory pile driving are highly unlikely and not considered further in this analysis.
Vessel noise	Some invertebrates would likely be able to detect the low-frequency component of vessel noise. Several studies have found physiological responses (e.g., stress and changes in growth and reproduction) and behavioral responses (e.g., changes in feeding activity, shell closing) in some invertebrate species in response to vessel noise playback. Vessel noise may also contribute to acoustic masking. • Exposure to other types of non-impulsive noise has resulted in statocyst damage in squid and octopus, physiological stress, effects on larval development, and behavioral reactions. Noise exposure in several of the studies occurred to captive individuals over time durations greater than that expected to occur during many training and testing activities, and therefore direct applicability of the results to the proposed action is uncertain. However, it is possible that invertebrates in the Study Area that are exposed to episodic vessel noise could exhibit similar reactions. • Marine invertebrates capable of sensing sound may alter their behavior or experience masking of other sounds if exposed to vessel noise. Because the distance over which most marine invertebrates are expected to detect sounds is limited, and because most vessel noise is transient or intermittent (or both), most behavioral reactions and masking effects from training and testing activities would likely be short term, ceasing soon after vessels leave an area. An exception could occur in and around port navigation channels and nearshore waters that receive a high volume of ship or small craft traffic, where sound disturbance would be more frequent. • The relatively high frequency and intensity of vessel traffic in many nearshore training and testing areas may have also given organisms an opportunity to adapt behaviorally to a noisier environment. For example, survey work by the Virginia Institute of Marine Science suggests that large populations of oysters inhabit Navy piers in the Chesapeake Bay that have persisted despite a history of chronic vessel noise. Without prolonged exposure to nearby sounds of relatively high intensity and generally low frequency, measurable effects or behavioral adaptation are not expected. • Effects from vessel noise are highly unlikely and not considered further in this analysis.
Aircraft noise	Aircraft and missile overflight noise is not applicable to invertebrates due to the very low transmission of sound pressure across the air/water interface and will not be analyzed further in this section.

Table 3.4-4: Acoustic Information Summary (continued)

Substressor	Information Summary
Weapon noise	Invertebrates could be temporarily affected by noise produced by muzzle blasts and impact of large non-explosive practice munitions. • Effects would likely be limited to pelagic invertebrates (e.g., squid, jellyfish, zooplankton) located near the surface. • Injury and physiological stress would not be likely because most invertebrates are relatively insensitive to underwater sounds. Behavioral reactions have been observed for squid but not for other invertebrates such as crustaceans, jellyfish, or zooplankton. • Overall, effects from weapons noise are highly unlikely and not considered further in this analysis

Assessing whether sounds may disturb or injure an animal involves understanding the characteristics of the acoustic sources, the animals that may be near the sound, and the effects that sound may have on the physiology and behavior of those animals. Marine invertebrates are likely only sensitive to water particle motion caused by nearby low-frequency sources, and likely do not sense distant or mid- and high-frequency sounds (Appendix D). Compared to some other taxa of marine animals (e.g., fishes, marine mammals), little information is available on the potential effects on marine invertebrates from exposure to sonar and other sound-producing activities (Hawkins et al., 2015). Historically, many studies focused on squid or crustaceans and the consequences of exposures to broadband impulsive air guns typically used for oil and gas exploration (Carroll et al., 2017; Erbe & Thomas, 2022). More recent investigations have included additional taxa (e.g., molluscs) and sources, although extensive information is not available for all potential stressors and effect categories (Carroll et al., 2017; Erbe & Thomas, 2022; Solé et al., 2023). Background information on acoustic effects on marine invertebrates from physical injury to behavioral or stress response is provided in Appendix D. Acoustic stressors such as aircraft noise is not applicable to marine invertebrates due to the very low transmission of sound pressure across the air/water interface and are not analyzed in this section.

3.4.3.1.1 Sonar and Other Transducers

3.4.3.1.1.1 Effects from Sonar and Other Transducers Under Alternative 1

Training and Testing. Marine invertebrates would be exposed to low-, mid-, and high-frequency sonar and sound produced by other transducers during training and testing activities throughout the Study Area. Sounds produced during training and testing are described in Section 3.0.3.3.1.

Invertebrates would likely only sense low-frequency sonar or the low-frequency component of nearby sounds associated with other transducers. Sonar and other transducers are often operated in deep water, where effects would be more likely for pelagic species than for benthic species. Only individuals within a short distance (potentially a few feet) of the most intense sound levels would experience effects on sensory structures such as statocysts. Any marine invertebrate that detects low-frequency sound may alter its behavior (e.g., change swim speed, move away from the sound, or change the type or level of activity). Given the limited distance to which marine invertebrates are sensitive to sound, only a small number of individuals relative to overall population sizes would likely have the potential to be affected. Because the distance over which most marine invertebrates are expected to detect any sounds is limited and because most sound sources are transient or intermittent (or both), any physiological effects, masking, or behavioral responses would be short term and brief. Without prolonged exposures to nearby sound sources, adverse effects on individual invertebrates are not expected, and there would be no effects at the population level. Low frequency sonar and other sounds may result in brief, intermittent effects on individual marine invertebrates and groups of marine invertebrates close to a sound source, but they are unlikely to affect survival, growth, recruitment, or reproduction of marine invertebrate populations or subpopulations.

As summarized in Table 3.4-4, low-frequency sonar and other transducers could expose some benthic invertebrates to higher intensity sounds, but the exposures from mobile platforms would be brief and intermittent and affect mostly pelagic invertebrates very close to the particle motion generated by the transducers. Training and testing activities could occur in designated black abalone critical habitat. However, sound associated with training and testing would not affect essential biological features of critical habitat, which consist of adequate substrate, food availability, and water quality and circulation patterns. Critical habitat is not designated for white abalone or sunflower sea stars under the ESA. Due to the limited range of sound detection and infrequent use of sonar in relatively shallow waters where these species occur, physiological or behavioral reactions due to sonar exposure are unlikely. Although the number of sonar hours used would be greater under Alternative 2 than Alternative 1, the effects on marine invertebrates would be the same, as analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs and for reasons summarized in Table 3.4-4.

Modernization and Sustainment of Ranges. There would be no sonar use during modernization and sustainment of ranges activities. All sonar used on the SOAR, SWTR, Mine Warfare, or other training areas is analyzed under Training and Testing above.

Conclusion. Activities that include the use of sonar and other transducers under Alternative 1 would result in less than significant effects for reasons presented in Table 3.4-4.

3.4.3.1.1.2 Effects from Sonar and Other Transducers Under Alternative 2

The only difference between Alternatives 1 and 2 in sonar and other transducer use is that the number of sonar hours used would be greater under Alternative 2 (Table 3.0-2). Even though the number of sonar and transducers used in Alternative 2 would be greater than Alternative 1, potential impacts on invertebrates are not expected to be meaningfully different.

Therefore, activities that include the use of sonar and other transducers under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.4.3.2 Explosive Stressors

3.4.3.2.1 In-Water Explosives

Explosions produce pressure waves with the potential to cause injury or physical disturbance due to rapid pressure changes, as well as loud, impulsive, broadband sounds. Impulsive sounds are characterized by rapid pressure rise times and high peak pressures. When explosive munitions detonate, fragments of the weapon are thrown at high velocity from the detonation point, which can injure or kill invertebrates if they are struck. However, the friction of the water quickly slows these fragments to the point where they no longer pose a threat. The number and location of explosives that may result in fragments are presented in Table 3.0-17. Supporting information on how explosives affect marine invertebrates is presented in Appendix D.

Various types of explosives are used during military readiness activities. The type, number, and location of activities that use explosives are discussed in Chapter 3.0. While explosives would be used throughout the Hawaii Study Area, underwater explosions would primarily occur in the vicinity of Pearl Harbor, and Barbers Point, and Ewa Minefield Training area (areas that have been historically used for these activities), as well as at Pearl City Peninsula and Lima Landing in Pearl Harbor (see Figure H-33). In the SOCAL Range Complex, underwater detonations could occur in San Diego Bay at the Echo location (see Figure H-39) and in nearshore areas within the SSTC training lanes and training areas surrounding SCI over sandy bottom.

Table 3.4-5 contains a summary of information relevant to the analyses of effects from explosive stressors. Detailed background information is provided in Appendix D. Note that underwater explosions from human activities have not been identified among the causes of decline in marine invertebrate populations to date (Appendix C).

Table 3.4-5: Explosive Stressors Information Summary

Information Summary	
Explosions in the water	Explosions produce pressure waves with the potential to cause injury or physical disturbance due to rapid pressure changes and other physical effects. Charges detonated in shallow water on or near the bottom could kill and injure marine invertebrates within hundreds of yards of the location. A blast on or near the bottom could also degrade hard substrate suitable for invertebrate colonization or form a crater in soft bottom. A blast in the vicinity of hard corals could cause direct effects on coral polyps, or fragmentation and siltation of the corals. • Invertebrates that detect impulsive or non-impulsive sounds resulting from an explosion may experience stress or exhibit behavioral reactions. Any auditory masking of biologically relevant sounds would be very brief. • The majority of underwater explosions occur on the surface and typically in offshore locations more than 3–9 nautical miles from shore in water depths greater than 100 feet (30 meters), where invertebrate size and abundance is generally low compared to estuarine and nearshore waters. In addition, invertebrate abundances in offshore surface waters tend to be lower during the day, when surface explosions typically occur, than at night. • Charges detonated on or near shallow, soft-bottom habitats affect invertebrate communities that are adapted to frequent disturbance from storms and associated sediment redistribution. Studies of the effects of large-scale sediment disturbance, such as dredging and sediment borrow projects, have found recovery of benthic communities over a period of weeks to years depending on multiple factors (e.g., substrate type, current speeds, and storm intensities). • With the exception of clay bottom, craters resulting from detonations in the soft bottom would be filled and smoothed by waves and long-shore currents over time, resulting in no long-term change to bottom profiles that could affect invertebrate species assemblages. Craters in clay bottom could persist for years.

3.4.3.2.1.1 Effects from Explosives Under Alternative 1

Training and Testing. Mine warfare activities are typical examples of activities involving detonations on or near the bottom in nearshore waters. Invertebrates in these areas such as exposed coastlines, are adapted to frequent disturbance from storms and associated sediment redistribution. Studies of the effects of large-scale sediment disturbance, such as dredging and sediment borrow projects, have found recovery of benthic communities over a period of weeks to years (Posey & Alphin, 2002; U.S. Army Corps of Engineers, 2012). Recovery time is variable and may be influenced by multiple factors but is generally faster in areas dominated by sand and moderate to strong water movement. The area of bottom habitat disturbed by explosions would be less than that associated with dredging or other large projects and would occur mostly in soft-bottom areas that are regularly disturbed by natural processes such as water currents and waves. It is therefore expected that areas affected by detonations would rapidly be recolonized (potentially within weeks) by recruitment from the surrounding invertebrate community. Craters resulting from detonations in the soft bottom would be filled and smoothed by waves and long-shore currents over time, resulting in no permanent change to bottom profiles that could affect invertebrate species assemblages. The time required to fill craters would depend on the size and depth, with deeper craters likely requiring more time to fill (U.S. Army Corps of Engineers, 2001). The amount of bottom habitat affected by explosions would be a very small percentage of the habitat available in the Study Area. Information on the total area of bottom habitat potentially disturbed by explosions is presented in Appendix I. In addition, the locations, number of events, area affected, and potential effects associated with explosives would be the same under Alternative 1 and Alternative 2.

Many corals and hard bottom invertebrates are sessile, fragile, and particularly vulnerable to shock wave effects. Many of these organisms are slow growing and could require decades to recover (Precht et al., 2001). However, most other military readiness activities that use explosions would occur at or near the water surface and offshore, reducing the likelihood of effects on shallow-water corals.

As discussed in Section 5.7, mitigation to avoid effects from explosives on seafloor resources in mitigation areas would be implemented throughout the Study Area. For example, except for mine warfare ranges and locations previously used for underwater detonations, explosive mine countermeasure and neutralization activities would not be conducted within 350 yards of shallow-water coral reefs, precious coral beds, artificial reefs, and shipwrecks. The mitigation would consequently also help avoid potential effects on invertebrates that inhabit these areas. The Navy does not conduct underwater detonations near black and white abalone habitat based on established protocol which authorizes on select areas of a given range complex for explosive events. Underwater explosions would also not overlap with designated black abalone critical habitat.

Modernization and Sustainment of Ranges. Explosives would not be used during modernization and sustainment of ranges; therefore, there would be no explosives effects.

Conclusion. Activities that include the use of explosives under Alternative 1 would result in less than significant effects because of: (1) an unlikely spatial coincidence between explosive effects and the distribution of sensitive invertebrates (e.g., shallow-water coral reefs); (2) a quick recovery of soft bottom communities that are more likely impacted (e.g., worms, clams); and (3) only short-term impacts from most local disturbances of the surface water or seafloor, with some temporary increases in suspended sediment in mostly shallow, soft bottom habitats.

3.4.3.2.1.2 Effects from Explosives Under Alternative 2

The locations, number of events, area affected, and potential effects associated with explosives would be the same or similar to those described under Alternative 1 and potential impacts on invertebrates are not expected to be meaningfully different.

Mitigation to avoid impacts effects from explosives on seafloor resources would be implemented in mitigation areas throughout the Study Area, as described under Alternative 1 and in Section 5.7.

Therefore, activities that include the use of explosives under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.4.3.3 Physical Disturbance and Strike Stressors

Table 3.4-6 contains brief summaries of information relevant to analyses of effects for each physical disturbance and strike substressor. Supporting information on marine invertebrate effects from physical disturbance and strike stressors are provided in Appendix F.

Table 3.4-6: Physical Disturbance and Strike Stressors Information Summary

Substressor	Information Summary
Vessels and in-water devices	• In general, there would be a higher likelihood of vessel and in-water device disturbance or strike in the nearshore areas than in the open ocean portions of the Study Area because of the concentration of activities and comparatively higher abundances of invertebrates in areas closer to shore. • In most cases, vessels and in-water devices would avoid contact with bottom (and associated invertebrates) per standard operating procedures unless the vessel/vehicle is designed to touch the bottom (e.g., amphibious vehicles). • Most invertebrates in the water column around a passing vessel would be disturbed, rather than struck, as water flows around a vessel or device due to the hydrodynamic shape. • Propeller wash and turbulent water flow could damage or kill zooplankton and invertebrate gametes, eggs, embryonic stages, or larvae. Even if some tiny invertebrates were affected, their populations are vast, with short life cycles and naturally high mortality rates. Many squid and zooplankton species also migrate far from the surface during the day, reducing the overall potential for strikes or even disturbance. • The potential for vessels to disturb invertebrates on or near the bottom and along the shoreline would occur mostly during nearshore military readiness activities, and along navigation channels. Invertebrates in such areas (e.g., shrimp, crab, oysters, clams, worms) could be affected by sediment disturbance or direct strike during vessel movement in shallow water (e.g., waterborne training, amphibious landings). Touching the bottom in shallow, soft bottom is a common practice among boaters that does not necessarily damage the vessel. • Although amphibious vehicles are designed to touch the bottom during amphibious landings, they are generally used along ocean beaches and similar high-energy shorelines where the numbers of invertebrates present are small and resilient to frequent disturbance. • Invertebrates inhabiting shallow bottoms and shoreline may be subject to recurring wake-induced turbidity and erosion (Zabawa & Ostrom, 1980). For context, Navy vessels represent a small fraction of total maritime traffic (Mintz, 2016) and the wakes generated by small Navy vessels which, for safety reasons are not generally operated at excessive speeds close to shore, are similar to wind waves that naturally occur.
Military expended materials	• Military expended material (MEM) deployed over water include a wide range of items that may affect invertebrates upon initial impact or may occur when items reach the seafloor to settle or be moved along the bottom by water currents or gravity. • The effects of expended materials at the surface would be minimal because many invertebrates are absent from surface waters during the day, which is when most military readiness activities occur. Compared to surface waters and offshore areas, a greater number of macroinvertebrates typically occurs on the bottom and closer to shore, where relatively few materials are expended. • After striking the surface or being launched underwater, MEM passing nearby may disturb individuals and cause a stress response or behavioral reaction. Expended items may bury or smother organisms when they reach the seafloor. Expended items could also increase turbidity that could temporarily affect filter-feeding species nearby.

Table 3.4-6: Physical Disturbance and Strike Stressors Information Summary (continued)

Substressor	Information Summary
Military expended materials (continued)	• Whereas some benthic invertebrates have hard, resilient shells (e.g., clams, snails), other species (e.g., sponges and soft corals) have fragile structures and sensitive body parts that could be damaged or covered by MEM. Heavy expended materials such as a ship hulk could also break hard structures such as coral skeletons and mussel beds. Shallow- and deep-water corals that build complex or fragile structures could be particularly susceptible to breakage or abrasion. Expended items may also provide new colonization sites for benthic invertebrates, although species composition on artificial substrates often differs from that of the surrounding natural community. • MEM that are less dense than the underlying substrate (e.g., decelerators/ parachutes) will likely remain on the substrate surface for some time after sinking. The effect of lighter materials on benthic invertebrates would also be temporary and minor due to the mobility of such materials. The rare exception would be for light materials that snag on structure bottom features (e.g., decelerator/parachute or wire/cable on reef-building corals). The potential for lighter materials to drift into shallow, nearshore habitats from at-sea training and testing areas would be low based on the prevailing ocean currents. • Potential effects on deep-water corals and sponges present the greatest risk of long-term damage compared with resilient soft bottom communities. The probability of striking deep-water corals or other sensitive invertebrates located in deep-water habitat is extremely low due to their relatively patchy coverage on suitable habitat.
Seafloor devices	• Seafloor devices are either stationary (e.g., mine shapes, anchors, bottom-placed instruments, fiber optic cables) or move very slowly along the bottom (e.g., bottom-crawling unmanned underwater vehicles) where they may temporarily disturb the bottom before being recovered. • Seafloor devices pose little threat to highly mobile organisms (e.g., squid, shrimp) in the water column. Effects on pelagic invertebrates resulting from movement of a device through the water column before it reaches the seafloor would likely consist of only temporary displacement as the object passes by. • Effects on sessile or less mobile benthic organisms (e.g., corals, sponges, snails) may include injury or mortality due to direct strike, disturbance, smothering, and temporary impairment of respiration or filter-feeding due to increased sedimentation and turbidity. The severity of the effect would be greater for relatively fragile invertebrate parts (e.g., coral polyps). • Although intentional placement of seafloor devices on bottom structure is avoided to ensure recovery, seafloor devices placed in depths less than about 2,500 meters may inadvertently affect deep-water corals and other invertebrates associated with live hard bottom (e.g., sponges, anemones). The probability of striking deep-water corals or other sensitive invertebrates located on hard substrate is also relatively low given their typically low percent coverage on suitable habitat.
Pile driving	• Pile driving and removal activities at Port Hueneme involves both impact and vibratory methods in soft substrate. Pile driving may have the potential to affect soft bottom communities temporarily during driving, removal, and in the short term thereafter. The effect on benthic invertebrates include displacement within the footprint of the pilings, sediment disturbances during driving and extraction, and loss of sessile invertebrates that colonize the pilings prior to removal.

3.4.3.3.1 Vessels and In-Water Devices

3.4.3.3.1.1 Impacts from Vessels and In-Water Devices

Training and Testing. The number and location of activities that include vessels is shown in Table 3.0-15, and the number and location of activities that include in-water devices is shown in Table 3.0-16. Most training and testing activities include vessels, while a lower number of activities include in-water devices. As indicated in Section 3.0.3.3.4.1, vessel operation would be widely dispersed throughout the Study Area but would be more concentrated near ports, naval installations, and range complexes. Most vessel use would occur in the California Study Area. Amphibious landings could occur at designated beaches adjacent to the Study Area, including beaches adjacent to proposed Amphibious Corridors. Hydrographic surveys have been used to map precise transit routes through sandy bottom areas to avoid potential vessel strikes of corals in the Hawaii Study Areas.

Similar to vessel operation, activities involving in-water devices could be widely dispersed throughout the Study Area, but would be more concentrated near naval ports, piers, and ranges.

Invertebrates located at or near the surface could be struck or disturbed by vessels, and invertebrates throughout the water column could be similarly affected by in-water devices. There would be a higher likelihood of vessel and in-water device strikes over the continental shelf than in the open ocean portions of the Study Area because of the concentration of activities and comparatively higher abundances of invertebrates in areas closer to shore. However, direct strikes would generally be unlikely for most species. Exceptions would include amphibious landings, where vessels contact the bottom and may directly affect invertebrates. Organisms inhabiting these areas are expected to rapidly re-colonize disturbed areas. Other than during amphibious landings, purposeful contact with the bottom by vessels and in-water devices would be avoided. The potential to disturb invertebrates on or near the bottom would occur mostly during vessel nearshore and onshore training activities, and along dredged navigation channels. Invertebrates that typically occur in areas associated with nearshore or onshore activities, such as shorelines, are highly resilient to vessel disturbance. Propeller wash and turbulent water flow could damage or kill zooplankton and invertebrate gametes, eggs, embryonic stages, or larvae. Overall, the area exposed to vessel and in-water device disturbance would be a very small portion of the surface and water column in the Study Area, and only a small number of individuals would be affected compared to overall abundance. Therefore, the effect of vessels and in-water devices on marine invertebrates would be inconsequential. Activities are not expected to yield any lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level. In addition, even though there would be a very small increase in vessel and in-water device use in the Study Area in Alternative 2 compared with Alternative 1, the difference would not result in substantive changes to the potential for or types of effects on invertebrates.

Species that do not occur near the surface within the Study Area, including ESA-listed black abalone and white abalone, as well as ESA-proposed sunflower sea stars, would not be exposed to vessel strikes. In addition, these species would not be affected by amphibious landings (amphibious assault, insertion, and extraction) since abalone inhabit rocky shores and hard bottom, which are not used for amphibious landings. In addition, these activities would not occur within black abalone critical habitat.

Modernization and Sustainment of Ranges. No vessels or in-water devices are involved in the proposed Special Use Airspace Modernization. Vessels and in-water devices associated with SOAR Modernization; SWTR Installation; Sustainment of Undersea Ranges; Hawaii and California undersea cable projects; and Installation and Maintenance of Underwater Platforms, Mine Warfare, and Other Training Areas would move very slowly during installation activities (0–3 knots) and would not pose a collision threat to invertebrates. Although invertebrates located at or near the surface could be struck or disturbed by vessels, in-water devices would be placed primarily in soft bottom areas and would have less than significant effects on benthic invertebrate species.

Conclusion. Activities that include the use of vessels and in-water devices would not have reasonably foreseeable adverse effects on invertebrates for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs and presented in Table 3.4-6. Some of these reasons include the following: (1) invertebrate populations are vast with short life cycles and naturally high mortality rates, so even if some tiny invertebrates are affected, populations would not be affected; and (2) many invertebrates inhabiting nearshore areas are adapted to recurring waves and storm surge, which can generate increased turbidity and suspended sediments.

3.4.3.3.2 Military Expended Materials

3.4.3.3.2.1 Effects from Military Expended Materials

Training and Testing. A potential strike to marine invertebrates comes from the following categories of MEM: (1) all sizes of non-explosive practice munitions (Table 3.0-16); (2) fragments from high-explosive munitions (Table 3.0-17); (3) expendable targets (Table 3.0-18); and (4) expended materials other than munitions, such as sonobuoys or torpedo accessories (Table 3.0-19). A discussion of the types of activities that use MEM is presented in Appendix B, and supporting information on potential MEM effects on marine invertebrates is presented in Appendix I.

MEM would occur throughout the Study Area, although relatively few items would be expended in the HCTT Transit Corridor. Most MEM would occur within the California and Hawaii Study Areas. Potential effects on marine invertebrates from MEM may include injury or mortality due to direct strike or burial, disturbance, and indirect effects such as increased turbidity. The potential for direct strikes of pelagic zooplankton and squid at the surface would be minimized by their decreased occurrence in surface waters during the day when training activities typically occur.

The effect of MEM on marine invertebrates is likely to cause injury or mortality to individuals of soft-bodied species that are smaller than the MEM. Zooplankton could therefore be affected by most MEM. Effects on populations would likely be inconsequential because the number of individuals affected would be small relative to known population sizes, the area exposed to the stressor is extremely small relative to the area of both suitable and occupied habitats, the activities are dispersed such that few individuals would likely be exposed to more than one event, and exposures would be localized and would cease when the MEM becomes part of the bottom (e.g., buried or encrusted with sessile organisms). Activities involving MEM are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at the population level.

As discussed in Section 5.7, mitigation to avoid effects from MEM on seafloor resources would be implemented in mitigation areas throughout the Study Area. For example, gunnery activities within a specified distance of shallow-water coral reefs and precious coral beds would not be conducted. The mitigation would consequently also help avoid potential effects on sensitive invertebrates that inhabit these areas, such as corals. Even though the total area affected for military readiness activities would increase slightly under Alternative 2 compared to Alternative 1, the potential effects on marine invertebrates would be similar between the two alternatives.

In general, the Navy does not conduct training activities that result in MEM in shallow, rocky areas where ESA-listed black abalones occur. In addition, significant amounts of MEM are not used at depths where white abalone are found, such as Tanner Bank. Some MEM may be expended in the nearshore waters off the southern part of SCI, the future Shallow Water Test Range, and explosive ordnance disposal areas near SSTC and southern SCI. Although most MEM typically sinks after use, it is conceivable a MEM item deployed offshore could drift into shallow water, including black abalone critical habitat, although this would be infrequent and insignificant. Similarly, infrequent drifting MEM could be deposited near shallow white abalone habitat such as Tanner Bank. Given the low population of both abalone species, spatial distances between individuals, and very infrequent co-occurrence with MEM, while there could be potential effects, any likely effect would be transitory and minimal. Overall, MEM effects on ESA-listed abalone species and ESA-proposed sunflower sea stars would be minimal due to relatively little overlap with MEM deployment.

Modernization and Sustainment of Ranges. No MEM are expected during modernization and sustainment of ranges activities. However, some anchors may not be recovered and would become MEM. Those effects are covered in the analysis of seafloor devices.

Conclusion. Activities that include the use of MEM would not have reasonably foreseeable adverse effects on invertebrates for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs and presented in Table 3.4-6. Some of these reasons include the following: (1) the effects of expended materials would be minimal at the surface because many invertebrates are absent from surface waters during the day, when most military readiness activities occur; and (2) a greater number of macroinvertebrates typically occur on the bottom and closer to shore, where relatively few materials are expended.

3.4.3.3.3 Seafloor Devices

3.4.3.3.3.1 Effects from Seafloor Devices

Training and Testing. Seafloor devices represent items used during training or testing activities that are deployed onto the seafloor and recovered. Section 3.0.3.3.4.3 provides the number and location of seafloor devices in the Study Area (see Table 3.0-20). Supporting information on effects of seafloor devices on marine invertebrates is presented in Appendix F.

Effects on marine invertebrates may include injury or mortality due to direct strike, disturbance, smothering, and impairment of respiration or filter-feeding due to increased sedimentation and turbidity. Effects resulting from movement of the devices through the water column before they contact the bottom would likely consist of only temporary displacement as the object passes by.

Although intentional placement of seafloor devices on bottom structure is avoided, activities occurring at depths less than about 3,000 m may inadvertently affect deep-water corals, other invertebrates associated with hard bottom, and other marine invertebrate assemblages. However, most activities involving seafloor devices (e.g., anchors for mine shapes such as concrete blocks) are typically conducted in nearshore areas far from deep-sea corals. Most seafloor devices are operated in the nearshore environment on bottom habitats suitable for deployment and retrieval (e.g., soft or mixed bottom). Hard substrate potentially supporting deep-water corals and other invertebrate communities is present on the continental shelf break and slope. A low percentage of deep substrate on the continental shelf is suitable for hard bottom communities. Based on the results of limited investigation, a low percentage of available hard substrate may be inhabited by deep-water corals or other invertebrate species (Watters et al., 2022), although the percentage of coverage may be higher in some areas, such as undersea banks associated with the Channel Islands. The number of organisms affected is not expected to result in effects on the viability of invertebrate populations.

During precision anchoring, the effect of the anchor on the bottom would likely crush a relatively small number of benthic invertebrates. Effects associated with turbidity and sedimentation would be temporary and localized. Precision anchoring would occur multiple times per year in the same general location. Therefore, although invertebrates in soft bottom areas are generally resilient to disturbance, community composition may be chronically disturbed at anchoring sites that are used repeatedly. However, the effect is likely to be inconsequential and not detectable at the population level for species occurring in the region near the anchoring locations. In addition, even though there would be a small increase in the number of activities involving seafloor devices from Alternative 1 to Alternative 2, this increase would not result in substantive changes to potential effects or the types of effects on marine invertebrates.

Navy practice is to place seafloor devices on soft bottom areas not normally associated with abalone or sunflower sea star habitat. Proposed activities using seafloor devices would not overlap with black abalone critical habitat, and minimally overlap white abalone habitat at Tanner Banks. Therefore, potential effects from seafloor devices on ESA invertebrates would be negligible.

Mitigation that includes not conducting precision anchoring (except in designated anchorages) would be implemented within the anchor swing circle of shallow-water coral reefs, precious coral beds, artificial reefs, and shipwrecks to avoid potential effects from seafloor devices on seafloor resources in mitigation areas throughout the Study Area (see Section 5.7). This mitigation would consequently help avoid potential effects on invertebrates that inhabit these areas.

Modernization and Sustainment of Ranges. New range modernization and sustainment activities include installation of undersea cables integrated with hydrophones and underwater telephones to sustain the capabilities of the SOAR. Deployment of fiber optic cables along the seafloor would occur in three locations: south and west of SCI in the California Study Area, and to the northeast of Oahu and west of Kauai in the Hawaii Study Area. In all locations the installations would occur completely within the water; no land interface would be involved. Cable-laying activities in the California Study Area could disturb white abalone and sunflower sea star bottom habitat when the cable crosses rocky substrate at depths between 65 to 196 ft. (20 to 60 m) for the SWTR Intallation. However, it is anticipated that rocky substrate would be avoided to the greatest extent possible throughout the cable corridor to minimize these effects.

Installation and maintenance of underwater platforms, mine warfare training areas, and installation of other training areas involve seafloor disturbance where those activities would take place. Each installation would occur on soft, typically sandy bottom, avoiding rocky substrates.

Conclusion. Activities that include the use of seafloor devices would not have reasonably foreseeable adverse effects on invertebrates for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs and presented in Table 3.4-6. Some of these reasons include the following: (1) marine invertebrates in the water column (e.g., squid, shrimp) are highly mobile; and (2) although relatively fragile invertebrate parts (e.g., coral polyps) would be affected greater than other invertebrates, seafloor devices are not typically placed in shallow nearshore areas where coral reefs or other sensitive populations occur.

3.4.3.3.4 Pile Driving

3.4.3.3.4.1 Effects from Pile Driving

Training and Testing. Effects on invertebrates resulting from pile driving and vibratory pile extraction are considered in the context of injury, mortality, or displacement that may occur due to physical strikes and disturbance. Pile driving produces impulsive sound that may also affect invertebrates. Effects associated with impulsive sound are discussed with other acoustic stressors in Section 3.4.3.1, and supporting information is presented in Appendix D.

Impact pile driving and vibratory pile removal would occur during training for Port Damage Repair. Pile driving for the Port Damage Repair would occur in shallower water over soft substrates at Port Hueneme, California. Some benthic invertebrates could be crushed, injured, displaced, or react behaviorally because of pile installation and removal. In addition, turbidity could affect respiration and feeding in some individuals. In addition, the location and number of events for pile driving associated with Port Damage Repair at Port Hueneme would be the same under both alternatives.

Because pile driving activities would only be conducted in Port Hueneme as part of Port Damage Repair training, and ESA-listed black and white abalone and ESA-proposed sunflower sea stars and black abalone critical habitat do not occur in Port Hueneme, there would be no on these species.

Modernization and Sustainment of Ranges. Pile driving would not occur during modernization and sustainment of ranges activities.

Conclusion. Activities that include pile driving would not have reasonably foreseeable adverse effects on invertebrates for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs. Some of these reasons are as follows: (1) pile installation and removal would only occur in one location (Port Hueneme) and for a limited number of times; and (2) although some slow-moving benthic invertebrates may be removed or crushed during pile installation and removal activities, the number of invertebrates affected would be extremely low and have no population-level effects.

3.4.3.4 Entanglement Stressors

Entanglement stressors that can affect marine invertebrates include wires and cables and decelerators/parachutes. Nets deployed during testing of XLUUV would not entangle marine invertebrates and are not discussed further. The number and locations where wires and cables would be expended are presented in Table 3.0-22. Table 3.4-7 contains brief summaries of background information that is relevant to analyses of effects for each entanglement substressor on invertebrates. Supporting information on marine invertebrate effects from entanglement stressors are provided in Appendix F.

Table 3.4-7: Entanglement Stressors Information Summary

Substressor	Information Summary
Wires and cables	Fiber-optic cables, torpedo guidance wires, sonobuoy wires, and expendable bathythermograph wires would be expended during military readiness activities. • A marine invertebrate with some degree of mobility could become temporarily entangled and escape unharmed, be held tightly enough that it could be injured during its struggle to escape, be preyed upon while entangled, or starve while entangled. However, the effect of wires and cables on marine invertebrates is not likely to cause injury or mortality to individuals because of the linear and somewhat rigid nature of the material. • Once the items reach the bottom, they could be moved into different shapes or could loop around objects due to water currents, but the items are not expected to form tight coils. Fiber-optic cables are also relatively brittle and easily broken. • The wires and cables would eventually become buried in sediment or encrusted by marine growth. Benthic and sessile invertebrates would be physically disturbed rather than entangled by a wire or cable.
Decelerators/ parachutes	Following impact at the water's surface, the decelerator/parachute assembly is expended and sinks away from the unit. • Small and medium decelerator/parachute assemblies may remain at the surface for 5–15 seconds before drifting to the bottom, where it becomes flattened and more of a physical disturbance stressor than an entanglement stressor. • Large and extra-large decelerators/parachutes may remain at the surface or suspended in the water column for a longer time due to the lack of weights, but eventually also sink to the bottom and become flattened. • A decelerator/parachute with attached lines sinking through the water column are unlikely to affect pelagic invertebrates; most pelagic invertebrates would be too small to be ensnared, the lines would be relatively straight during descent, and there are large openings between the cords. Small decelerator/parachute lines may also be detached and incapable of entangling an invertebrate.

3.4.3.4.1 Wires and Cables

3.4.3.4.1.1 Effects from Wires and Cables

Training and Testing. Marine invertebrates may be affected by wires and cables such as fiber-optic cables, torpedo guidance wires, sonobuoy wires, and expendable bathythermograph wires expended during training and testing activities. These materials would be expended during sinking exercises, anti-submarine warfare activities, torpedo exercises, and various mine warfare and countermeasures exercises in the Hawaii and California Study Areas and the Transit Corridor. Compared to sonobuoy wires, a low number of fiber-optic cables, guidance wires, and bathythermograph wires are expended in the Study Area. Most expended items would be sonobuoy wires, and most of the sonobuoy wires would be expended in the California Study Area.

The effect of wires and cables on marine invertebrates is not likely to cause injury or mortality to individuals because of the linear and somewhat rigid nature of the material. Effects on individuals and populations would be inconsequential because the area exposed to the stressor is extremely small relative to the distribution ranges of most marine invertebrates, the activities are dispersed such that few individuals would likely be exposed to more than one event, and exposures would be localized. In addition, marine invertebrates are not particularly susceptible to entanglement stressors, as most would avoid entanglement and simply be temporarily disturbed. Activities involving wires and cables are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels. All locations of wire and cable use potentially coincide with deep-water corals and other invertebrates associated with hard bottom areas in water depths less than 3,000 m. The portion of suitable substrate occupied by corals is generally low, and coincidence with such low densities of linear materials is unlikely. However, in some areas, deep-water corals may cover a greater portion of available hard substrate (Watters et al., 2022). Even though there would be a small increase in the number of sonobuoy wires expended in the California Study Area from Alternative 1 to Alternative 2, this increase is not expected to result in substantive changes to the potential for or types of effects on marine invertebrates.

ESA-listed abalone species and ESA-proposed sunflower sea stars do not occur in offshore areas where torpedo launches, or other entanglement stressors would occur, and these species would not be entangled by fiber-optic cables or sonobuoy wires because they are sedentary invertebrates. There is no probable scenario in which an abalone or sunflower sea star would be ensnared by a fiber-optic cable on the bottom and suffer adverse effects.

Modernization and Sustainment of Ranges. Fiber optic cables are deployed on the seafloor during SOAR Modernization, and the installation of two SWTRs. The Navy also proposes to deploy undersea fiber optic cables and connected instrumentation to existing undersea infrastructure along the seafloor in the California Study area (south and west of SCI), and the Hawaii Study Area (northeast of Oahu and west of Kauai). Entanglement of invertebrates is not likely because of the rigidity of the cable that is designed to lie extended on the sea floor vice coil easily. Once installed on the seabed, the new cable and communications instruments would be equivalent to other hard structures on the seabed, again posing no risk of adverse effect on invertebrates.

Conclusion. Activities that include the use of wires and cables would not have reasonably foreseeable adverse effects on invertebrates for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs and presented in Table 3.4-7. Some of these reasons include the following: (1) marine invertebrates do not typically get entangled in wires and cables due to their linear and somewhat rigid nature of the material; and (2) wires and cables would eventually become buried in sediment or encrusted by marine growth, and benthic and sessile invertebrates would be physically disturbed rather than entangled.

3.4.3.4.2 Decelerators/Parachutes

3.4.3.4.2.1 Effects from Decelerators/Parachutes Under Alternative 1

Training and Testing. The number and location of decelerators/parachutes expended during proposed training and testing activities are presented in Table 3.0-19, and the size categories of decelerators/parachutes are presented in Table 3.0-23. Supporting information on marine invertebrate effects from entanglement stressors are provided in Appendix F.

Decelerator/parachute lines could temporarily displace invertebrates in the water column but would be unlikely to ensnare individuals. Decelerator/parachute mesh could envelop invertebrates as the item sinks through the water column. Envelopment would primarily be associated with zooplankton, although other relatively slow-moving invertebrates such as jellyfish and swimming crabs could be caught in a billowed decelerator/parachute. Ensnared individuals may be injured or killed or may eventually escape. Decelerators/parachutes on the bottom could cover benthic invertebrates, but some would likely be able to move away from the item. It is highly unlikely that an individual invertebrate would be ensnared by a decelerator/parachute on the bottom and suffer adverse effects. It is possible that decelerators/parachutes could break or abrade deep-water corals.

Most marine invertebrates would not encounter a decelerator/parachute. The effect of decelerators/parachutes on marine invertebrates is not likely to cause injury or mortality to individuals, and effects would be inconsequential because the area exposed to the stressor is extremely small relative to most marine invertebrates' ranges, the activities are dispersed such that few individuals would likely be exposed to more than one event, and exposures would be localized. The surface area of decelerators/parachutes expended across the Study Area is extremely small compared to the relatively low percentage of suitable substrate inhabited by deep-sea coral species, resulting in a low risk of coincidence. In addition, marine invertebrates are not particularly susceptible to entanglement stressors, as most mobile invertebrates would be able to avoid entanglement and simply be temporarily disturbed. The number of individuals affected would be inconsequential compared to overall invertebrate population numbers. Activities involving decelerators/parachutes are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction of invertebrate species at individual or population levels. In addition, even though there would be a small increase in the number of small decelerators/parachutes used in Alternative 2 compared to Alternative 1, this increase would not be expected to result in substantive changes to the potential for or types of effects on invertebrates discussed earlier.

Decelerators/parachutes are unlikely to drift into most areas where ESA-listed black abalone and white abalone or ESA-proposed sunflower sea stars are present due to the typical offshore locations of use (water depths of 600 ft. or more). Potential exceptions include offshore areas known to support these species (e.g., Tanner and Cortes Banks). It is not likely that a sedentary abalone could be ensnared by a decelerator/parachute cord. Effects would more likely be associated with covering or abrasion. An abalone that becomes covered by a decelerator/parachute could have reduced access to food items such as drifting or attached macroalgae until the animal moves away from the item. Respiration could also be affected if an abalone becomes covered by a decelerator/parachute to the extent that water flow is restricted. There is a remote possibility that abalone larvae could be caught in a decelerator/parachute as it sinks, although microscopic organisms may be able to pass through the mesh.

Modernization and Sustainment of Ranges. No decelerators/parachutes would be expended during modernization and sustainment of ranges activities.

Conclusion. Activities that include the use of decelerators/parachutes would not have reasonably foreseeable adverse effects on invertebrates for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs and presented in Table 3.4-7. Some of these reasons include the following: (1) marine invertebrates do not typically get entangled in declarators/parachute lines but could be temporarily displaced in the water column; (2) most pelagic invertebrates would be too small to be ensnared; and (3) the decelerator/parachute lines would be relatively straight during descent, and the openings between the cords would be large enough for an invertebrates to escape if ensnared.

3.4.3.5 Ingestion Stressors

The various types of MEM used by the Navy during military readiness activities within the Study Area may be broadly categorized as munitions and materials other than munitions. Aspects of ingestion stressors applicable to marine organisms in general are presented in Section 3.0.3.3.6. The number and location of targets expended in the Study Area that may result in fragments is presented in Table 3.0-24.

Table 3.4-8 contains brief summaries of background information that is relevant to analyses of effects for each ingestion substressor. Supporting information on ingestion stressors for marine invertebrates is provided in Appendix F.

Table 3.4-8: Ingestion Stressors Information Summary

Substressor	Information Summary
Military expended materials	Ingestion of intact military expended materials is not likely for most types of expended items because they are too large to be ingested by most marine invertebrates. Though ingestion of intact munitions or large fragments is conceivable in some circumstances, such a scenario is unlikely due to the animal's ability to discriminate between food and non-food items. Indiscriminate deposit- and detritus-feeding invertebrates could potentially ingest munitions fragments that have degraded to sediment size. Metal particles in the water column may be taken up by suspension feeders, although metal concentrations in the water are typically much lower than concentrations in sediments. Most military expended materials would sink to the bottom, while some could persist at the surface or in the water column for some time. • Ingestion is not likely for most military expended materials because they are too large to be consumed by most marine invertebrates. Though ingestion of intact items on the bottom is conceivable in some circumstances, such a scenario is unlikely due to the animal's ability to discriminate between food and non-food items. Similarly, it is unlikely that an invertebrate at the surface or in the water column would ingest a relatively large, expended item as it floats or sinks through the water column. • Degradation of plastic materials could result in microplastic particles being released into the marine environment over time. Eventually, deposit-feeding, detritus-feeding, and filter-feeding invertebrates could ingest these particles. Ingestion of plastic particles may result in negative physical and chemical effects on invertebrates. • Marine invertebrates may occasionally encounter and incidentally ingest chaff fibers when they ingest prey or water, but chaff poses little environmental risk to marine organisms at concentrations that could reasonably occur from military training and testing.

3.4.3.5.1 Military Expended Materials

3.4.3.5.1.1 Effects from Military Expended Materials

Training and Testing. MEM from munitions associated with training and testing activities that could potentially be ingested by marine invertebrates include non-explosive practice munitions (small- and medium-caliber), small-caliber casings, fragments from high explosives, target fragments, chaff, canisters, and flare casings. These items could be expended throughout most of the Study Area but would be concentrated in the Hawaii Range Complex and SOCAL Range Complex.

It is possible, but unlikely, that invertebrates would ingest MEM. Some invertebrates could potentially ingest MEM fragments that have degraded to sediment size, chaff fibers, and particulate metals may be taken up by suspension feeders. In addition, small plastic pieces may be consumed by a wide variety of invertebrates with diverse feeding methods (detritivores, planktivores, deposit-feeders, filter-feeders, and suspension-feeders) in the water column or on the bottom. Adverse effects due to metal pieces on the bottom or in the water column are unlikely. Microplastic particles could affect individuals. Although the potential effects on invertebrate populations due to microplastic ingestion are currently uncertain, proposed activities would result in small amounts of plastic particles introduced to the marine environment compared to other sources. Effects on individuals are unlikely, and effects on populations would probably not be detectable. The locations, types, and number of military expended materials that pose a risk of being ingested would be the same under both alternatives.

Mitigation (e.g., not conducting gunnery activities within a specified distance of shallow-water coral reefs and precious coral beds) would be implemented to avoid potential effects from MEM on seafloor resources in mitigation areas throughout the Study Area (see Section 5.7). This mitigation would consequently help avoid potential effects on invertebrates associated with shallow-water coral reefs and precious coral beds.

ESA-listed abalone species occur in the California Study Area, but while possible, it is highly unlikely that ESA-proposed sunflower sea stars are present in the California Study Area. Potential effects on black abalone would be limited to individuals accidentally ingesting small fragments of exploded munitions as they scrape algae or biofilm (a thin layer of microorganisms) off hard substrates in shallow water. However, materials are primarily expended far from shore, in the open ocean where black abalone and sunflower sea stars do not occur. While the majority of MEM would be used in waters beyond white abalone habitat, there may be infrequent, rare use of select MEM in slightly shallower water. However, combined with very low numbers of white abalone, dispersion of individuals across various shallow water ridges, and low MEM use in white abalone habitat, the potential for ingestion and consequent effects would be low. However, due to the low overall abalone population density and the widely dispersed use of expendable materials, the potential for ingestion and consequent effects would be low.

Modernization and Sustainment of Ranges. No MEM are expected during modernization and sustainment of ranges activities.

Conclusion. Activities that include the use of MEM would not have reasonably foreseeable adverse effects on invertebrates for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs and presented in Table 3.4-8. Some of these reasons include the following: (1) MEM are typically too large to be consumed by most marine invertebrates; and (2) most MEM, such as chaff, poses little environmental risk to marine invertebrates at concentrations that could reasonably occur from military readiness activities.

3.4.3.6 Secondary Stressors

The effects of explosives and MEM in terms of habitat disturbance are described in Section 3.5. The assessment of potential sediment and water quality degradation on aquatic life is covered in Section 3.2. The analysis of sediment and water quality degradation in Section 3.2 is sufficient to suggest that marine invertebrates do not have elevated sensitivities to the types of pollutants generated from military readiness activities. Supporting information on secondary stressors and their potential effects on marine invertebrates are provided in Appendix F.

Effects on invertebrate prey availability from military readiness activities would likely be insignificant overall based on the analysis conclusions for the direct stressors on their food resources (e.g., vegetation, other invertebrates, fish, other animal carcasses).

The analysis conclusions for secondary stressors associated with military readiness activities are consistent with a less than significant determination and therefore would result in an insignificant effect on marine invertebrates.

3.4.4 Combined Stressors

The analysis and conclusions for the potential effects from each of the individual stressors are discussed in the previous sections and are summarized in Section 3.4.4.2.1 and Table 3.4-5 for ESA-listed species. Stressors associated with military readiness activities do not typically occur in isolation but rather occur in some combination. For example, mine neutralization activities include elements of acoustic, physical disturbance and strike, entanglement, ingestion, and secondary stressors that are all coincident in space and time. An analysis of the combined effects of all stressors considers the potential consequences of additive and synergistic stressors. This analysis assumes that most exposures to stressors are non-lethal, and instead focuses on consequences potentially affecting the organism's fitness (e.g., physiology, behavior, reproductive potential). Invertebrates in the Study Area could potentially be affected by introduction of invasive species due to direct predation, competition for prey, or displacement from suitable habitat. Invasive species could be introduced by growth on vessel hulls or discharges of bilge water. Refer to Appendix C for a discussion of naval vessel discharges.

There are generally two ways that an invertebrate could be exposed to multiple additive stressors. The first would be if an invertebrate were exposed to multiple sources of stress from a single event or activity within a single training or testing event (e.g., a mine warfare event may include the use of a sound source and a vessel). The potential for a combination of these effects from a single activity would depend on the range to effects of each of the stressors and the response or lack of response to that stressor. Secondly, an invertebrate could be exposed to multiple military readiness activities over the course of its life; however, training and testing activities are generally separated in space and time in such a way that it would be unlikely that any individual invertebrate would be exposed to stressors from multiple activities within a short timeframe. However, animals with a home range intersecting an area of concentrated activity have elevated exposure risks relative to animals that simply transit the area through a migratory corridor.

Multiple stressors may also have synergistic effects. For example, invertebrates that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Invertebrates that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to entanglement and physical strike stressors via malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple stressors, the synergistic effects from the combination of stressors are difficult to predict in any meaningful way.

The following analysis makes the reasonable assumption that the majority of exposures to individual stressors are non-lethal, and instead focuses on consequences potentially affecting invertebrate fitness (e.g., physiology, behavior, reproductive potential).

3.4.4.1 Combined Effects of All Stressors

Most of the activities proposed under both Alternative 1 and Alternative 2 generally involve the use of moving platforms (e.g., ships, torpedoes) that may produce one or more stressors; therefore, if invertebrates were within the effects range of those activities, they may be introduced to multiple stressors at different times. The minimal effects of far-reaching stressors (e.g., sound pressures, particle motion) may also trigger some animals to leave the area ahead of a more damaging effect (e.g., physical disturbance or strike). Individual stressors that would otherwise have minimal to no effect may combine to have a measurable effect. Due to the wide dispersion of stressor sources, speed of the platforms, and general dynamic movement of many military readiness activities, it is unlikely that highly mobile invertebrates would occur in the potential effects range of multiple sources or sequential exercises. Military readiness activities that produce MEM that fall to the bottom have the greatest potential to effect attached/sessile and slow-moving organisms. Effects on sessile and slow-moving species in areas where military readiness activities are concentrated and consistently located could include strike, crushing, or being covered.

Although potential effects on invertebrates from military readiness activities may include injury and mortality, in addition to other effects such as physiological stress and behavioral effects, the combined effects under both Alternative 1 and Alternative 2 are not expected to lead to long-term consequences for invertebrate populations. Based on the general description of effects, the number of invertebrates affected is expected to be small relative to overall population sizes and would not be expected to yield any lasting effects on the survival, growth, recruitment, or reproduction of any invertebrate species.

The combined effect of all stressors on marine invertebrates is consistent with a less than significant determination.

3.4.5 Endangered Species Act Determinations

Pursuant to the ESA, the analyses in this section show that military readiness activities may affect ESA-listed black and white abalone and ESA-proposed sunflower sea stars and black abalone designated critical habitat. The Action Proponent is consulting with the National Marine Fisheries Service (and/or U.S. Fish and Wildlife Service) as required by section 7(a)(2) of the ESA. The summary of effects determinations for each ESA-listed species and/or designated critical habitat is provided in Table 3.4-9.

Table 3.4-9: Marine Invertebrate ESA Effect Determinations for Military Readiness Activities Under Alternative 1

Species	Overall Determination	Acoustic Stressors	Explosive Stressors	Physical Disturbance and Strike Stressors				Entanglement Stressors		Ingestion Stressors	Indirect Effects
		Sonar & Other Transducers	Explosions	Vessels & In-Water Devices	Military Expended Material	Seafloor Devices	Pile Driving	Wires & Cables	Decelerators/ Parachutes	Military Expended Materials	
ESA-Listed Species											
Black abalone	MA	NE	MA	MA	MA	NE	NE	NE	MA	NE	MA
White abalone	MA	NE	MA	MA	MA	NE	NE	NE	MA	NE	MA
ESA-Proposed Species											
Sunflower sea star	MA	NE	MA	MA	MA	NE	NE	NE	MA	NE	MA
Critical Habitat											
Black abalone	MA	NE	NE	NE	MA	NE	NE	NE	NE	NE	NE

Notes: MA = May Affect, NE = No Effect

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3.5 Abiotic Habitats

ABIOTIC HABITATS SYNOPSIS

Stressors to abiotic habitats that could result from the Proposed Action within the Study Area were considered, and the following conclusions have been reached for the Preferred Alternative (Alternative 1).

- Explosives: Most of the high-explosive MEM would detonate at or near the water surface. The surface area of bottom substrate affected would be an extremely small fraction of the total training and testing area available in the Study Area. As such, impacts would be less than significant.
- Physical Disturbance and Strike: Most seafloor devices would be placed in areas that would result in minor and temporary bottom substrate effects. Once on the seafloor and over time, MEM would be buried by sediment, corroded from exposure to the marine environment, or colonized by benthic organisms. The surface area of bottom substrate affected over the short term would be a tiny fraction of the total Study Area. As such, impacts would be less than significant.

3.5.1 Introduction

The following sections describe the abiotic or non-living habitat features (e.g., water column, sandy shores, rocky bottoms) found in the Study Area and the potential for direct effects from proposed military readiness activities. Direct effects on habitats would be considered secondary stressors to the living resources that rely on these habitats.

Discussion of marine habitats is included in Chapter 6 from the perspective of the National Marine Sanctuaries Act, EO 13158 (Marine Protected Areas), and the Magnuson-Stevens Fishery Conservation and Management Act. For more detailed information on abiotic habitats, refer to Appendix C and Section C.4.

3.5.2 Affected Environment

The affected environment provides the context for evaluating the effects of the proposed military readiness activities on abiotic habitats.

3.5.2.1 General Background

Much of the general background has not changed over what was described in the 2018 HSTT and 2022 PMSR EIS/OEISs. The HCTT Study Area differs from the HSTT Study Area in that HCTT includes an expanded SOCAL Range Complex (West Extension and South Extension); special use airspace corresponding to the new extensions; the inclusion of two existing training and testing at-sea ranges, PMSR and the NOCAL Range Complex; inclusion of areas along the SOCAL coastline from approximately Dana Point to Port Hueneme; and four amphibious approach lanes providing California land access from NOCAL and PMSR. Nearshore areas within the Hawaii Study Area, such as Kaneohe Bay or MCTAB, may be used more frequently or for new training or testing activities, but the geographic boundary of the Hawaii Study Area would remain unchanged. Updated information for abiotic substrate in these new areas was included, where available. Since 2018, higher quality and detailed data has been released for habitat data in both the California and Hawaii Study Areas. The most notable update to benthic habitat data from 2018 HSTT Phase III is the inclusion of the Multibeam Backscatter and Bathymetry Synthesis for the Main Hawaiian Islands, prepared in 2016 (Smith, 2016). This data provides high-quality benthic habitat data in the Hawaii Study Area. For supporting information on general background, refer to Appendix C.

Although many classification schemes are available that span a range of spatial dimension and granularity (Allee et al., 2000; Cowardin et al., 1979a; Federal Geographic Data Committee, 2012; Howell et al., 2010; Kendall et al., 2001; United Nations Educational Scientific and Cultural Organization, 2009; Valentine et al., 2005), three basic types of abiotic substrates describe the affected environment: soft, hard, and mixed substrates. The term “mixed” has been updated from the term “intermediate,” previously used in Phase III. This update is consistent with Coastal Marine Ecological Classification Standard developed to provide a consistent classification framework for federally funded projects (Federal Geographic Data Committee, 2012). Soft substrate areas are dominated by mud (including clay and silt) or sand – substrate often too unstable for colonization by habitat-forming invertebrates (e.g., hard corals, oysters) or attached seaweed in the marine environment. Soft substrate in sheltered, estuarine environments may be colonized by seagrass or coastal wetland species (Section 3.3; Appendix C). Hard substrate areas are dominated by cobbles, boulders, or consolidated bedrock that is stable enough for colonization by habitat-forming invertebrates or attached seaweed. For more information on invertebrates in the study areas, see Section 3.4. Mixed substrates are dominated by unconsolidated material larger than sand but smaller than cobbles (e.g., gravel, shell fragments), may or may not be stable enough for habitat-forming invertebrates or attached seaweeds, depending on depth and other factors (e.g., current speeds) (Appendix C). Artificial features (shipwrecks, artificial reefs, piers, and quay wall) are another type of abiotic substrate that is based on material type and origin. Detailed descriptions of substrate types (including grain sizes) can be found in Appendix C, Section C.1.1.2.1 for grain sizes, and Section C.4 all other habitats information.

3.5.2.2 Bottom Habitats

The features described in this Draft EIS/OEIS include naturally and artificially occurring features of the shoreline and bottom within the Study Area (e.g., rocky reefs). Artificial substrates that may serve as habitat are described in Section 3.5.2.3. The general descriptions of shore habitats in the Study Area have not changed from those described in the 2018 HSTT and 2022 PMSR EIS/OEISs. Since shore habitats make up a relatively small portion of the Study Area, shore habitats are covered under bottom habitats. For detailed discussion of shore habitats, see Appendix C, Section C.4.1.1.

3.5.2.2.1 Hard Bottom

Hard bottom includes all aquatic habitats with substrates having a surface of stones, boulders, or bedrock (75 percent or greater coverage) (Cowardin et al., 1979b). This includes rocky outcrops and ridges, banks, and seamounts and other areas of seafloor that are exposed because of ocean currents. Hard bottom habitats in the Main Hawaiian Islands consist mostly of consolidated bedrock (~33 percent), sand (25 percent), rock/boulder habitat (22 percent) (National Centers for Coastal Ocean Science, 2024). Hard bottom habitats are localized off the California coast, and the potential for transitional mixed bottom habitat as well.

Subtidal rocky habitat occurs as extensions of intertidal rocky shores and as isolated offshore outcrops. The shapes and textures of the larger rock assemblages and the fine details of cracks and crevices are determined by the type of rock, the wave energy, and other local variables (Davis, 2009). Maintenance of mostly low relief hard bottom (e.g., bedrock) requires wave energy and/or currents sufficient to sweep sediment away (Lalli & Parsons, 1993) or offshore areas lacking a significant sediment supply; therefore, rocky reefs are rare on broad coastal plains near sediment-laden rivers and are more common on high-energy shores and beneath strong bottom currents, where sediments cannot accumulate.

In deep waters of the Pacific Ocean, there are also a number of chemosynthetic communities (cold seeps and thermal vents), which tend to support unique biotic communities. A cold seep, or cold vent, is an area of the ocean floor where chemical fluid seepage occurs. Cold seeps develop unique topography over time, where reactions between methane and seawater create carbonate rock formations and reefs. A thermal, or hydrothermal vent is a fissure in the seafloor where geothermally heated water is released. Hydrothermal vents are known near Hawaii Island. Cold seeps occur in association with multiple fault systems off Southern California. Hard substrate in the abyssal zone and some locations landward of the deep ocean are typically devoid of encrusting or attached organisms due to the scarcity of drifting food particles in the deep ocean (Nybakken, 1993).

The overall distribution of hard bottom substrate within the Study Area is illustrated in Figure 3.5-1 through Figure 3.5-3. In the Hawaii Study Area, approximately 5.28 percent is comprised of hard substrate, while 0.22 percent is present in the California Study Area (Table 3.5-1).

3.5.2.2.2 Soft Bottom

Soft bottoms include all aquatic habitats with the following three characteristics: (1) more than 25 percent cover of particles smaller than stones, (2) unconsolidated sediment predominantly mud or sand, and (3) primarily subtidal water regimes (Cowardin et al., 1979a). Soft bottom forms the substrate of channels, shoals, subtidal flats, and other features of the bottom. Sandy channels emerge where strong currents connect estuarine and ocean water columns. Shoals or capes form where sand is deposited by interacting, sediment-laden currents. Subtidal flats occur between soft shores and channels or shoals. The continental shelf extends seaward of the shoals and inlet channels and includes relatively coarse-grained, soft bottom habitats. Relatively finer-grained sediments collect off the shelf break, continental slope, and abyssal plain. Organisms' characteristic of soft bottom environments, such as worms and clams, may be found at all depths where there is sufficient oxygen and sediment accumulation (Nybakken, 1993).

The overall distribution of soft bottom substrate within the Study Area is illustrated in Figure 3.5-1 through Figure 3.5-3. In the Hawaii Study Area, approximately 91.79 percent is comprised of soft substrate, while 88.72 percent is present in the California Study Area (Table 3.5-1).

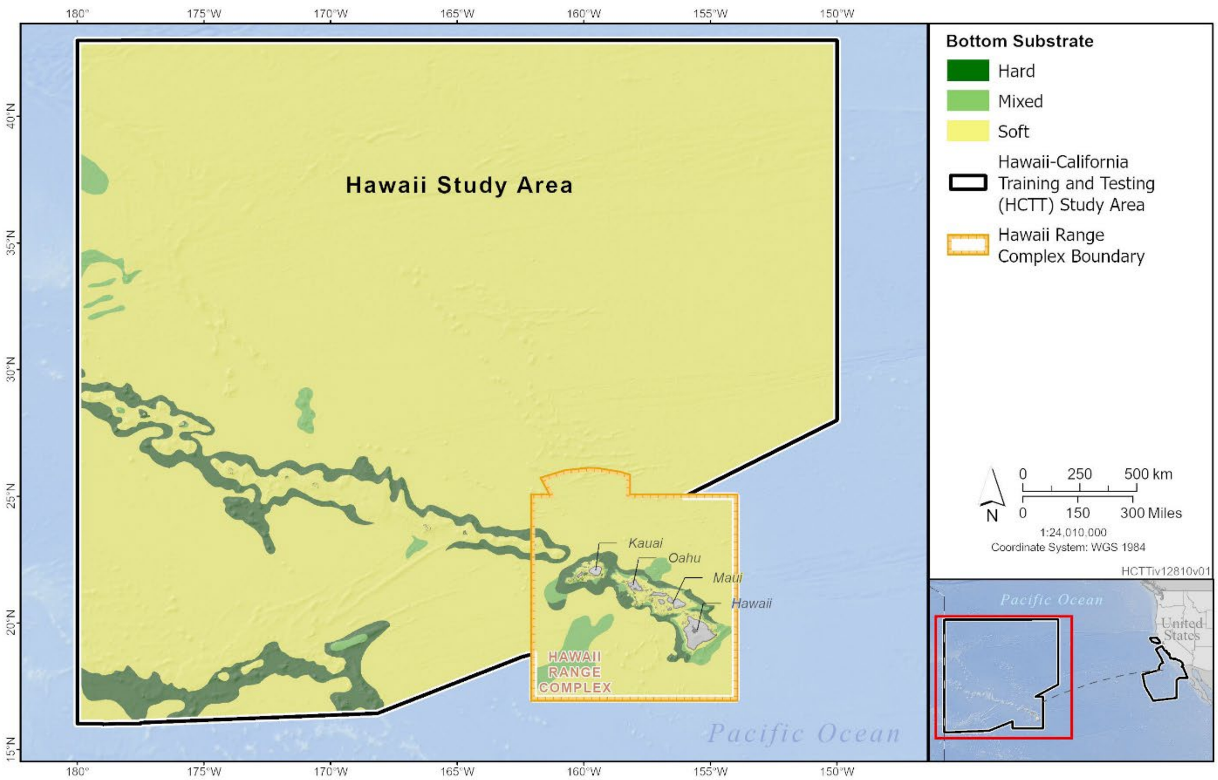

Figure 3.5-1: Substrate Type Within the Hawaii Study Area

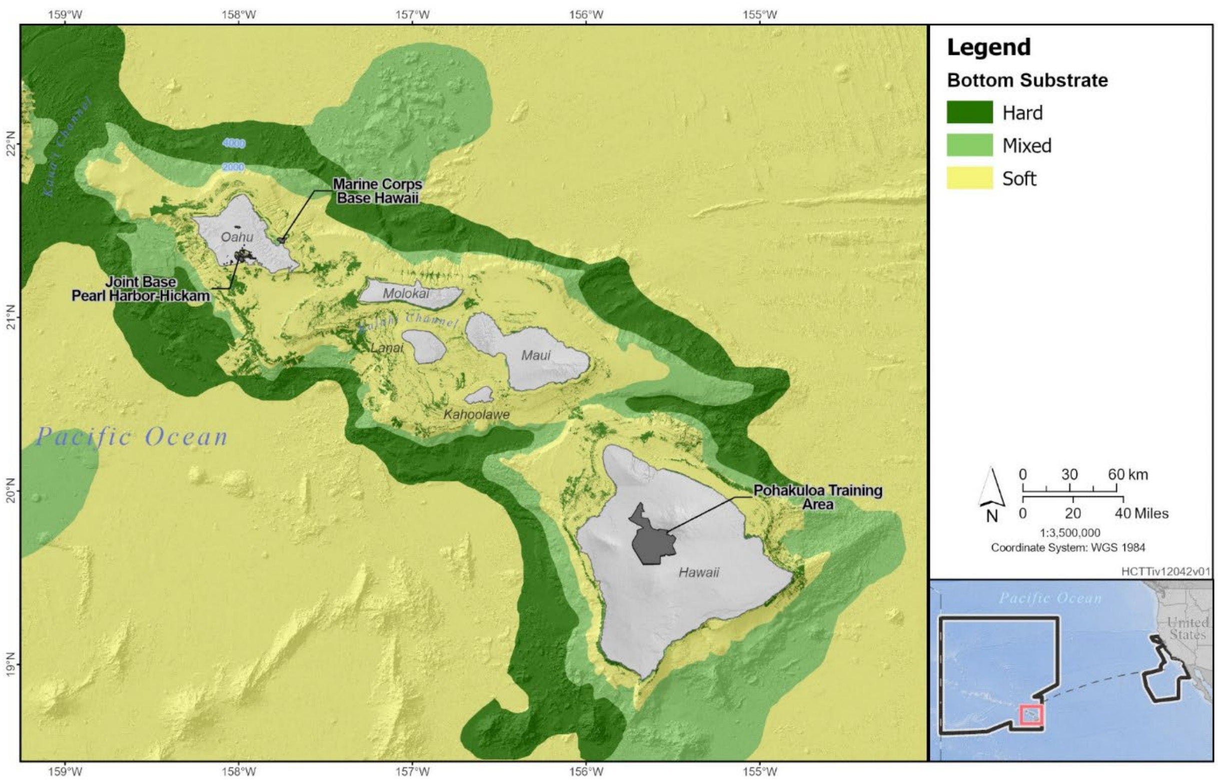

Figure 3.5-2: Substrate Type Within the Hawaii Range Complex

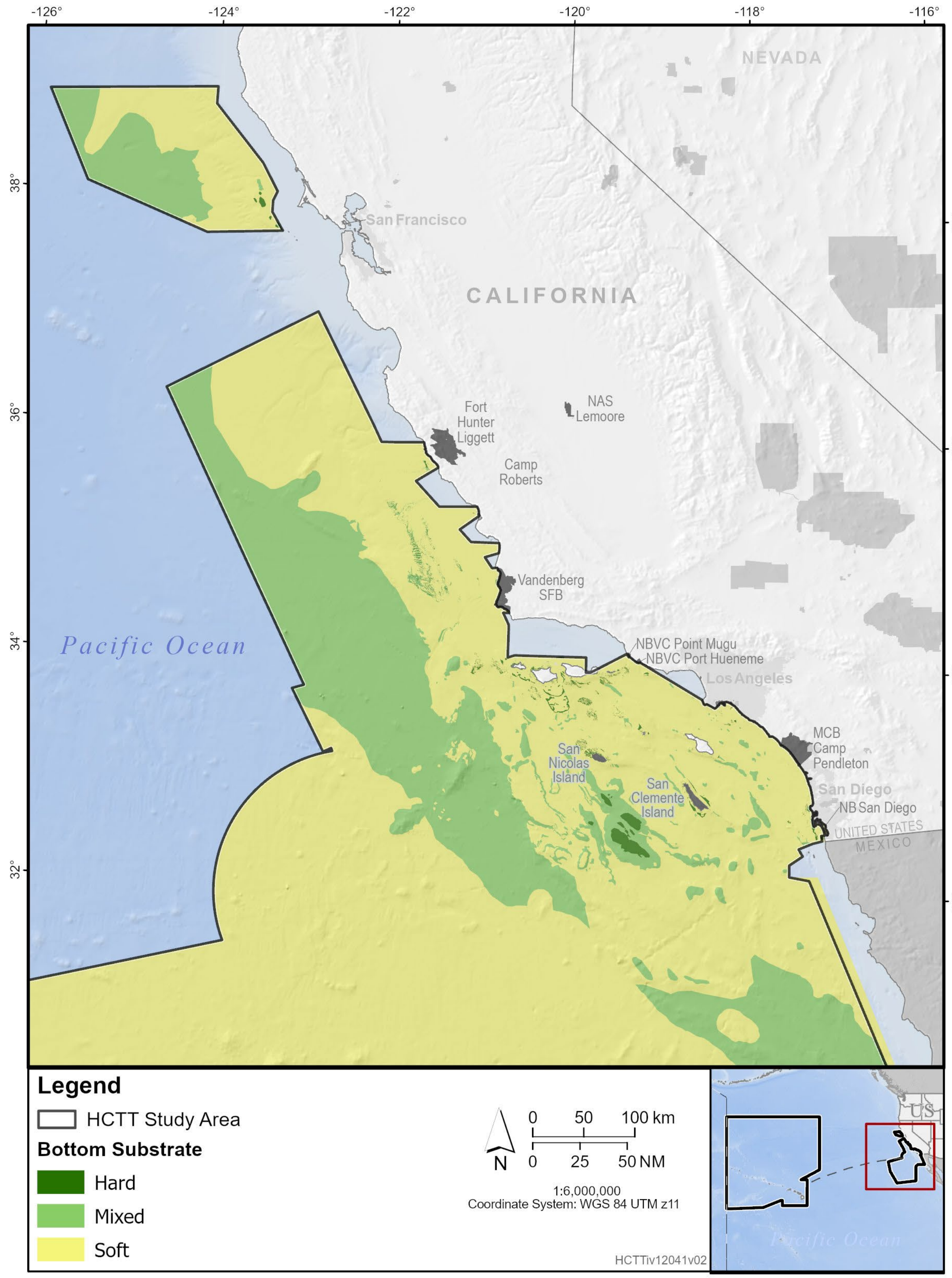

Figure 3.5-3: Substrate Type Within the California Study Area

3.5.2.2.3 Mixed Bottom

Mixed bottom includes all aquatic habitats with the following three characteristics: (1) substrates with at least 25 percent cover in particles smaller than stones, (2) unconsolidated substrate is predominantly gravel or cobble-sized, and (3) primarily subtidal water regimes. Detailed information regarding grain sizes and distribution is located in Appendix C. These areas may or may not be stable enough for attached vegetation or sedentary invertebrates, depending on overlying hydrology and water quality.

The overall distribution of mixed bottom substrate within the Study Area is illustrated in Figure 3.5-1 through Figure 3.5-3. In the Hawaii Study Area, approximately 1.68 percent is comprised of mixed substrate, while 11.06 percent is present in the California Study Area (Table 3.5-1).

Table 3.5-1: Percent Coverage of Abiotic Substrate Types in the Study Area

Study Area	Percent/Area of Study Area			Total Area (km^2)
	Hard	Soft	Mixed	
Hawaii Study Area	5.37% (421,755 km^2)	92.95% (7,300,565 km^2)	1.68% (132,133 km^2)	7,854,453
California Study Area	0.22% (1,960 km^2)	88.72% (790,400 km^2)	11.06% (98,532 km^2)	890,893
Grand Total[1]	4.85% (423,715 km^2)	92.52% (8,090,965 km^2)	2.64% (230,665 km^2)	8,745,346

[1] Numbers may not add up due to coordinate reference system projections.

3.5.2.3 Artificial Features

Man-made structures that are either deliberately or unintentionally submerged underwater create artificial habitats that mimic some characteristics of natural habitats, such as providing hard substrate and vertical relief (Broughton, 2012). Artificial reef habitats have been intentionally created with material from sunken ships, rock and stone, concrete and rubble, car bodies, tires, scrap metal, and various other materials. Artificial habitats also have been created as a result of structures built for other purposes (e.g., breakwaters, jetties, piers, wharves, bridges, oil and gas platforms, fish aggregating devices, cables and underwater range equipment). Some artificial structures provide ecological functions similar to natural hard bottom habitats, such as providing attachment substrate for algae and sessile invertebrates, which in turn supports a community of mobile organisms that may forage, shelter, and reproduce there (National Oceanic and Atmospheric Administration, 2007).

Artificial habitats in the Study Area include artificial reefs, shipwrecks, and cables. Artificial reefs are designed and deployed to supplement the ecological services provided by coral or rocky reefs. Artificial reefs range from simple concrete blocks to highly engineered structures. Vessels that are sunk in the Study Area may be colonized by encrusting and attached marine organisms if there is a larval source and enough nutrition (e.g., detritus) drifting through the water column. Wrecks in the abyssal zone and some locations landward of the deep ocean are typically devoid of encrusting or attached organisms due to the scarcity of drifting food particles in the deep ocean.

Supporting information on mapped artificial structures in the Study Area is found in Appendix C. As shown in Table 3.5-2, 1,355 mapped points were identified, consisting of shipwrecks (1,180), artificial reefs (166), and oil and gas platforms (9)

Table 3.5-2: Number of Artificial Structures Documented in the Study Area

Study Area	*Artificial Reef*	*Shipwreck*	*Oil/Gas Platforms*	*Grand Total*
Hawaii Study Area	35	626	0	661
California Study Area	131	554	9	694
Grand Total	166	1,180	9	1,355

Note: shipwrecks that are "address restricted" due to status on the National Register of Historic Places and ship hulks sunk during Naval SINKEX are not included in this table (U.S. Department of the Navy, 2018).

3.5.2.3.1 Regulatory Environment

State Standards and Guidelines

State jurisdiction regarding water quality extends from the low tide line to 3 NM offshore for both California and Hawaii. Federal jurisdiction regarding water quality extends to 200 NM along the Pacific Coast of the U.S. Detailed information on the regulatory state and federal standards and guidelines is presented in Chapter 6.

3.5.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section describes and evaluates how and to what degree the activities described in Chapter 2 and Section 3.0.3.3 could potentially affect abiotic habitats within the Study Area.

Appendix A provides detailed information on each activity. Appendix F provides more detailed effect analysis of stressors analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs. Appendix I provides detailed information regarding substrate effects from MEM, including but not limited to explosives, in-water devices, and buoys. Where such detailed information cannot be included in this document, these appendices are referenced.

For abiotic habitats, the stressors and sub-stressors considered in the analysis are the following:

- **explosives** (explosives detonated on or near the bottom)
- **physical disturbance and strike** (vessels and in-water devices [including amphibious vehicles], MEM, seafloor devices [including seafloor cables], pile driving)

The environmental effect analysis considers standard operating procedures and mitigation measures that would be implemented under Alternative 1 and Alternative 2.

As noted in Section 3.0.2, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in 40 CFR 1501.3(d). Of the two stressors analyzed in this section, both explosives and physical disturbance and strike could have a reasonably foreseeable adverse effect; thus requiring a significance determination.

A stressor is considered to have a significant effect on the human environment based on an examination of the context of the action and the intensity of the effect. In the present instance, the effects of explosives or physical disturbance would be considered significant if the effects have short-term or long-term changes well outside the natural variability in physical habitat characteristics. Habitat would be degraded over the long term or permanently such that it would no longer possess sustainable habitat requirements.

3.5.3.1 Explosive Stressors

Table 3.5-3 contains a brief summary of information that is relevant to analyses of effects from explosive stressors. Detailed information on explosive stressor analysis is provided in Appendix D. Explosives use underwater has not been identified among the causes of habitat degradation and loss as documented in Appendix F, Section F.2.

Table 3.5-3: Explosive Stressors Summary Information

Sub-Stressor	Background Information Summary
Explosions in the water	Explosions produce pressure waves with the potential to cause physical disturbance due to rapid pressure changes and other physical effects. • The physical properties of water column habitat could be impacted by in-water explosions, but only for instances in increased temperature and water motion within relatively small areas. The physical properties of shoreline habitats would be unaffected by explosives because they are not used on any shorelines in the Study Area. Bottom habitats could be impacted by in-water explosions on or near the bottom. • Most explosive detonations during military readiness activities involving the use of high explosive munitions would occur in the air or near the water's surface in waters greater than 3 nautical miles from shore in water depths greater than 100 feet (30 meters) and would not impact the bottom. • Closer to shore, explosive charges could occur near the surface, in the water column, or on the bottom and generally in specific locations devoid of underwater hazards. Overall, impacts on hard bottom habitat would be avoided, where practicable. • An explosive charge would produce percussive energy that would be absorbed and reflected by the bottom. The specific size of explosive charge, crater depths, and crater widths would vary depending on the depth of the charge and substrate type. • On hard bottom, the explosive energy would be mostly reflected, and there would be some conversion of hard substrate to soft or mixed substrate. To the maximum extent practicable, explosives would not be used near hard substrate. All underwater detonations are either in the water column far from the bottom or are in the areas used for decades that are not hard bottom. • On soft substrate types other than clay, the crater formed would be temporary (days to weeks), whereas craters in clay may persist for years.
Explosions in the air	Explosions in the air would not affect habitat due to the physical resilience for the medium (i.e., water, substrate) and lack of proximity to aquatic abiotic habitats.

3.5.3.1.1 Effects from Explosives Under Alternative 1

Training and Testing. Training and testing activities under Alternative 1 that may affect abiotic habitat would be mainly explosives placed on or near the bottom (seafloor detonations). The number and locations of these stressors under Alternative 1 are provided in Table 2-10 through Table 2-13. Overall, detonations on the seafloor would be very limited in where they occur. Detonations on the seafloor would result in approximately 0.8 acre (ac.) and 2.0 ac. of affected habitat per year in the Hawaii Study Area and California Study Area, respectively, under the conservative analysis scenario (refer to Appendix I). Some habitats would recover over time, as soft substrates are dynamic systems and craters could refill. Most areas of hard bottom and other sensitive habitats would be avoided using the Protective Measures Assessment Protocol (PMAP) (Chapter 5). Additionally, many in-water detonations would occur in the same areas, reducing effects on undisturbed areas. Although locations and quantities may differ somewhat, overall effects to habitats would be similar to what was analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs. As such, effects from in-water explosions under Alternative 1 would mostly be limited to local and short-term effects on habitat structure in the Study Area.

Modernization and Sustainment of Ranges. No explosives would be involved in modernization and sustainment of ranges.

Conclusion. Activities that include the use of explosives under Alternative 1 would result in less than significant effects since (1) seafloor detonations would be infrequent, (2) the percentage of the Study Area affected would be small, and (3) the disturbed areas are likely soft bottom areas that recover relatively quickly from disturbance.

3.5.3.1.2 Effects from Explosives Under Alternative 2

The locations and types of military readiness activities using explosives would be the same under Alternatives 1 and 2. There would be a very small increase in the number of activities conducted in the California Study Area. However, the increase would not result in substantive changes to the potential for or types of effects on abiotic habitats.

Therefore, activities that include the use of explosives under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.5.3.2 Physical Disturbance and Strike

This section analyzes the potential effects of the various types of physical disturbance and strike stressors resulting from military readiness activities within the Study Area. This analysis includes the potential effects of (1) vessels and in-water devices, (2) MEM, (3) seafloor devices, and (4) pile driving. Table 3.5-4 contains brief summaries of information that is relevant to the analysis of effects for each physical disturbance and strike sub-stressor on abiotic habitats. A detailed description of each of these potential effects are found in Appendix F.

Table 3.5-4: Physical Disturbance and Strike Stressors Summary Information

Sub-Stressor	Information Summary
Aircraft and aerial targets	Effects on aquatic abiotic habitats from aircraft and aerial targets are not applicable because they occur in airborne environments. Debris associated with such activities is considered MEM and covered in Section 3.5.3.2.2.
Vessels and in-water devices	The majority of the military readiness activities include vessels. In general, there would be a higher likelihood of vessels and in-water devices (e.g., unmanned underwater vehicles [UUVs], recovered surface targets) affecting seafloor habitats in the coastal areas than in the open ocean portions of the Study Area. This is due to the concentration of activities and the comparatively higher abundances of organisms in areas closer to shore. • In most cases, vessels and in-water devices would avoid contact with the bottom per standard operating procedures. The exception would be if the vessel/vehicle is designed to touch the bottom (e.g., amphibious vehicles). • Amphibious operations occur within regularly used lanes. The beaches, which are above the mean high tide line, are not a part of the study area and any potential associated effects to beach from amphibious operations are not analyzed in this document. • Along more sheltered shorelines, vessels operating in very shallow water can temporarily disturb sediments through propeller wash and actual contact with the bottom (Sargent et al., 1995; Stevenson et al., 1979); touching the bottom in shallow, soft bottom is a common practice among boaters that temporarily disturbs the substrate. • For safety reasons, small vessels are not generally operated at excessive speeds close to shore and outside of navigation canals, and the wakes generated would have similar effects as naturally occurring wind waves.
Military Expended Materials	MEM deployed over water include a wide range of items that may affect abiotic habitats where the item settles or moves across the bottom. Before the item is buried or encrusted with marine growth, the effects on abiotic habitat may include temporary increases in turbidity around the material and longer-term coverage of the underlying substrate with artificial materials. • In soft substrate the expended material may result in a depression, localized turbidity, or sediment redistribution resulting in scouring. Solid expended materials (e.g., bombs, shell casings) may also function as artificial hard bottom, although differences in texture and mineral content may result in species composition that is different from the surrounding area (Perkol-Finkel et al., 2006; Ross et al., 2016). • On hard bottom or artificial structures, a direct strike is unlikely to occur with sufficient force to damage the substrate due to the dissipation of kinetic energy within the first few feet of the water column. • In shallower portions of the continental shelf, heavy materials would likely be covered by sediments in under a year (Inman & Jenkins, 2002). However, changes in the pattern of erosion and sedimentation on the bottom with intense storms and long-term shifts in currents can later expose MEM to some degree of mobility (e.g., World War II mines rolling up on beaches). • On deep ocean substrate under less energetic conditions, heavy expended materials would persist for longer on the substrate surface. The potential effect of such persistent materials on the deep ocean floor is also minimized by a substantial decrease in size and density of benthic organisms as well as the relevance of structural differences in benthic habitat.

Table 3.5-4: Physical Disturbance and Strike Stressors Summary Information (continued)

<table>
<tr><th>Sub-Stressor</th><th>Information Summary</th></tr>
<tr><td>Military Expended Materials (continued)</td><td>MEM that are less dense than the underlying substrate (e.g., decelerator/ parachutes) have the potential to remain on the substrate surface for some time after sinking. The effect of lighter materials on substrates would be temporary and minor due to the mobility of such materials. The rare exception would be for some light materials (e.g., decelerator/parachute or wire/cable) that snag on structure bottom features. The potential for lighter materials to drift into shallow, nearshore habitats from military readiness activities would be low based on the prevailing ocean currents.
Within the Study Area, weapons firing and launch of munitions typically occurs greater than 3 nautical miles from shore. After striking the sea surface and falling relatively slowly through the water column, the effect of MEM on the seafloor would be on mostly soft substrate that is resilient to disturbance and would thus recover quickly in the event of a disturbance.</td></tr>
<tr><td>Seafloor devices</td><td>Seafloor devices are either stationary (e.g., mine shapes, anchors, bottom-placed instruments), or move very slowly along the bottom (e.g., bottom-crawling UUV) where they may temporarily disturb the bottom before being recovered. This also includes the existing and proposed modernization and range sustainment SWTRs that use underwater hydrophones and seafloor cables.
Effects may include temporary increases in turbidity around the device and temporary coverage and compaction of underlying substrate.
Intentional placement of seafloor devices on bottom structure is avoided to ensure recovery. Intentional placement of seafloor devices on hard bottom is avoided.
Seafloor devices are most likely to affect abiotic habitats for soft and mixed bottom communities that cover 84% of Study Area locations less than 2,500 meters deep.</td></tr>
<tr><td>Pile Driving</td><td>Pile driving and removal at Port Hueneme, California involves both impact and vibratory methods in soft substrate.
Pile driving would occur in a new location that did not previously occur in the 2018 HSTT EIS/OEIS.
Effects would be limited to the number of piles, which is relatively small, and would be short term.</td></tr>
<tr><td>Range Sustainment and Modernization</td><td>Range sustainment and modernization activities are analyzed separately under applicable stressors as they have not been analyzed in the 2018 HSTT or 2022 PSMR EIS/OEISs. These activities include:
SOAR range modernization
Maintenance of Barking Sands Tactical Underwater Range/Barking Sands Underwater Range Expansion
Deployment of seafloor cables
The cables installed at SOAR, Tanner Bank, SCI SWTR, and the Hawaii Cable Project (northeast of Oahu and west of Kauai) are thick, armored for durability and abrasion resistance, and relatively inflexible. These cables would not loop or drift during deployment, so effects to abiotic habitats would be localized.
Installation and maintenance of mine warfare and other training areas
Installation and maintenance of underwater platforms</td></tr>
</table>

3.5.3.2.1 Vessels and In-Water Devices

Table 3.5-4 contains a summary of the information used to analyze the potential effects of vessels and in-water devices on abiotic habitats. For detailed information on this sub-stressor, see Appendix F.

3.5.3.2.1.1 Effects from Vessels and In-Water Devices Under Alternative 1

Training and Testing. The majority of the training and testing activities include vessels. These activities could be widely dispersed throughout the Study Area but would be more concentrated near naval ports, piers, and ranges. Amphibious training would be restricted to designated amphibious approach lanes within the Hawaii Study Area and California Study Area. Because of the nature of vessel operation and intentional avoidance of bottom strikes, bottom habitats would not be exposed to vessel strikes but could be exposed to vessel disturbance by propeller wash. Groundings would be accidental and rare.

With the exception of amphibious operations, which occur at predetermined locations, vessel disturbance and strikes affecting abiotic habitats would be extremely unlikely. Shallow-water vessels typically operate in defined boat lanes with sufficient depths to avoid propeller or hull strikes of bottom habitats. Amphibious landings would occur within one of the four amphibious approach lanes in the California Study Area (Figure 2-2), as well as existing amphibious landing locations previously analyzed in the 2018 HSTT EIS/OEIS. Landings would occur on designated lanes within the shallow water area that are regularly used and naturally resilient to disturbance. Overall, effects would be similar to those analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs. As such, under Alternative 1, vessels and in-water devices are unlikely to affect abiotic habitats because standard operating procedures avoid contact with the bottom. Any effects from amphibious training would be localized, temporary, and would cease with the conclusion of the activity.

Modernization and Sustainment of Ranges. Vessels and in-water devices associated with SOAR Modernization; SWTR Installation; Sustainment of Undersea Ranges; Hawaii and California undersea cable projects; and Installation and Maintenance of Underwater Platforms, Mine Warfare, and Other Training Areas would move very slowly during installation activities (0–3 knots), at the surface, and over depths where bottom habitats would not be exposed to vessel disturbance. These activities would occur offshore and on soft bottom habitat.

Conclusion. Activities that include the use of vessels and in-water devices under Alternative 1 would result in less than significant effects since there would be (1) avoidance of artificial structures and hard bottom habitats, (2) quick recovery of soft bottom habitats that would be likely affected, and (3) short-term and localized disturbances of the water column (e.g., suspended sediments) and substrate (e.g., scarring) in shallow water.

3.5.3.2.1.2 Effects from Vessels and In-Water Devices Under Alternative 2

The locations and types of military readiness activities using vessels and in-water devices would be the same under Alternatives 1 and 2. There would be a very small increase in the number of activities conducted in the California Study Area. However, the increase would not result in substantive changes to the potential for or types of effects on vessel and in-water devices.

Therefore, activities that include the use of vessels and in-water devices under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.5.3.2.2 Military Expended Materials

Table 3.5-4 contains a summary of information used to analyze the potential effects of MEM on abiotic habitats. For detailed information on this sub-stressor, see Appendix F.

3.5.3.2.2.1 Effects from Military Expended Materials Under Alternative 1

Training and Testing. Training and testing activities involving MEM (Appendix A) would have the potential to effect marine substrates. To determine the percentage of a given substrate within a Study Area that may potentially be impacted by MEM under a conservative scenario, the total affected area for each Study Area was divided by the total amount of that particular substrate type within the same Study Area as provided in Table 3.5-1 (Appendix I).

MEM is not expected to impact more than 0.01 percent of the available soft, 0.01 percent for mixed, and 0.01 percent for hard bottom habitats annually within any of the Study Areas. Even if MEM distribution is not uniform and some areas experience more MEM than other, the area of disturbance would still be small.

Additional analysis was conducted to determine the proportional impact of MEM from training and testing activities on marine habitats within the Study Area. A total of approximately 34.2 ac. would be affected by MEM across all substrate types in the Hawaii Study Area, and 116.6 ac. in the California Study Area would be impacted (150.8 ac. across both Study Areas). This represents less than a thousandth of one percent of available bottom habitat in any range complex. The distribution of the impact footprints among habitat types is described in Appendix I.

Modernization and Sustainment of Ranges.

No MEM is expected during modernization and sustainment of ranges activities. Some anchors may not be recovered and become MEM, but those are covered in the analysis of seafloor devices.

Conclusion. Activities that include the use of MEM under Alternative 1 would result in less than significant effects since (1) a limited spatial coincidence between impact footprints and the distribution of hard bottom, (2) a quick recovery of the soft and mixed substrate types that are more likely impacted and (3) mostly short-term effects for most local disturbances of the seafloor, with some temporary increase in suspended sediment in mostly soft bottom areas.

3.5.3.2.2.2 Effects from Military Expended Materials Under Alternative 2

The locations and types of military readiness activities using MEM would be the same under Alternatives 1 and 2. There would be a very small increase in the number of activities conducted in the California Study Area. The increase in footprint from Alternative 1 to 2 is 182.9 ac., which is substantially low compared to the size of the California (890,893 square kilometers [km^2]) and Hawaii (7,854,453 km^2) Study Areas. However, the increase would not result in substantive changes to the potential for or types of effects on abiotic habitats.

Therefore, activities that include the use of MEM under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.5.3.2.3 Seafloor Devices

Table 3.5-4 contains a summary of the information used to analyze potential effects of seafloor devices on abiotic habitats. Appendix B and Chapter 2 summarize the types of activities that use seafloor devices, including where the devices are used and how many activities would occur under each alternative.

3.5.3.2.3.1 Effects from Seafloor Devices Under Alternative 1

Training and Testing. Under Alternative 1, seafloor devices would be used throughout the Study Area during training and testing activities, as described in Chapter 2. The types of seafloor devices proposed under Alternative 1 would not vary significantly from what was analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs. As summarized in Table 3.5-4, seafloor devices would be used in previously disturbed soft bottom habitat. Hard bottom habitat would be avoided per mitigation measures.

Modernization and Sustainment of Ranges. The installation and maintenance of seafloor devices (cables, hydrophones, anchors, etc.) during implementation of modernization and range sustainment activities would disturb underlying abiotic habitat. Deployment of cables along the seafloor would occur in three locations: (1) south and west of SCI in the California Study Area, (2) to the northeast of Oahu and (3) west of Kauai in the Hawaii Study Area. Installation and maintenance of underwater platforms, mine warfare training areas, and installation of other training areas also involve seafloor disturbance. These activities would occur offshore and on soft bottom habitat. Seafloor devices would cover underlying substrate and temporarily inhibit the substrates' ability to function as habitat. Where hardbottom habitat cannot be avoided, over time seafloor devices would not change the substrates' ability to function as a habitat. As such, effects would only be long term; however, habitat would be expected to return to baseline conditions once modernization and range sustainment activities are complete.

Conclusion. Activities that include the use of seafloor devices under Alternative 1 would result in less than significant effects since (1) the area exposed to the stressor is extremely small relative to overall availability of habitat of each type, (2) the activities are dispersed such that with the exception of precision anchoring activities, few abiotic habitats would be exposed to multiple events, (3) effects would be localized and those involving soft bottom would likely be temporary due to the dynamic nature of the habitats, and (4) sensitive habitats would tend to be avoided due to snagging or entanglement that could hinder recovery of the device.

3.5.3.2.3.2 Effects from Seafloor Devices Under Alternative 2

The locations and types of military readiness activities using seafloor devices would be the same under Alternatives 1 and 2. There would be a very small increase in the number of activities conducted in the California Study Area. However, the increase would not result in substantive changes to the potential for or types of effects on abiotic habitats.

Therefore, activities that include the use of seafloor devices under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.5.3.2.4 Pile Driving

Table 3.5-4 contains a summary of the background information used to analyze the potential effects of pile driving on abiotic habitats. For detailed information on this sub-stressor, see Appendix C**.**

3.5.1.1.1.1 Effects from Pile Driving Under Alternative 1

Testing and Training. Pile driving would occur in Port Hueneme Harbor, a developed industrial harbor in the California Study Area. While pile driving may have the potential to effect soft bottom habitat, the effects would be extremely limited since the number of piles and size is relatively small (n = 20 concrete 24-in. piles), and the duration is short (20 days for assembly and 10 days for disassembly). Piles would remain in the water for up to 60 days. Since pile driving would occur in the harbor, the dynamic nature of the soft bottom habitat is likely to return to its previous state shortly following removal of the temporary piles. Effects to abiotic habitats from pile driving would be consistent with what was previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs.

Modernization and Sustainment of Ranges. Pile driving would not occur during modernization and sustainment of ranges activities.

Conclusion. Activities that include pile driving under Alternative 1 would result in less than significant effects since (1) number of piles would be relatively small, (2) duration is short term, and (3) would occur in previous disturbed areas.

3.5.1.1.1.2 Effects from Pile Driving Under Alternative 2

The locations and types of military readiness activities using pile driving would be the same under Alternative 1. Therefore, activities that include pile driving under Alternative 2 would be the same as Alternative 1 and would result in less than significant effects.

3.5.4 Summary of Potential Effects on Abiotic Habitats

3.5.4.1 Combined Effects of All Stressors Under Alternative 1

The impact area for in-water explosions and MEM were all much less than a thousandth of one percent of the total area of documented hard, soft, or mixed bottom for each mapped substrate type, in both Study Areas. Hard bottom habitat would be avoided to the maximum extent practicable, and effects would mostly occur on soft bottom habitat. Large and dense MEM (e.g., large-caliber projectile casings, non-explosive bombs) deposited on the bottom would be the most persistent. However, soft-bottom habitats may recover in the short term where heavier MEM are buried under shifting sediments; hard bottom habitats would recover over the long term where hard, stable MEM become overgrown with similar organisms.

For abiotic habitat, the combined impact area of explosive stressors, physical disturbances, and strike stressors proposed from military readiness activities in Alternative 1 would have minimal effect on the ability of soft bottom, mixed bottom, or hard bottom to serve their function as habitat. Military readiness activities under Alternative 1 would have a total footprint of potential impact across all habitat types of 150.8 ac. from MEM and 2.8 ac. from explosive detonations. This also represents less than a thousandth of one percent (0.00007 percent) of the bottom habitat within the Study Area (8,745,346 km^2). The total area of mapped hard bottom in the area dwarfs the estimated 0.08 ac. impacted from explosive detonations (there are no habitat-specific acreages for MEM) (Appendix I). The combined total proportional impact from military readiness activities is primarily to soft bottom habitat, much less to hard and mixed substrate habitats, and very little to areas with unknown substrate type. Overall, the effects from implementation of military readiness activities under Alternative 1 on abiotic habits would be less than significant.

3.5.4.2 Combined Effects of All Stressors Under Alternative 2

For abiotic habitats, the combined effects of explosive stressors, physical disturbances, and strike stressors proposed for military readiness activities would have minimal effect on the ability of soft, mixed, or hard bottom to function as habitat. Activities would have a total footprint of potential impact of 299.5 ac. across all habitat types from MEM and 3.1 ac. from explosive detonations. This represents less than a thousandth of one percent (0.00014 percent) of the bottom habitat within the Study Area (8,745,346 km^2). Overall, the effects from implementation of military readiness activities under Alternative 2 on abiotic habitat would be less than significant.

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3.6 Fishes

FISHES SYNOPSIS

Stressors to fishes that could result from the Proposed Action were considered, and the following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Acoustic: The use of each acoustic substressor (sonar and other transducers, air guns, pile driving, vessel noise, aircraft noise, and weapons noise) could result in impacts on fishes. Some sonars, vessel and weapons noise could result in masking, physiological responses, or behavioral reactions. Aircraft noise would not likely result in impacts other than brief, mild behavioral responses in fishes that are close to the surface. Each of these substressors would be unlikely to result in temporary threshold shift. Air guns and pile driving have the potential to result in mortality, injury, or hearing loss at very short ranges (tens of meters) in addition to the effects listed above. Most impacts are expected to be temporary and infrequent as most activities involving acoustic stressors would be temporary, localized, and infrequent resulting in short-term and mild to moderate impacts. More severe impacts (e.g., mortality) could lead to permanent effects for individuals but, overall, long-term consequences for fish populations are not expected. As such, effects would be less than significant.
- Explosives: The use of explosives could result in impacts on fishes within the Study Area. Sound and energy from explosions can cause mortality, injury, hearing loss, masking, physiological stress, or behavioral responses. The time scale of individual explosions is very limited, and military readiness activities involving explosions are dispersed in space and time, therefore, repeated exposure of individuals is unlikely. Most effects such as hearing loss or behavioral responses are expected to be short term and localized. More severe impacts (e.g., mortality) could lead to permanent effects for individuals but, overall, long-term consequences for fish populations are not expected. As such, effects would be less than significant.
- Energy: The use of in-water electromagnetic devices may elicit brief behavioral or physiological stress responses only in those exposed fishes with sensitivities to the electromagnetic spectrum. This behavioral impact is expected to be temporary and minor. Similar to regular vessel traffic that is continuously moving and covers only a small spatial area during use. Except for some seafloor cables that could produce electromagnetic fields, most fields generated by in-water devices would be continuously moving and cover only a small spatial area during use; thus, population-level impacts are unlikely. As such, effects would be less than significant.
- Physical Disturbance and Strike: The use of vessels, in-water devices, military expended materials, and seafloor devices pose a risk for collision, stress response, or impacts caused by sediment disturbance, particularly near coastal areas and bathymetric features where fish densities are higher. Most fishes are mobile and have sensory capabilities that enable them to detect and avoid vessels and other items. Behavioral and stress responses would be temporary. As such, effects would be less than significant.

FISHES SYNOPSIS (continued)

- Entanglement: Fishes could be exposed to a number of entanglement stressors and the potential for impacts is dependent on the physical properties of the expended materials and the likelihood that a fish would encounter a potential entanglement stressor and then become entangled in it. Physical characteristics of wires and cables and decelerators/parachutes, combined with the sparse distribution of these items throughout the Study Area, indicates a very low potential for fishes to encounter and become entangled in them. Because of the low numbers of fishes potentially impacted by entanglement stressors, population-level impacts are unlikely. As such, effects would be less than significant.
- Ingestion: Military expended materials from munitions and military expended materials other than munitions present an ingestion risk to fishes that forage at the surface, in the water column, and on the seafloor. The likelihood that expended items would be ingested and cause an adverse effect would depend on the size and feeding habits of a fish, the rate at which a fish would encounter items, and the composition and physical characteristics of the item. Because of the low numbers of fish potentially impacted by ingestion stressors, population-level impacts are unlikely. As such, effects would be less than significant.

3.6.1 Introduction

The following sections provide an overview of fishes found in the Study Area and the potential adverse effects of the proposed military readiness activities on them. For this EIS/OEIS, marine fish are evaluated as groups of species characterized by distribution, morphology (body type), or behavior relevant to the stressor being evaluated. Activities are evaluated for their potential effects on the fish species in the Study Area that are listed or proposed for listing under the ESA, as well as other fish in the Study Area.

3.6.2 Affected Environment

The affected environment provides the context for evaluating the effects of the proposed military readiness activities on fishes.

3.6.2.1 General Background

Fishes are not distributed uniformly throughout the Study Area but are closely associated with a variety of habitats. Some species, such as large sharks, salmon, tuna, and billfishes, range across thousands of square miles. Other species, such as gobies and most reef fish, generally have small home ranges and restricted distributions (Helfman et al., 2009). The early life stages (e.g., eggs and larvae) of many fish may be widely distributed even when the adults have relatively small ranges. The movements of some open-ocean species may never overlap with coastal fishes that spend their lives within several hundred feet of the shore. The distribution and specific habitats in which an individual of a single fish species occurs may be influenced by its life stage, size, sex, reproductive condition, and other factors. Approximately 78 percent of all marine fish species occur in waters less than 200 m deep and in close association with land, while 13 percent are associated with the open ocean (Moyle & Cech, 2004).

Each major habitat type in the Study Area (e.g., reef, hard bottom, soft bottom, and beds of submerged aquatic vegetation) supports an associated fish community with the number of species increasing with decreasing latitude (transition from north to south). However, this pattern is not as clearly defined for wide-ranging migratory open-ocean species (Macpherson, 2002).

Detailed information on habitat use, movement, and behavior, sound sensing and production, and threats that affect or have the potential to affect natural communities of fishes within the Study Area are presented in Appendix C.

3.6.2.2 Endangered Species Act-Listed Species

Table 3.6-1 presents ESA-listed fishes in the Study Area, including three Evolutionarily Significant Units (ESUs) of Chinook salmon (*Oncorhynchus tshawytscha*), three ESUs of coho salmon (*O. Kisutch*), five Distinct Population Segments (DPS) of steelhead (*O. mykiss*), green sturgeon (*Acipenser medirostris*), eulachon (*Thaleichthys pacificus*), oceanic whitetip shark (*Carcharhinus longimanus*), scalloped hammerhead shark (*Sphyrna lewini*), and giant manta (*Manta birostris*). There are no fish species in the Study Area that are proposed for listing under the ESA, however, the tope shark (*Galeorhinus galeus*) is a candidate for listing under the ESA. Detailed information on each ESA-listed species and critical habitat is presented in Appendix C. Note that designated critical habitat for salmon, steelhead, and eulachon does not overlap with the Study Area and will not be analyzed further in this document. Green sturgeon designated critical habitat overlaps with a small portion of the California Study Area (Figure C.5-4).

Table 3.6-1: Regulatory Status and Occurrence of Endangered Species Act-Listed Fishes and Critical Habitat in the Study Area

Species	Distinct Population Segment (DPS)/Evolutionarily Significant Unit (ESU) in the Study Area	Species Status	*Critical Habitat in the Study Area*	Occurrence in the Study Area	
				Hawaii Study Area	California Study Area
Chinook salmon (*Oncorhynchus tshawytscha*)	California Coastal ESU	Threatened			X
	Central Valley Spring-Run ESU	Threatened			X
	Sacramento River Winter-Run ESU	Endangered			X
Coho salmon (*Oncorhynchus kisutch*)	Oregon Coast ESU	Threatened			X
	Southern Oregon/Northern California Coast ESU	Threatened			X
	Central California Coast ESU	Endangered			X
Steelhead (*Oncorhynchus mykiss*)	Northern California DPS	Threatened			X
	California Central Valley DPS	Threatened			X
	Central California Coast DPS	Threatened			X
	South-Central California Coast DPS	Threatened			X
	Southern California DPS	Endangered			X
Green sturgeon (*Acipenser medirostris*)	Southern DPS	Threatened	X		X
Eulachon (*Thaleichthys pacificus*)	Southern DPS	Threatened			X
Oceanic whitetip shark (*Carcharhinus longimanus*)		Threatened		X	X
Scalloped hammerhead shark (*Sphyrna lewini*)	Eastern Pacific DPS	Endangered			X
Giant manta (*Manta birostris*)		Threatened		X	X
Tope shark (*Galeorhinus galeus*)		Candidate			X

3.6.2.3 Species Not Listed Under the Endangered Species Act

Taxonomic categories of major fish groups in the Study Area are provided in Table 3.6-2. These fish groups are based on the organization presented by Moyle and Cech (2004), Nelson (2006), Helfman et al. (2009), and Froese and Pauly (2016). These groupings are intended to organize the extensive and diverse list of fishes that occur in the Study Area and serve to structure the analysis of potential effects on fishes with similar physiological characteristics and habitat use. Exceptions to these generalizations exist within each group and are noted wherever appropriate in the analysis of potential effects. For simplicity, the fishes are presented in generally accepted evolutionary order. Supporting information on each group is provided in Appendix C.

Table 3.6-2: Major Taxonomic Groups of Fishes in the Study Area

Major Fish Groups			Occurrence in the Study Area	
Group Names	**Description**	**Representative Species**	**Open Ocean**	**Coastal Waters ***
Jawless Fishes (Orders Myxiniformes and Petromyzontiformes)	Primitive, cartilaginous, eel-like vertebrates; parasitic or feed on dead fish	Hagfishes, Lamprey	Seafloor	Water column, seafloor
Ground Sharks, Mackerel Sharks, and Bullhead Sharks (Orders Carcharhiniformes, Lamniformes, Orectolobiformes, and Heterodontiformes)	Cartilaginous, two dorsal fins or first large, an anal fin, and five gill slits	Great White, Horn, Oceanic Whitetip, Scalloped Hammerhead, Whale, and Tiger sharks	Water column, seafloor	Water column
Frilled and Cow Sharks, Sawsharks, Dogfish, and Angel Sharks (Orders Hexanchiformes, Squaliformes, and Squatiniformes)	Cartilaginous, anal fin and nictitating membrane absent, 6-7 gill slits	Dogfish, Frill, Sevengill, and Sixgill sharks	Water column, seafloor	Seafloor
Stingrays, Sawfishes, Skates, Guitarfishes, Electric Rays and Rays (Orders Myliobatiformes, Pristiformes, Rajiformes, and Torpediniformes)	Cartilaginous, flat-bodied, usually 5 gill slits	Electric ray, Giant Manta rays, Skates, Stingrays	Water column, seafloor	Water column, seafloor
Ratfishes (Order Chimaeriformes)	Cartilaginous, placoid scales	Chimaera, Rabbitfish, Ratfishes	Seafloor	NA
Herrings and allies (Order Clupeiformes)	Silvery, lateral line on body and fin spines absent, usually scutes along ventral profile	Anchovies, Herrings, Sardines	NA	Surface, water column

Table 3.6-2: Major Taxonomic Groups of Fishes in the Study Area (continued)

Major Fish Groups			Occurrence in the Study Area	
Group Names	**Description**	**Representative Species**	**Open Ocean**	**Coastal Waters ***
Tarpons and allies (Orders Elopiformes and Albuliformes)	Body encased in silvery scales, mouth large, mostly a single dorsal fin, some with tapered tail fin, spines absent	Bonefishes, Ladyfish, Malacho, Tarpons	Water column, seafloor	Surface, water column, seafloor
Eels and allies (Orders Anguilliformes, Notacanthiformes, and Saccopharyngiformes)	Body very elongate, usually scaleless with pelvic fins and fin spines absent	American, Conger, Duckbill, Halosaur, Morays, Sawtooth, Short-tailed, Spiny, Gulper, Pelican	Water column, seafloor	Water column, seafloor
Salmonids (Orders Salmoniformes)	Silvery body, adipose fin present	Chinook and Chum salmon, Steelhead	NA	Surface, water column
Argentines and allies (Order Argentiniformes)	Body silvery, and elongate; fin spines absent; adipose fin sometimes present, pelvic fins and ribs sometimes absent	Barreleyes, Deep sea smelts, Slickheads, Tubeshoulders	Water column, seafloor	NA
Bristlemouths and allies (Orders Stomiiformes)	Photophores present, adipose and chin barbels fin sometimes present	Dragonfishes, Fangjaws, Hatchetfishes, Lightfishes	Water column, seafloor	NA
Greeneyes and allies (Order Aulopiformes)	Upper jaw protrusible adipose fin present, forked tail usually present	Barracudinas, Daggertooth, Greeneyes, Lizardfishes, Pearleyes, Waryfishes	Surface, water column, seafloor	NA
Lanternfishes and allies (Order Myctophiformes)	Small-sized, adipose fin, forked tail and photophores usually present	Lanternfishes	Water column, seafloor	NA
Hakes and allies (Order Gadiformes)	Long dorsal and anal fins; no true spines, spinous rays present in dorsal fin, barbels present	Cods, Codlings, Grenadiers, Hakes, Whiptails	Water column, seafloor	Surface, water column, seafloor
Brotulas and allies (Order Ophidiiformes)	Pelvic absent or far forward and filamentous, no sharp spines, Dorsal and anal fins joined to caudal fins	Brotulas, Cusk-eels	Water column, seafloor	Water column, seafloor

Table 3.6-2: Major Taxonomic Groups of Fishes in the Study Area (continued)

Major Fish Groups			Occurrence in the Study Area	
Group Names	**Description**	**Representative Species**	**Open Ocean**	**Coastal Waters ***
Toadfishes and allies (Order Batrachoidiformes)	Body compressed; head large; mouth large with tentacles; two dorsal fins, the first with spines	Toadfish, Midshipman	NA	Seafloor
Anglerfishes and allies (Order Lophiiformes)	Body globulose, first spine on dorsal fin usually modified, pelvic fins usually absent	Anglerfishes, Footballfishes, Frogfishes, Goosefishes, Sea devils	Water column, seafloor	Seafloor
Flyingfishes (Order Beloniformes)	Jaws extended into a beak; pelvic fins very large wing-like; spines absent	Flyingfishes, Halfbeaks, Needlefishes Sauries	Surface, water column	Surface, water column
Killifishes (Orders Cyprinodontiformes)	Small-sized, silvery stripe on sides, pectoral fins high, first dorsal fin with flexible spine, pelvic fin with one spine	California killifish	NA	Surface, water column
Silversides (Order Atheriniformes)	Protrusible upper jaw; fin spines rarely present; single dorsal fin	Grunion, Jacksmelt, Topsmelt	NA	Water column
Opahs and allies (Order Lampriformes	Upper jaw protrusible; pelvic fins forward on body, below or just behind insertion of pectoral fins	Crestfishes, Oarfishes, Opahs, Ribbonfishes, Tapertails, Tube-eyes	Water column, seafloor	NA
Squirrelfishes and allies (Order Beryciformes)	Body usually round, one dorsal fin often set far back, pelvic fins absent, fin spines often present	Bigscales, Fangtooths, Pricklefish, Slimeheads, Squirrelfishes Whalefishes	Water column, seafloor	NA
Dories and allies (Order Zeiformes)	Body deeply compressed, protrusible jaws, spines in dorsal fin, pelvic fin spines sometimes present	Boarfishes, Dories, Oreos, Tinselfishes	Water column, seafloor	NA

Table 3.6-2: Major Taxonomic Groups of Fishes in the Study Area (continued)

Major Fish Groups			Occurrence in the Study Area	
Group Names	**Description**	**Representative Species**	**Open Ocean**	**Coastal Waters ***
Pipefishes (Order Syngnathiformes)	Snout tube-like, mouth small, scales often modified bony plates	Cornetfish, Seahorses, Snipefishes	Water column, seafloor	Seafloor
Sticklebacks (Order Gasterosteiformes)	Mouth small, scales often modified bony plates	Threespine stickleback	Water column, seafloor	Seafloor
Scorpionfishes (Order Scorpaeniformes)	Usually strong spines on head and dorsal fin; cheeks with bony struts, pectoral fins usually rounded	Poachers, Rockfishes, Sculpins Snailfishes	Water column, seafloor	NA
Mullets (Order Mugiliformes)	Streamline body, forked tail, hard angled mouth, large scales	Acute-jawed, Flathead grey, Kanda	NA	Surface, water column, seafloor
Perch-like Fishes and Allies (Order Perciformes)	Deep bodied, to moderately elongate, 1–2 dorsal fins, large mouth and eyes, and throracic pelvic fins	Angelfishes, Cardinal Fishes, Drums, Groupers, Jacks, Remoras, Surfperches	Water column, seafloor	Water column, seafloor
Wrasses and Allies (Order Perciformes)	Compressed body, scales large, well-developed teeth, usually colorful	Hogfishes, Parrotfishes, Wrasses, Damselfishes	NA	Seafloor
Eelpouts and Allies (Order Perciformes)	Eel-like body, long dorsal and anal fins, pelvic fins usually absent	Gunnels, Ocean pout, Pricklebacks, Wolfeels	Seafloor	Seafloor
Stargazers (Order Perciformes)	Body elongated, lower jaw usually projecting beyond upper jaw, pelvic and anal fins with spines	Stargazers	Water column, seafloor	Water column, seafloor
Blennies, Gobies, and Allies (Order Perciformes)	Body eel-like to sculpin-like, pelvic fins reduced or fused	Blackeye and Cheekspot goby, mussel blenny	NA	Seafloor
Surgeonfishes (Order Perciformes)	Body deeply compressed laterally, mouth small, scales usually small, pelvic fins with spines	Achilles tang, Surgeonfishes	NA	NA

Table 3.6-2: Major Taxonomic Groups of Fishes in the Study Area (continued)

Major Fish Groups			Occurrence in the Study Area	
Group Names	**Description**	**Representative Species**	**Open Ocean**	**Coastal Waters ***
Tunas and Allies (Order Perciformes)	Large mouth, inlets and keels usually present, pelvic fins often absent or reduced, fast swimmers	Barracudas, Billfishes, Swordfishes, Tunas	Surface, water column	Water column for juvenile barracudas only
Butterfishes (Order Perciformes)	Snout blunt and thick, teeth small, maxilla mostly covered by bone	Ariommatids, Driftfishes, Medusafishes	Surface, water column, seafloor	NA
Flatfishes (Order Pleuronectiformes)	Body flattened; eyes on one side of body	Flounders, Halibuts, Sanddabs, Soles, Tonguefishes	Seafloor	Seafloor
Pufferfishes (Order Tetraodontiformes)	Skin thick or rough sometimes with spines or scaly plates, pelvic fins absent or reduced, small mouth with strong teeth coalesced into biting plate	Boxfishes, Filefishes, Ocean sunfishes, Triggerfishes	Water column	Surface, water column, seafloor

* Coastal Waters include bays, estuaries, and harbors.
Note: NA = not applicable

3.6.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, baseline conditions of the existing environment for fishes would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section describes and evaluates how and to what degree the activities and stressors described in Chapter 2 and Section 3.0.3.3 potentially effect fishes known to occur within the Study Area.

The stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors analyzed for fishes are as follows:

- **acoustic** (sonar and other transducers; air guns; pile driving; vessel noise; aircraft noise; and weapons noise)
- **explosives** (in-air explosions and in-water explosions)
- **energy** (in-water electromagnetic devices and high-energy lasers)

- **physical disturbance and strikes** (vessels and in-water devices, MEM, seafloor devices, and cable installation)
- **entanglement** (wires and cables, decelerators/parachutes, nets)
- **ingestion** (MEM)

The analysis considers standard operating procedures and mitigation measures that would be implemented under Alternative 1 and Alternative 2. The standard operating procedures and mitigation specific to fishes are listed in Table 3.6-3.

Table 3.6-3: Relevant Mitigation Measures for Fishes

Applicable Stressor	Requirements Summary and Protection Focus	Section Reference
Explosives	The Action Proponents will not detonate any in-water explosives within a horizontal distance of 350 yards (yd.) from shallow-water coral reefs and precious coral beds.	Section 5.7.1[1]
	The Action Proponents will not detonate any in-water explosives within a horizontal distance of 350 yd. from artificial reefs, biogenic habitat, and shipwrecks, except in designated locations where these resources will be avoided to the maximum extent practical.	Section 5.7.2[1]
	The Action Proponents will conduct visual observations as part of activity-based mitigation for large schools of fish during events with the largest net explosive weights involving explosive torpedoes and ship shock trials.	Section 5.6[2]
	The Action Proponents will not: (1) deploy non-explosive ordnance against surface targets within 350 yd. of shallow-water coral reefs	Section 5.7.1[1]
	The Action Proponents will not: (1) place non-explosive seafloor devices directly on artificial reefs, biogenic hard bottom, submerged aquatic vegetation, or shipwrecks	Section 5.7.2[1]

[1]The mitigation was developed to protect specific habitats, which also protects fish that are associated with those habitats.
[2]The mitigation was developed to protect possible indicators of marine mammal presence, which includes large schools of fish.

As noted in Section 3.0.2, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in 40 CFR 1501.3(d). All stressors analyzed could have a reasonably foreseeable adverse effect; thus requiring a significance determination.

A stressor is considered to have a significant effect on the human environment based on an examination of the context of the action and the intensity of the effect. In the present instance, the effects of the stressors analyzed would be considered significant if the impacts to fishes would be short-term or long-term and well outside the limits of natural variability of species' populations, their habitats, or the natural processes sustaining them. A significant effect finding would be appropriate if the effects caused mortality beyond a small number of individuals, resulting in a decrease in population levels, or if fish habitat would be degraded over the long term or permanently such that it would no longer support a sustainable fishery and/or would cause the population of a managed species to become stressed, less productive, or unstable.

3.6.3.1 Acoustic Stressors

This section summarizes the potential effects of acoustic stressors used during military readiness activities within the Study Area. The acoustic substressors included for analysis are (1) sonar and other transducers, (2) air guns, (3) pile driving, (4) vessel noise, (5) aircraft noise, and (6) weapons noise. Table 3.6-4 contains brief summaries of background information that is relevant to the analyses of effects for each acoustic substressor (sonar and other transducers, etc.) on fishes. Detailed information on acoustic impact categories in general, as well as effects specific to each substressor, is provided in Appendix D. For a listing of the types of activities that use or produce acoustic stressors, refer to Appendix A and Appendix B. The types and quantities of sonar sources, air guns, and pile driving, the number of events using vessels and aircrafts, and the locations of those events under each alternative are shown in Section 3.0.3.3.1.

Due to updated acoustic effects modeling, the quantitative analysis of effects due to sonars and other transducers, air guns, and pile driving (i.e., ranges to effects) provided in this section supplant the analyses in the 2018 HSTT EIS/OEIS. The detailed assessment of these acoustic stressors under this Proposed Action is in Appendix E. Potential changes in the predicted acoustic effects are due to the following:

- Improvements to criteria used to determine if acoustic stressors may cause effects.
- Revisions to the modeling of explosive effects in the Navy Acoustic Effects Model. For additional details see the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (U.S. Department of the Navy, 2024).
- Changes in the locations, numbers, and types of modeled military readiness activities as described in Chapter 2, and associated quantities (hours and counts) of acoustic stressors shown in Section 3.0.3.3.1.

Table 3.6-4: Acoustic Stressors Information Summary

Substressor	Information Summary
All acoustic substressors	Fishes are not equally sensitive to sound at all frequencies. • Most fishes are hearing generalists and primarily detect particle motion at frequencies below 2 kilohertz (kHz). • Hearing specialists can detect low frequencies but also possess anatomical specializations to enhance hearing and are capable of sound pressure detection up to 10 kHz, or over 100 kHz in some species. • Fishes with a swim bladder are generally more susceptible to temporary threshold shift (TTS) than those without a swim bladder, regardless of the sound source.
Sonar and other transducers	Sonar and other transducers may result in hearing loss, masking, physiological stress, or behavioral reactions. • Most low-frequency sonars have relatively low source levels (see Table 3.0-2, in Section 3.0.3.3.1 for the quantities of low-frequency sonars with source levels < 205 decibels) and would not likely result in TTS. If TTS did occur, it would occur within near to intermediate distances from a sound source (a few to tens of meters) from systems with high source levels, or those that are operated at high duty cycles or continuously. • Although masking is possible for sources that fish can hear, the narrow bandwidth and intermittent nature of most sonar signals would result in only a limited probability of effects.

Table 3.6-4: Acoustic Stressors Information Summary (continued)

Substressor	Information Summary
Sonar and other transducers (continued)	• Available research showed very little response of both captive and wild Atlantic herring (hearing specialists) to sonar (e.g., no avoidance). Such data suggests sonar poses little risk to populations of herring and that there is a low probability of behavioral reactions to sonar for most fishes. • Direct injury from sonar and other transducers is highly unlikely and is not considered further in this analysis.
Air guns	Exposure to air guns could result in hearing loss, masking, physiological stress, or behavioral reactions, and in some cases, injury. • Hair cell loss and TTS have been reported in fishes exposed to air guns, though fishes typically recovered from these effects in controlled laboratory settings. • Although masking could occur, air gun pulses are typically brief (fractions of a second) and biological sounds can be detected between pulses within close distances to the source. Masking could also indirectly occur because of repetitive impulsive signals where the repetitive sounds and reverberations over distance may create a more continuous noise exposure. • Fish may react behaviorally to any impulsive sound source within near and intermediate distances (tens to hundreds of meters), with decreasing probability of reaction at increasing distances. Examples of reported behavioral reactions to impulsive sources include startle response, changes in swimming speeds and movement patterns, avoidance of the sound source, and no observed response. • Exposure to air gun shots has not caused mortality, and fishes typically recovered from injuries in controlled laboratory settings.
Pile driving	Pile installation and removal involves both impact and vibratory methods. Exposure to pile driving could result in hearing loss, masking, physiological stress, or behavioral reactions, and in some cases, injury. • Hair cell loss and TTS have been reported in fishes exposed to impact pile driving, though fishes typically recovered from these effects in controlled laboratory settings. • Although masking could occur, impact pile driving pulses are typically brief (fractions of a second) and biological sounds can be detected between pulses within close distances to the source. Masking could also indirectly occur because of repetitive impulsive signals where the repetitive sounds and reverberations over distance may create a more continuous noise exposure. • Vibratory pile driving could result in reductions in auditory sensitivity and masked biological signals. The relative risk of masking due to vibratory pile driving is highest in the near and moderate distances from the source (up to hundreds of meters) but decreases with increasing distance. • Fish may react behaviorally to any impulsive sound source within near and intermediate distances (tens to hundreds of meters), with decreasing probability of reaction at increasing distances. Examples of reported behavioral reactions to impulsive sources include startle response, changes in swimming speeds and movement patterns, avoidance of the sound source, and no observed response. • Exposure to impact pile driving has not caused mortality, and fishes typically recovered from injuries in controlled laboratory settings. • Direct injury from vibratory pile driving, like other continuous sources, is highly unlikely and is not considered further in this analysis.

Table 3.6-4: Acoustic Stressors Information Summary (continued)

Substressor	Information Summary
Vessel disturbance (including vessel noise)	Vessel disturbance (including the production of noise) may result in hearing loss, masking, physiological stress, or behavioral reactions. In some more industrialized or populated areas, vessel noise is a chronic and frequent stressor. • Behavioral responses to vessels can be caused by multiple factors (e.g., visual cues) as vessel sound exposure is rarely decoupled from the physical presence of a vessel. • Fishes with hearing specializations are more susceptible to TTS from long duration continuous noise (e.g., 12 hours). However, it is less likely that TTS would occur in fishes that are hearing generalists. • The probability of masking, physiological responses, and behavioral reactions from vessel noise is higher at near to moderate distances from the source (up to hundreds of meters) but decreases with increasing distance. • Direct injury from vessel noise is highly unlikely and is not considered further in this analysis.
Aircraft disturbance (including aircraft noise)	Aircraft noise may result in masking, physiological stress, or behavioral reactions in fishes near the surface as aircrafts pass overhead. • Aircraft sound exposure is rarely decoupled from the physical presence of an aircraft therefore responses may be due to multiple factors (e.g., visual cues). • Most aircraft activities are transient resulting in brief periods of exposure (seconds to minutes), with fewer instances where aircraft noise would persist for longer periods (e.g., hovering helicopters, which are accompanied by other disturbance factors such as shadows and water displacement). • Sound from an overhead aircraft would only be transmitted into the water in a narrow beam directly below the source, minimizing the total energy that enters the water and limiting the total ensonified area. • Documented reactions by fishes to aircraft noise is limited, however fishes would be expected to react to aircraft noise as they would react to other transient sounds (e.g., vessel noise).
Weapons noise	Weapons noise may result in hearing loss, masking, physiological stress, or behavioral reactions. • Weapons noise is rarely decoupled from the physical presence of a vessel or object (e.g., projectiles) therefore responses may be due to multiple factors (e.g., visual cues). • Sound from weapons firing would only be transmitted into the water directly below the firing source, transiting projectile, or at the area of impact, minimizing the total energy that enters the water and limiting the total ensonified area. • Reactions by fishes to weapons noise is limited; however, fishes would be expected to react to weapons noise as they would react to other transient sounds (e.g., vessel noise). • Documented reactions by fishes weapons noise is limited, however fishes would be expected to react to weapons noise as they would react to other impulsive sounds (e.g., impact pile driving or air guns).

3.6.3.1.1 Effects from Sonar and Other Transducers

Table 3.6-4 contains a summary of the background information used to analyze the potential effects of sonar and other transducers (hereafter inclusively referred to as sonars) on fishes. Many non-impulsive sounds associated with military readiness activities are produced by sonar. Other transducers include items such as acoustic projectors and countermeasure devices.

Although some marine fishes are considered hearing specialists (e.g., shad) and could be impacted by mid- or high-frequency sources, sound from these systems do not propagate as far as other sonars limiting the range these sources would be detectable, and therefore minimizing potential risk of effects. Most marine fishes (hearing generalists) would not detect most mid- or high-frequency sonars and therefore would not experience effects from these systems. Therefore, only sonars below 2 kHz, including low-frequency sonar, are analyzed for their effects on fishes. Potential effects from sonars could include TTS, behavioral reactions, physiological response, and masking.

3.6.3.1.1.1 Effects from Sonar and Other Transducers Under Alternative 1

Training and Testing. All fishes can detect low-frequencies, therefore, most effects would be limited to a subset of activities that utilize low-frequency (<2 kHz) sonars. Low-frequency sonars are operated less often than mid- or high-frequency sources throughout the Study Area. These systems could be used throughout the Study Area in the locations identified in Chapter 2 but would be concentrated in the Hawaii Range Complex and SOCAL Range Complex. Some low-frequency sonars could also be utilized in shallow water training ranges or nearshore areas (e.g., SCI nearshore under training and Pearl Harbor under testing activities), though these systems are typically operated farther offshore, in deeper waters. Generally, sonar is used more often during testing than training activities, resulting in slightly more potential effects from testing activities.

Fishes may only detect the most powerful low-frequency systems within a few kilometers; and most other, less powerful systems, at shorter ranges. Overall, TTS is not anticipated to occur in fishes exposed to low-frequency sonars as these systems generally lack the power necessary to generate hearing loss. Although unlikely, hearing specialists in proximity (tens of meters) to some mid-frequency systems may experience TTS. These individuals may experience a reduced ability to detect biologically relevant sounds until their hearing recovers (likely within a few minutes to hours depending on the amount of threshold shift).

Most sonars do not have the potential to substantially mask key environmental sounds due to the limited time of exposure resulting from the moving sound sources and variable duty cycles. Although available research has shown a lack of behavioral reactions to military sonar by hearing specialists (herring) (e.g., Sivle et al., 2012), it is possible that fish exposed to sonar could show some physiological or behavioral responses, especially in fish or schools of fish located close to the source (hundreds of meters). However, these effects, if any, would be localized and infrequent, only lasting a few seconds or minutes due to the transient nature of most sonar operations.

Based on the updated background and analysis for training and testing under Alternative 1, sonar effects on fishes would be limited to brief (seconds to minutes) periods of physiological or behavioral reactions to individual fish found within localized areas.

Modernization and Sustainment of Ranges. Sonars would not be used during modernization and sustainment of range activities.

Conclusion. Activities that include the use of sonars under Alternative 1 would result in less than significant effects due to the limited to brief (seconds to minutes) periods of physiological or behavioral reactions to individual fish found within localized areas. Overall, sonar use is unlikely to impact individuals and long-term consequences for fish populations would not be expected.

3.6.3.1.1.2 Effects from Sonar and Other Transducers under Alternative 2

Because sonar use in terms of types, duration, and locations is similar to Alternative 1, effects from sonar and other transducers under Alternative 2 would be similar to those discussed under Alternative 1. Therefore, activities that include the use of sonar under Alternative 2 would result in less than significant effects.

3.6.3.1.2 Effects from Air Guns

Table 3.6-4 contains a summary of the background information used to analyze the potential effects of air guns on fishes. The broadband impulses from air guns are within the hearing range of all fishes. Potential effects from air guns could include auditory injuries, TTS, behavioral reactions, physiological response, and masking. The ranges to auditory effects for air guns are in in Appendix E.

3.6.3.1.2.1 Effects from Air Guns Under Alternative 1

Training and Testing. Air guns would not be used during training activities. During testing activities, small air guns would be fired over a limited period within a single day. Air gun use would occur nearshore in the SOCAL Range Complex and greater than 3 NM from shore in the Hawaii, NOCAL, and SOCAL Range Complexes.

A quantitative analysis was performed to estimate range to effects for fishes exposed to air guns. However, calculated ranges to effects indicate injury and hearing loss would only occur within a short distance (less than 5 m). Exposure to air guns could also result in masking, physiological response, or behavioral reactions. These effects are expected to be brief (seconds to minutes) due to the short pulse length (approximately 0.1 second) and intermittent use of air guns throughout the Study Area.

Based on the updated background and analysis for training and testing under Alternative 1, air gun effects on fishes would be limited to temporary (minutes to hours) physiological and behavioral responses, and some instances of TTS or direct injury (though this would be rare) in individual fishes found within localized areas.

Modernization and Sustainment of Ranges. Air guns would not be used during modernization and sustainment of ranges activities.

Conclusion. Activities that include the use of air guns under Alternative 1 would result in less than significant effects due to the unlikelihood of injurious effects and hearing loss (i.e., due to the short ranges to effects), and the limited to brief (seconds to minutes) periods of physiological or behavioral reactions to individual fish found within localized areas. Overall, air guns use is unlikely to impact individuals and long-term consequences for fish populations would not be expected.

3.6.3.1.2.2 Effects from Air Guns Under Alternative 2

Effects from air guns under Alternative 2 are not meaningfully different from Alternative 1. Therefore, activities that include the use of air guns under Alternative 2 would result in less than significant effects.

3.6.3.1.3 Pile Driving

Table 3.6-4 contains a summary of the background information used to analyze the potential effects of pile driving noise on fishes. Only port damage repair training includes pile driving. The impact and vibratory pile driving hammers would expose fishes to impulsive and continuous non-impulsive broadband sounds, respectively. Potential effects could include injuries, TTS, behavioral reactions, physiological responses (stress), and masking. The ranges to injurious and auditory effects for pile driving are in in Appendix E.

3.6.3.1.3.1 Effects from Pile Driving Under Alternative 1

Training and Testing. Impact and vibratory pile driving would not occur during testing activities. Pile driving would occur as part of Port Damage Repair activities in Port Hueneme, California. Impact and vibratory pile driving during Port Damage Repair training activities can occur over a period of 14 days during each training event, and up to 12 times per year. Pile driving activities would occur intermittently in very limited areas and would be of temporary duration. The activity location is in a highly urbanized all quay wall port.

A quantitative analysis was performed to estimate range to effects for fishes exposed to pile driving. Due to the static nature of pile driving activities, two exposure times were used when calculating potential range to effects for different types of fish (e.g., transient, or migratory species versus resident species or those with high site fidelity). The calculations for ranges to effects assumed that some transient fishes would likely move through the area during pile driving activities, resulting in low exposure durations. In contrast, calculations for ranges to effects assumed that resident fishes may remain in the area during pile driving activities and therefore would receive a higher cumulative exposure level.

Estimated ranges to mortality and injury for transient species from the largest pile type and size (i.e., up to 20-inch steel piles) was 10 meters. Although it was estimated that TTS could occur within 131 m for some species, TTS would likely occur at shorter distances for other pile types and sizes, and for hearing generalists. In contrast, ranges to effects for resident species from the largest pile type and size was 50 and 93 m, respectively. Furthermore, it is anticipated that most hearing specialists present in the port for a full day may receive TTS as the estimated ranges would cover the entire footprint of Port Hueneme. However, the port is a highly disturbed environment with high existing ambient levels of noise so it is unlikely most fishes would remain in the port for long periods of time due to high amount of human disturbance and the lack of suitable habitat. Additionally, the standard operating procedure for soft starts may warn nearby fishes causing them to avoid the ensonified area. Available research suggest fishes are more likely to startle or avoid the immediate area surrounding a pile driving activity or, in some cases, would habituate and return to normal behaviors after initial exposure. In the rare event some individuals remain in the area for a full day and receive TTS, these fish may experience a reduced ability to detect biologically relevant sounds until their hearing recovers (likely within a few minutes to days depending on the amount of threshold shift).

Fishes exposed to vibratory extraction would not experience mortality, injury, or TTS based on the low source level and limited duration of these activities. Based on the predicted noise levels, fishes may exhibit other responses such as temporary masking, physiological response, or behavioral reactions such as increasing their swimming speed, moving away from the source, or not responding at all. Individual fish that avoid the pile driving location would likely find similar suitable habitat in adjacent areas or would return to the location after cessation of the noise, reducing the potential for long-term effects.

Based on the updated background and analysis for training and testing under Alternative 1, pile driving effects on fishes could result in the death or injury of a small number of individual fish, as well as brief (seconds to minutes) periods of physiological or behavioral reactions of fish found within localized areas. This is consistent with a moderate (due to limited potential injury/mortality to some individuals) impact on fish populations.

Modernization and Sustainment of Ranges. Pile driving would not be used during modernization and sustainment of range activities.

Conclusion. Activities that include pile driving or removal under Alternative 1 would result in less than significant effects due to the likelihood that only a small number of individuals would be harmed, which would have minimal effects on the overall population and abundance of a given species, and the limited to brief (seconds to minutes) periods of physiological or behavioral reactions to individual fish found within localized areas. Although some individuals may be impacted, long-term consequences for fish populations would not be expected.

3.6.3.1.3.2 Effects from Pile Driving Under Alternative 2

Effects from pile driving during training under Alternative 2 are no different from Alternative 1. Therefore, activities that include pile driving or removal under Alternative 2 would be the same as Alternative 1 and would result in less than significant effects.

3.6.3.1.4 Vessel Noise

Table 3.6-4 contains a summary of the background information used to analyze the potential effects of vessel noise on fishes. The broadband, non-impulsive, and continuous noise from vessels is within the hearing range of all fishes. Additional information on the assessment of this acoustic stressor under the Proposed Action is in Appendix E.

3.6.3.1.4.1 Effects from Vessel Noise Under Alternative 1

Training and Testing. Based on the updated background and previous analysis for training and testing under Alternative 1, vessel noise effects on fishes would be limited to temporary (hours) behavioral and stress-startle responses to individual fish found within localized areas. This is consistent with a negligible impact on fish populations.

Modernization and Sustainment of Ranges. Vessel noise would be produced during SOAR Modernization, SWTR Installation, Sustainment of Undersea Ranges, Deployment of Seafloor Cables and Instrumentation, Installation and Maintenance of Mine Warfare and Other Training Areas, and Installation and Maintenance of Underwater Platforms. Vessel noise may result in masking, physiological stress, or behavioral reactions. During installation activities, vessels would move slowly (0 to 3 knots) which would limit ship-radiated noise from propeller cavitation and water flow across the hull.

Conclusion. Activities that include vessel noise under Alternative 1 would result in less than significant effects due to the limited to brief (seconds to minutes) periods of physiological or behavioral reactions to individual fish found within localized areas. Overall, vessel noise is unlikely to impact individuals and long-term consequences for fish populations would not be expected.

3.6.3.1.4.2 Effects from Vessel Noise Under Alternative 2

Effects from vessel noise under Alternative 2 are not meaningfully different from Alternative 1. Therefore, activities that include vessel noise under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.6.3.1.5 Aircraft Noise

Table 3.6-4 contains a summary of the background information used to analyze the potential effects of aircraft noise on fishes. Aircrafts produce broadband, non-impulsive, continuous noise during operation and transit that is within the hearing range of all fishes. Additional information on the assessment of this acoustic stressor under the Proposed Action is in Appendix E.

3.6.3.1.5.1 Effects from Aircraft Noise Under Alternative 1

Training and Testing. Based on the updated background and previous analysis for training and testing under Alternative 1, aircraft noise effects on fishes would be limited to brief (seconds to minutes) behavioral and stress-startle responses to individual fish found within localized areas.

Modernization and Sustainment of Ranges. Aircraft noise would not be produced during modernization and sustainment of range activities.

Conclusion. Activities that include aircraft noise under Alternative 1 would result in less than significant effects due to the limited to brief (seconds to minutes) periods of physiological or behavioral reactions to individual fish found within localized areas. Overall, aircraft noise is unlikely to impact individuals. If impacts do occur, they are expected to be insignificant; therefore, long-term consequences for fish populations would not be expected.

3.6.3.1.5.2 Effects from Aircraft Noise Under Alternative 2

Effects from aircraft noise under Alternative 2 are not meaningfully different from Alternative 1. Therefore, activities that include aircraft noise under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.6.3.1.6 Weapons Noise

Table 3.6-4 contains a summary of the background information used to analyze the potential effects of weapons noise on fishes. Firing of guns, vibrations from the hull of ships, items that impact the water's surface, and items launched from underwater may produce weapons noise that are within the hearing range of all fishes. Additional information on the assessment of this acoustic stressor under the Proposed Action is in Appendix E.

3.6.3.1.6.1 Effects from Weapons Noise Under Alternative 1

Training and Testing. Based on the updated background and previous analysis for training and testing under Alternative 1, weapons noise effects on fishes would be limited to brief (seconds to minutes) behavioral and stress-startle responses to individual fish found within localized areas.

Modernization and Sustainment of Ranges. Weapons noise would not be produced during modernization and sustainment of range activities.

Conclusion. Activities that include weapons noise under Alternative 1 would result in less than significant effects due to the limited to brief (seconds to minutes) periods of physiological or behavioral reactions to individual fish found within localized areas. Overall, sonar use is unlikely to impact individuals. If impacts do occur, they are expected to be insignificant; therefore, long-term consequences for fish populations would not be expected.

3.6.3.1.6.2 Effects from Weapons Noise Under Alternative 2

Effects from weapons noise under Alternative 2 are not meaningfully different from Alternative 1. Therefore, activities that include weapons noise under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.6.3.2 Explosive Stressors

This section summarizes the potential effects of explosives used during military readiness activities within the Study Area. Table 3.6-5 summarizes background information that is relevant to the analyses of effects for explosives. New applicable and emergent science regarding explosive effects is presented in Appendix D. Due to updates to acoustic effects modeling, criteria and thresholds used to assess effects, and changes to proposed use of explosives, the analysis of effects due to explosives provided in this section supplant the analyses in the 2018 HSTT EIS/OEIS. The detailed assessment of explosive stressors under this Proposed Action is in Appendix E. Changes in the predicted explosive effects are due to the following:

- Improvements to criteria used to determine if an exposure to explosive energy may cause effects.
- Revisions to the modeling of explosive effects in the Navy Acoustic Effects Model. See the technical report Quantifying Acoustic Effects on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing (U.S. Department of the Navy, 2024).
- Changes in the locations, numbers, and types of modeled military readiness activities as described in Chapter 2, and associated quantities of explosives (counts) shown in Section 3.0.3.3.2.

Table 3.6-5: Explosive Stressors Information Summary

Substressor	Information Summary
Explosives in water	Sound and energy from explosives in water pose the greatest potential threats for injury and mortality in marine fishes and may also cause hearing loss, masking, physiological stress, or behavioral responses. • Fishes without a swim bladder, adult fishes, and larger species would generally be less susceptible to injury and mortality from sound and energy associated with explosive activities than fishes with a swim bladder, small, juvenile, or larval fishes. • Sound and energy from explosions could result in mortality, injury, and temporary threshold shift, on average, for hundreds or even thousands of meters from some of the largest explosions. • Generally, the size of the explosive correlates to the ranges to effects (i.e., larger charges produce longer ranges). Observed effects also depend on the geometry of the exposure (e.g., distance and depth relationship to the receiver). • Though hearing loss has never been measured in fishes exposed to explosives, fish may respond to explosives similarly to other impulsive sources. • Masking would be unlikely due to the intermittent nature of explosions. If masking were to occur, it would only occur during the duration of the signal. • Without specific data, it is assumed that fishes with similar hearing capabilities show similar behavioral reactions to all impulsive sounds (e.g., air guns and impact pile driving) outside the zone for hearing loss and injury.
Explosives in air	In-air detonations at or near the water surface could transmit sound and energy into the water and impact fishes. However, detonations within a few tens of meters of the surface are analyzed as if detonating completely underwater and the background information described above would also apply. Detonations that occur at higher altitudes would not propagate enough sound and energy into the water to result in effects on fishes and therefore are not analyzed in this section.

As discussed in Section 3.6.3, the Action Proponents will implement mitigation under Alternative 1 and Alternative 2 to reduce potential effects from explosives on fish. Activity-based mitigation will include visual observations for large schools of fish during ship shock trials, and restrictions on the use of certain explosives within important habitats used by fish for important life processes (e.g., in proximity to shallow-water coral reefs).

3.6.3.2.1 Effects from Explosives

Table 3.6-5 contains a summary of the background information used to analyze the potential effects of explosives on fishes. Potential effects from explosive energy and sound include non-auditory injury (including mortality), auditory effects (auditory injuries and TTS), behavioral reactions, physiological response, and masking. Ranges to effects for mortality, non-auditory injury, and auditory effects are shown in Appendix E. Explosive noise is very brief and intermittent, and detonations usually occur in a limited area over a brief period rather than being widespread. The potential for masking is limited. Fishes may behaviorally respond, but responses to single detonations or small numbers of clusters may be limited to startle responses.

3.6.3.2.1.1 Effects from Explosives Under Alternative 1

Training and Testing. Most explosive activities would occur in the SOCAL Range Complex, Hawaii Range Complex, and PMSR, although activities with explosives would also occur in other areas as described in Appendix A. Activities involving in-water explosives from medium- and large-caliber naval gunfire, missiles, bombs, or other munitions are conducted more than 12 NM from shore. This includes Small Ship Shock Trials that could occur in the SOCAL Range Complex. Sinking Exercises (SINKEX) are conducted greater than 50 NM from shore. Certain activities with explosives may be conducted closer to shore at locations identified in Appendix A, including the training activity Mine Neutralization Explosive Ordnance Disposal and testing activities Semi-Stationary Equipment Testing.

The death of an animal would eliminate them from the population and impact future reproductive potential. Exposures that result in non-auditory injuries may limit an animal’s ability to find food, communicate with other animals, interpret the surrounding environment, or detect and avoid predators. Impairment of these abilities can decrease an individual’s chance of survival or affect its ability to reproduce depending on the severity of the impact. Though TTS can impair an animal’s abilities, individuals may recover quickly with little significant effect depending on the amount of threshold shift.

Fishes may also experience brief periods of masking, physiological response, or behavioral reactions, depending on the level and duration of exposure. However, due to the short duration of single explosive detonations, these effects are expected to be brief (seconds to minutes). Although multiple shots conducted during large events could lead to prolonged or repeated exposures within a short period of time (hours), military readiness activities involving explosions are generally dispersed in space and time. Consequently, repeated exposures over the course of a day or multiple days are unlikely and most behavioral effects are expected to be brief (seconds or minutes) and localized, regardless of the size of the explosion, and fish would likely return to their natural behavior shortly after exposure.

Based on the updated background and analysis for training and testing under Alternative 1, explosive effects on fishes could result in the death or injury of a small number of individual fish, as well as brief (seconds to minutes) periods of physiological or behavioral reactions of fish found within localized areas. This is consistent with a moderate (due to limited potential injury/mortality to some individuals) impact on fish populations.

Modernization and Sustainment of Ranges. Explosives would not be used during modernization and sustainment of range activities.

Conclusion. Activities that include the use of explosives under Alternative 1 would result in less than significant effects due to the likelihood that only a small number of individuals would be harmed, which would have minimal effects on the overall population and abundance of a given species, and the limited to brief (seconds to minutes) periods of physiological or behavioral reactions to individual fish found within localized areas. Although some individuals may be impacted, long-term consequences for fish populations would not be expected.

3.6.3.2.1.2 Effects from Explosives Under Alternative 2

Effects from explosives in water under Alternative 2 are not meaningfully different from Alternative 1. Therefore, activities that include the use of explosives under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.6.3.3 Energy Stressors

The potential adverse effects on fishes from energy stressors that can occur during military readiness activities within the Study Area are from (1) in-water and in-air electromagnetic devices and (2) high-energy lasers. The characteristics of energy introduced through military readiness activities and the relative magnitude and location of these activities that are the basis for analysis of potential effects on biological resources are provided in Section 3.0.3.3.3. The number and location of in-water electromagnetic devices and high-energy lasers events are provided in Table 3.0-10 and 3.0-12, respectively.

Summary information relevant to the analyses of effects for each energy substressor on fishes is provided in Table 3.6-6. Detailed information on energy effect categories in general, as well as effects specific to each substressor, is provided in Appendix F. In-air electromagnetic stressors are not applicable to fishes because they are transmitted in the air and not underwater and will not be analyzed further in this section.

Table 3.6-6: Energy Stressors Information Summary

Substressor	Information Summary
In-Water Electromagnetic Devices	Although many fish groups (particularly sharks and rays) are sensitive to electric and magnetic fields, the range to effects would be small and adverse physiological and behavioral effects would be unlikely at field strengths encountered by most individuals during proposed military readiness activities: • The potential response of various species to electric fields and electrical pulses may include no reaction, avoidance, habituation, changes in activity level, or attraction, but effects would only occur near the source. • Some shark and ray species have demonstrated behavioral reactions to magnetic fields (including avoidance), and some freshwater species have shown developmental and physiological effects, but the experimental field intensities were much greater than those associated with proposed activities. • Salmon navigate using Earth's magnetic field (Scanlan et al., 2018), and electromagnetic fields can alter their magnetic orientation (Naisbett-Jones et al., 2020). • A recent review of the effects of power cables and other energized devices found an overall relatively low risk of physiological and behavioral effects on fish (Copping et al., 2021). • Due to the relatively low field intensity, highly localized impact area, and limited duration of the activities (hours), exposure is not likely to impact the health of resident or migratory populations or have lasting effects on survival, growth, recruitment, or reproduction at the population level.

Table 3.6-6: Energy Stressors Information Summary (continued)

Substressor	Information Summary
High-Energy Lasers	The potential for fishes to be exposed to high-energy lasers would be low based on laser operational use and fish distribution**:** • High-energy lasers are directed at surface targets and would only affect fishes very near the surface if the laser missed its target. • Most fish species do not occur near the surface. • Most pelagic fishes do not occur at or near the surface during the day, when lasers would be used. Fishes located near the surface during the day would likely move away from mobile laser targets before lasers were fired, decreasing the potential for exposure.

3.6.3.3.1 In-Water Electromagnetic Devices

3.6.3.3.1.1 Effects from In-Water Electromagnetic Devices Under Alternative 1

Training and Testing. Military readiness activities involving in-water electromagnetic devices occur in the Hawaii and California Study Areas. Exposure of fishes to electromagnetic stressors is limited to those fish groups that can detect the electromagnetic properties in the water column (Bullock et al., 1983; Helfman et al., 2009) such as sharks and rays. A detailed analysis of potential electromagnetic effects on fishes from training and testing activities is provided in in the 2018 HSTT and the 2022 PMSR EIS/OEISs (U.S. Department of the Navy, 2018, 2022).

The in-water electromagnetic devices used in training and testing activities would not be anticipated to result in more than minimal effects on fishes as individuals or populations because (1) the range of effect (i.e., greater than Earth's magnetic field) is small (0.2 microtesla at 200 m from the source), (2) the electromagnetic components of these activities are limited to simulating the electromagnetic signature of a vessel as it passes through the water, and (3) the electromagnetic signal is temporally variable and would cover only a small spatial range during each activity in the Study Area. Some fishes could have a detectable response to electromagnetic exposure, but the fields generated are typically well below physiological and behavioral responses of magnetoreceptive fishes, and any effects would be temporary with no anticipated effect on an individual's growth, survival, annual reproductive success, or lifetime reproductive success (i.e., fitness), or species recruitment, and are not expected to result in population-level effects. Electromagnetic exposure of eggs and larvae of sensitive bony fishes would be low relative to their total ichthyoplankton biomass (Able & Fahay, 1998); therefore, potential effects on recruitment would not be expected.

The generation of electromagnetic fields during training and testing activities has the potential to interfere with prey detection and navigation in some ESA-listed fishes, such as scalloped hammerhead sharks, white tip reef sharks, and giant manta rays, but any disturbance would be inconsequential due to the reasons described in Table 3.6-6. As the locations, number of events, area affected, and potential effects associated with in-water electromagnetic devices would be similar under both alternatives (Section 3.0.3.3.3.1), the effects would also be similar.

Modernization and Sustainment of Ranges. New range modernization and sustainment activities include installation of undersea cables and sensor nodes to sustain the capabilities of the SOAR. Undersea cables and sensor nodes would also be installed at the two new SWTRs as an extension to the SOAR. Deployment of fiber optic cables along the seafloor would occur in three locations: south and west of SCI in the California Study Area, to the northeast of Oahu, and west of Kauai in the Hawaii Study

Area. The EMF produced by these cables as electromagnetic energy dissipates exponentially by distance from the energy source, the magnetic field from the cable would be equal to 0.1 percent of the Earth's at a distance of 6 m (20 ft.). The cables and nodes would be installed at the bottom of the ocean floor, in most cases at a minimum depth of 37 m (120 ft.). Given this depth, fish are unlikely to come into extended contact with cables or nodes and it is extremely unlikely that they would be affected by the magnetic field.

Conclusion. Activities that include the use of in-water electromagnetic devices under Alternative 1 would result in less than significant effects since physiological and behavioral effects on fishes would be unlikely at the electromagnetic field strengths that fishes encountered, as supported by a recent review (Copping et al., 2021), demonstrating that the overall potential risk to the physiological and behavioral health of fishes from energized devices is relatively low.

3.6.3.3.1.2 Effects from In-Water Electromagnetic Devices Under Alternative 2

The only difference between Alternatives 1 and 2 in use of in-water electromagnetic devices is that the number of events using in-water electromagnetic devices would be greater under Alternative 2 (Table 3.0-10). Even though the number of events in Alternative 2 would be greater than Alternative 1, potential impacts on fishes are not expected to be meaningfully different.

Therefore, activities that include the use of in-water electromagnetic devices under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.6.3.3.2 High-Energy Lasers

3.6.3.3.2.1 Effects from High-Energy Lasers

Training and Testing. As discussed in Section 3.0.3.3.3.3, high-energy laser weapons are designed to disable surface targets, rendering them immobile. The primary concern is the potential for a fish to be struck with the laser beam at or near the water's surface, where extended exposure could result in injury or death. High-energy lasers would only be used during testing activities.

Fishes could be exposed to the laser only if the beam misses the target. Should the laser strike the sea surface, individuals at or near the surface could potentially be exposed. Fish species, including some ESA-listed species such as oceanic whitetip sharks and giant mantas that are found in offshore locations and occur near the surface of the water column may have a higher risk of being exposed to high-energy lasers. However, it is not anticipated that an individual would surface at the exact moment in the exact place that the laser hit the surface. In addition, the laser shuts down once contact with the target is lost.

Modernization and Sustainment of Ranges. High-energy lasers would not be used during modernization and sustainment of ranges activities.

Conclusion. Activities that include the use of high-energy lasers would not have reasonably foreseeable adverse effects on fishes based on (1) the relatively low number of events, (2) the very localized potentially affected area of the laser beam, (3) the temporary duration of potential effects (seconds), and (4) the low likelihood of a fish surfacing at the precise time and location where a laser missed the target and hit the ocean surface.

3.6.3.4 Physical Disturbance and Strike Stressors

Table 3.6-7 contains brief summaries of information relevant to the analyses of effects for each physical disturbance and strike substressor (vessels and in-water devices, MEM, seafloor devices). Effects from aircraft and aerial targets are not applicable because fishes do not occur in airborne environments and will not be analyzed further in this section. Supporting information on effects on fishes from physical disturbance and strike stressors are provided in Appendix F.

Table 3.6-7: Physical Disturbance and Strike Stressors Information Summary

Substressor	***Information Summary***
Vessels and In-Water Devices	Most fishes would detect and avoid vessels and in-water devices and therefore, with the exception of certain slow-moving species located near the surface, strikes would be unlikely: • Fishes generally respond to an approaching vessel or in-water device with lateral or downward avoidance, although some fishes are attracted to them. • Most in-water devices move slowly or are closely monitored by observers. • Early life stages of most fishes could be displaced by a moving vessel and then entrained by the vessel (e.g., propeller movement or wash and cooling system) rather than struck. Large slow-moving fishes such as whale shark, mola molas, and manta rays may occur near the surface, making them susceptible to strikes.
Military Expended Materials	Fishes could be struck by military expended materials at the surface and on the seafloor as items settle on the bottom, and could also be disturbed by materials sinking through the water column. • Direct strike potential is greatest at or near the surface, but the number of fishes at the surface is typically low, particularly during the day when most activities would occur. • Most missiles and projectiles are fired at and hit their targets, so only a very small proportion hit the water. • Expended aerial targets and aerial target fragments hit the water surface with relatively high velocity and force, although they fall rather than being fired/propelled. • Disturbance or strike as expended materials sink through the water column is possible but not likely because most objects sink slowly and can be avoided. • Fishes on the seafloor (where an item settles) could be struck or displaced, but only small numbers of individuals would likely be affected. • Propelled fragments produced by an exploding bomb are large and decelerate rapidly, posing little risk to fishes. Sediment disturbance and turbidity caused by materials settling on the seafloor would be temporary and affect a small area.
Seafloor Devices	Strikes and disturbance of fishes by seafloor devices are possible but not likely: • Items dropped into the water could strike fishes, but the probability would be low based on the low number of fish at the surface and the ability of fish to avoid sinking objects. Few individuals would likely be affected by items deployed on the bottom, and many fishes would be able to avoid unmanned vehicles (e.g., bottom-crawling vehicles).

3.6.3.4.1 Vessels and In-Water Devices

3.6.3.4.1.1 Effects from Vessels and In-Water Devices Under Alternative 1

Training and Testing. The number and location of activities that include vessels and in-water devices is shown in Table 3.0-15. Most training and testing activities include vessels, while a lower number of activities include in-water devices. As indicated in Section 3.0.3.3.4.1, vessel operation would be widely dispersed throughout the Study Area but would be more concentrated near ports, naval installations, and range complexes. Most vessel use would occur in the California Study Area, less in the Hawaii Study Area.

The risk of a strike from vessels and in-water devices such as a remotely operated vehicles, unmanned surface vehicles, unmanned underwater vehicles, motorized autonomous targets, or towed mine warfare devices used in training and testing activities would be low because (1) most fishes can detect and avoid vessel and in-water device movements and (2) the types of fish that are likely to be exposed to vessel and in-water device strikes are limited (such as whale sharks and manta rays) and occur in low concentrations where vessels and in-water devices are most frequently used. Potential effects from exposure to vessels and in-water devices are not expected to result in substantial changes to an individual’s behavior, fitness, or species recruitment, and are not expected to result in population-level effects. In addition, best management practices would be implemented prior to deploying a towed in-water device to search the intended path of the in-water device for any floating debris (e.g., driftwood) or other potential obstructions (e.g., floating vegetation rafts and animals), since they have the potential to cause damage to the device. In addition, Navy personnel standing watch or serving as a lookout must complete Marine Species Awareness training, which includes detecting floating vegetation to minimize effects on the natural environment (U.S. Department of the Navy, 2021). Therefore, the device would not be used in areas where pelagic (open ocean) fish naturally aggregate.

The potential risk of a vessel or in-water device strike to an ESA-listed fish such as an Eastern Pacific DPS scalloped hammerhead shark, oceanic whitetip shark or giant manta ray would be extremely low, but possible in the surface waters where this species can be observed swimming. As a vessel approaches, an individual could have a detectable behavioral or physiological response (e.g., swimming away and increased heart rate) as the passing vessel displaces them. However, Eastern Pacific DPS scalloped hammerhead sharks, oceanic whitetip sharks and giant manta rays would be able to detect and avoid vessel movements and would return to their normal behavior after the ship or device passes. Vessels or in-water devices would not adversely affect the water and sediment quality, quantity, or functionality within the small portion of designated green sturgeon critical habitat that overlaps with a small portion of the California Study Area (Figure C.54, Appendix C).

As described above, the use of vessels and in-water devices may result in short-term and local displacement of fish in the water column. However, these behavioral reactions are not expected to result in substantial changes to an individual’s fitness, or species recruitment, and are not expected to result in population-level effects. As the locations, number of events, and potential effects associated with vessels and in-water devices would be similar under both alternatives (Section 3.0.3.3.4.1), the potential effects on fishes would also be similar.

Modernization and Sustainment of Ranges. No vessels are involved in the proposed Special Use Airspace Modernization. Vessels and in-water devices associated with SOAR Modernization; SWTR Installation; Sustainment of Undersea Ranges; Hawaii and California undersea cable projects; and Installation and Maintenance of Underwater Platforms, Mine Warfare, and Other Training Areas would move very slowly during installation activities (0–3 knots) and would not pose a collision threat to fishes.

Conclusion. Activities that include the use of vessels and in-water devices under Alternative 1 would result in less than significant effects due to (1) the low likelihood for most fishes to be struck by a vessel, since most fish occupy waters below the surface; (2) the fact that fish typically display an avoidance response to an approaching vessel; and (3) the fact that most in-water devices move slowly and are closely monitored during deployment.

3.6.3.4.1.2 Effects from Vessels and In-Water Devices Under Alternative 2

The only difference between Alternatives 1 and 2 in use of vessels and in-water devices is that the number of events using vessels or in-water devices would be greater under Alternative 2 (Table 3.0-15). Even though the number of events in Alternative 2 would be greater than Alternative 1, potential impacts on fishes are not expected to be meaningfully different.

Therefore, activities that include the use of vessels and in-water devices under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.6.3.4.2 Military Expended Materials

3.6.3.4.2.1 Effects from Military Expended Materials Under Alternative 1

Training and Testing. A potential strike to a fish comes from the following categories of MEM: (1) all sizes of non-explosive practice munitions (Table 3.0-16); (2) fragments from high-explosive munitions (Table 3.0-17); (3) expendable targets (Table 3.0-18); and (4) expended materials other than munitions, such as sonobuoys or torpedo accessories (Table 3.0-19). A discussion of the types of activities that use MEM is presented in Appendix B, and supporting information on potential MEM effects on fishes is presented in Appendix F.

While disturbance or strike from any of these objects as they sink through the water column is possible, it is not very likely for most expended materials because the objects generally sink through the water slowly and can be avoided by most, if not all fishes. Therefore, the analysis of MEM strikes focuses on strikes at the surface or in the upper water column from fragments (of high-explosives) and projectiles because those items have a greater potential for a fish strike as they hit the water, before slowing down as they move through the water column.

MEM would occur throughout the Study Area, although relatively few items would be expended in the HCTT Transit Corridor. Most MEM would occur within the California and Hawaii Study Areas. Major fish groups identified above in Table 3.6-2 that are particularly susceptible to MEM strikes are those occurring at the surface, within the offshore and continental shelf portions of the Study Areas (where the strike would potentially occur). Those groups include salmonids, pelagic sharks, flyingfishes, jacks, tunas, mackerels, billfishes, ocean sunfishes, and other similar species (Table 3.6-2). Additionally, certain deep-sea fishes would be exposed to strike risk as a ship hulk, expended during a sinking exercise, settles to the seafloor. These groups include hagfishes, dragonfishes, lanternfishes, anglerfishes, and oarfishes.

Projectiles, bombs, missiles, rockets, and associated fragments have the potential to directly strike fish as they hit the water surface and below the surface to the point where the projectile loses its forward momentum. Fishes at and just below the surface would be most susceptible to injury from strikes. Fishes that occur deeper in the water column would be less susceptible to injury because the velocity of these materials would rapidly decrease upon contact with the water and as they travel through the water column. Consequently, most water column fishes would have ample time to detect and avoid approaching munitions or fragments as they fall through the water column. The probability of strike based on the “footprint” analysis included in Appendix I indicates that even for an extreme case of expending all small-caliber projectiles within a single gunnery box, the probability of any of these items striking a fish (even as large as bluefin tuna or whale sharks) is extremely low. Therefore, since most fishes are smaller than bluefin tuna or whale sharks, and most MEM are less abundant than small-caliber projectiles, the risk of strike by these items is exceedingly low for fishes overall. A possibility exists that a small number of fish at or near the surface may be directly affected if they are in the target area and near the point of physical effect at the time of MEM strike, but population-level effects would not occur.

Sinking exercises could occur in open-ocean areas, outside of the coastal portions of the Study Areas. While serious injury or mortality to individual fish would be expected if they were present within range of high-explosive activities (analyzed in Section 3.6.3.1), sinking exercises would not result in effects on pelagic fish populations at the surface based on the low number of fish in the immediate area and the placement of these activities in deep, ocean areas where fish abundance is low or widely dispersed. Also, these activities are very few in number (up to three events annually). Disturbances to benthic fishes from sinking exercises would be highly localized. Any deep-sea fishes located on the bottom where a ship hulk would settle could experience displacement, injury, or death. However, population-level effects on the deep-sea fish community would not occur because of the limited spatial extent of the effect and the wide dispersal of fishes in deep ocean areas.

All ESA-listed fish species near the training and testing would be potentially exposed to MEM. While MEM use could overlap with the occurrence of ESA-listed species, the likelihood of a strike would be extremely low given their low abundance in the Study Area and the dispersed nature of the activity. As indicated in the analyses in Section 3.2.3, effects on sediments and water quality from explosives, explosives byproducts, and metals under Alternative 1 are expected to be minimal. The analysis of proportional footprint effects on the seafloor from MEM in Appendix I, Section I.1 indicates that the percentage of affected substrate relative to the entire Study Area is very low. Therefore, it is highly unlikely that the functionality of the very small proportion of designated green sturgeon critical habitat that overlaps with the NOCAL portion of the California Study Area (Figure C.54, Appendix C) would be affected from MEM under Alternative 1. Mitigation, such as not conducting gunnery activities within a specified distance of shallow-water coral reefs, precious coral beds, artificial reefs, and shipwrecks, would be implemented to avoid potential impacts from MEM wherever these seafloor resources occur within the Study Area. The mitigation would consequently help avoid potential effects on fishes that inhabit shallow-water coral reefs and rocky reefs.

The effect of MEM strikes on fishes would be inconsequential due to (1) the limited number of species found directly at the surface where MEM strikes could occur, (2) the rare chance that a fish might be directly struck at the surface by MEM, and (3) the ability of most fishes to detect and avoid an object falling through the water below the surface. The potential effects of MEM strikes would be short-term (seconds) and localized disturbances of the water surface (and seafloor areas within sinking exercise boxes) and are not expected to yield any behavioral changes or lasting effects on the survival, growth, recruitment, or reproduction at the population level. As the locations, number of events, and potential effects associated with MEM would be similar under both alternatives (Section 3.0.3.3.4.2), the potential effects on fishes would also be similar.

Modernization and Sustainment of Ranges. No MEM are expected during modernization and sustainment of ranges activities.

Conclusion. Activities that include the use of MEM under Alternative 1 would result in less than significant effects because (1) the greatest strike risk occurs at the surface, away from areas occupied by the majority of fishes, which occupy demersal and pelagic habitat; (2) only a small proportion of missile and projectiles hit the water, creating a risk; (3) MEM sinking in the water column would typically occur at a slow rate, with low potential to create a strike risk; and (4) few fishes on the seafloor would be affected by falling MEM.

3.6.3.4.2.2 Effects from Military Expended Materials Under Alternative 2

The only difference between Alternatives 1 and 2 in use of MEM is that the overall quantity of MEM would be greater under Alternative 2 (Tables 3.0-16 through 3.0-19). Even though the quantity of MEM in Alternative 2 would be greater than Alternative 1, potential impacts on fishes are not expected to be meaningfully different.

Therefore, activities that include the use of MEM under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.6.3.4.3 Seafloor Devices

3.6.3.4.3.1 Effects from Seafloor Devices Under Alternative 1

Training and Testing. Seafloor devices represent items used during training and testing activities that are deployed onto the seafloor and recovered. Section 3.0.3.3.4.3 provides the number and location of seafloor devices in the Study Area (Table 3.0-20). Supporting information on effects of seafloor devices on marine fishes is presented in Appendix F.

Aircraft-deployed mine shapes deployed at the surface during aerial mine laying activities has the greatest potential to strike a fish within the water column. While seafloor device use could overlap with some ESA-listed species distributions, the likelihood of a strike would be extremely low given the low abundance of these species in the Study Area, the ability for these ESA-listed species to detect and avoid falling objects through the water below the surface, and the dispersed nature of the activity. However, there would be the potential for effect. In addition, the probability of a physical disturbance or strike on a fish during cable installation activities would be extremely low. Fish would be able to move away from disturbed areas and return when activities are completed.

Mitigation would be implemented that includes not conducting precision anchoring (except in designated anchorages) within the anchor swing circle of shallow-water coral reefs, precious coral beds, artificial reefs, and shipwrecks to avoid potential effects from seafloor devices on seafloor resources in mitigation areas throughout the Study Area (Section 5.7). This mitigation would consequently help avoid potential effects on fishes that inhabit these areas. As the locations, number of events, and potential effects associated with Seafloor Devices would be similar under both alternatives (Section 3.0.3.3.4.3), the potential effects on fishes would also be similar.

Modernization and Sustainment of Ranges. New range modernization and sustainment activities include installation of undersea cables integrated with hydrophones and underwater telephones to sustain the capabilities of the SOAR. Deployment of fiber optic cables along the seafloor would occur in three locations: south and west of SCI in the California Study Area, to the northeast of Oahu in the Hawaii Study Area, and to the west of Kauai in the Hawaii Study Area. In all locations the installations would occur completely within the water; no land interface would be involved. These activities would occur far offshore of where most ESA-listed fish species do not occur. Some ESA-listed fish species such as oceanic whitetip sharks and scalloped hammerhead sharks could be present in the vicinity of the cable laying vessel during installation activities. However, effects on these species would be discountable since the species spends little time at the bottom habitat where the disturbance from laying the cable would occur.

Installation and maintenance of underwater platforms, mine warfare training areas, and installation of other training areas involve seafloor disturbance where those activities would take place. Each installation would occur on soft, typically sandy bottom, avoiding rocky substrates.

Conclusion. The use of seafloor devices under Alternative 1 would result in less than significant effects because (1) there would be a low probability of fish being struck during deployment of seafloor devices; and (2) fish would easily be able to avoid slow-moving, bottom-crawling devices. Most of the non-cable seafloor devices would only be placed temporarily and would not adversely affect the water and sediment quality, quantity, or functionality within the small portion of designated green sturgeon critical habitat that overlaps with the NOCAL portion of the California Study Area (Figure C.54, Appendix C). The long-term placement of seafloor cables in the SOAR and SWTRs occurs away from the NOCAL portion of the California Study Area and would not overlap with designated green sturgeon critical habitat.

3.6.3.4.3.2 Effects from Seafloor Devices Under Alternative 2

The only difference between Alternatives 1 and 2 in use of seafloor devices is that the number of events using seafloor devices would be greater under Alternative 2 (Table 3.0-20). Even though the number of events in Alternative 2 would be greater than Alternative 1, potential effects on fishes are not expected to be meaningfully different.

Therefore, activities that include the use of seafloor devices under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.6.3.5 Entanglement Stressors

Table 3.6-8 contains brief summaries of information relevant to the analyses of effects for each entanglement substressor such as wires and cables and decelerators/parachutes. The number and locations where wires and cables would be expended are presented in Table 3.0-22. Supporting information on effects from entanglement stressors on fishes are provided in Appendix F.

Table 3.6-8: Entanglement Stressors Information Summary

Substressor	Information Summary
Wires and Cables	Fiber-optic cables, guidance wires, bathythermograph wires, and sonobuoy components would pose a generally low potential entanglement risk to susceptible fishes, although the potential would be higher for sonobuoy components than for wires and cables: • Fiber-optic cables do not easily form loops. • Guidance wires typically sink immediately after release and remain on the seafloor and would not likely form loops because of their size and rigidity. • The encounter rate for fiber optic cables and guidance wires would be extremely low, as few would be expended. • Most sonobuoys are expended in offshore areas where large open-ocean species (e.g., manta rays) could become entangled in vertical cable. • Smaller species could become entangled in components such as plastic mesh. Fish species with protruding physical features, such as hammerhead sharks, manta rays, and billfishes, would be more susceptible to entanglement in wires and cables than other types of fish.

Table 3.6-8: Entanglement Stressors Information Summary (continued)

Substressor	Information Summary
Decelerators/ Parachutes	Decelerators/parachutes pose a potential entanglement risk to fishes (the risk is higher for decelerators/parachutes on the seafloor), although the number of fish affected would likely be low: • Decelerators/parachutes are relatively large and visible, reducing the chance that fish would accidentally become entangled. • Entanglement in the water column is unlikely because fish generally react to disturbance at the surface by swimming away. • Once a decelerator/parachute is on the bottom, a fish could become entangled in the item or its attachment lines while diving and feeding, especially at night or in deeper waters. • If a decelerator/parachute dropped in an area of strong bottom currents, it could billow open and pose a short-term entanglement threat to large fish feeding on the bottom. Most smooth-bodied fishes would not become entangled, but fish with spines or other protrusions would be more susceptible.
Nets	Nets would be deployed during testing of extra large unmanned underwater vehicles. • Nets are anticipated to be a maximum size of 300 ft. wide and 100 ft. deep, with a 1-inch mesh. • Nets would be temporary, tethered to one or two support vessel(s), and monitored at all times when in the water. • Areas where nets would be deployed will not overlap sensitive areas, and nets would not contact bottom substrates.

3.6.3.5.1 Wires and Cables

3.6.3.5.1.1 Effects from Wires and Cables Under Alternative 1

Training and Testing. Activities that expend fiber optic cables, guidance wires, and sonobuoy wires occur in both the California and Hawaii Study Areas. Fiber optic cables are comprised of silicon and are somewhat flexible, durable, and abrasion or chemical resistant. When fiber optic cables are placed, they sink rapidly to the bottom. The physical characteristics of the fiber optic material render the cable easily broken when tightly kinked or bent at a sharp angle, but highly resistant to breaking when wrapped or looped around an object.(U.S. Department of the Navy, 2001).

The likelihood of fish entanglement from wires and cables expended during training and testing activities is low because these species would be able to see and avoid cables and wires in the water column. In the rare instance where a fish did encounter a fiber optic cable, entanglement is unlikely because the cable is not strong enough to bind most fishes (U.S. Department of the Navy, 2001).

Guidance wire would only be expended in offshore areas and not within nearshore habitats in the Study Area. Some fishes could potentially encounter guidance wire because they can occur in nearshore waters out to the shelf break, where many fish species feed near the bottom and could encounter a guidance wire while feeding. However, it would be rare for a fish to encounter guidance wires expended during training and testing activities. If a guidance wire were encountered, the most likely result would be that the fish ignores it, which is inconsequential and considered negligible. In the rare instance where an individual fish became entangled in guidance wire and could not break free, the individual could be affected by impaired feeding, bodily injury, or increased susceptibility to predators. However, this is an extremely unlikely scenario because the density of guidance wires would be very low, as discussed in Section 3.0.3.3.5.1.

Sonobuoy wires may be expended throughout the HCTT Study Area. A sonobuoy wire runs through the stabilizing system and leads to the hydrophone components. The hydrophone components may be covered by thin plastic netting depending on type of sonobuoy but pose no entanglement risk. This is mainly due to the sonobuoy being made of a single wire that hangs vertically in the water column. Therefore, it would be highly unlikely that a fish would be entangled by a sonobuoy wire.

While individual fish susceptible to entanglement could encounter guidance wires, fiber optic cables, and sonobuoy wires, the long-term consequences of entanglement are unlikely for either individual or populations because (1) the encounter rate for cables and wires is low, (2) the types of fishes that are susceptible to these items is limited, (3) the restricted overlap with susceptible fishes, and (4) the physical characteristics of the cables and wires reduce entanglement risk to fishes compared to monofilament used for fishing gear. Potential effects from exposure to guidance wires and fiber-optic cables are not expected to result in substantial changes to an individual's behavior, fitness, or species recruitment, and are not expected to result in population-level effects. As the locations, number of events, and potential effects associated with wires and cables would be similar under both alternatives (Section 3.0.3.3.5.1), the potential effects on fishes would also be similar.

Modernization and Sustainment of Ranges. Fiber-optic cables are deployed on the seafloor during SOAR modernization, and the installation of two SWTRs. The Navy also proposes to deploy undersea fiber optic cables and connected instrumentation to existing undersea infrastructure along the seafloor in the California Study area (south and west of SCI), and the Hawaii Study Area (northeast of Oahu and west of Kauai). Entanglement of fishes is not likely because of the rigidity of the cable that is designed to lie extended on the sea floor. Once installed on the seabed, the new cable and communications instruments would be equivalent to other hard structures on the seabed, again posing no risk of adverse effect on fishes.

Conclusion. Activities that include the use of wires and cables under Alternative 1 would result in less than significant effects due to (1) a very low entanglement risk from fiber optic cables and guidance wires, (2) a low encounter rate between fish and the fiber-optic cables and guidance wires, and (3) the fact that most sonobuoys are expended offshore.

3.6.3.5.1.2 Effects from Wires and Cables Under Alternative 2

The only difference between Alternatives 1 and 2 in use of wires and cables is that the number of wires and cables expended would be greater under Alternative 2 (Table 3.0-22). Even though the number of wires and cables in Alternative 2 would be greater than Alternative 1, potential effects on fishes are not expected to be meaningfully different.

Therefore, activities that include the use of wires and cables under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.6.3.5.2 Decelerators/Parachutes

3.6.3.5.2.1 Effects from Decelerators/Parachutes Under Alternative 1

Training and Testing. The number and location of decelerator/parachutes expended during proposed training and testing activities are presented in Table 3.0-19, and the size categories of decelerators/parachutes are presented in Table 3.0-23. Supporting information on fish effects from entanglement stressors are provided in Appendix F.

Training and testing activities involving decelerator/parachute only occur in the open ocean portions of the Study Area. Given the size of the Study Area and the resulting widely scattered decelerators/parachutes, it would be very unlikely that a fish would encounter and become entangled in any decelerators/parachutes.

Some elasmobranchs (sharks and rays), swordfishes, and billfishes occurring within the offshore and continental shelf portions of the Study Area may be more susceptible to entanglement in decelerators/parachutes than most fish species, due primarily to their unusual body shape or projections. However, due to the highly maneuverable swimming capabilities of these fishes, entanglement would be highly unlikely while the decelerators/parachutes are at the surface or sinking through the water column. Oceanic whitetip sharks and giant manta rays occurring in offshore areas of the Hawaii Study Area could encounter a parachute/decelerator during training and testing activities. These species are also highly mobile and could easily avoid floating or suspended decelerators/ parachutes or break free if they got entangled. If any of these ESA-listed sharks or rays were to become entangled in a decelerator/parachute, they would likely thrash to break free. If such an effort were unsuccessful, the individual could remain entangled, possibly resulting in injury or death, but this scenario is considered so unlikely that it would be discountable. Individual fish are not prone to be repeatedly exposed to decelerators/parachutes, so long-term consequences of entanglement risks from decelerators/parachutes are unlikely for either individuals or populations. As the locations, number of events, and potential effects associated with decelerators/parachutes would be similar under both alternatives (Section 3.0.3.3.5.2), the potential effects on fishes would also be similar.

Modernization and Sustainment of Ranges. Decelerators/parachutes would not be expended during modernization and sustainment of ranges activities.

Conclusion. Activities that include the use of decelerators/parachutes under Alternative 1 would result in less than significant effects because (1) the decelerators/parachutes are relatively large, visible, and slow moving, making them easier to avoid; and (2) should a fish encounter a decelerator/parachute, it would likely display avoidance behavior and swim away.

3.6.3.5.2.2 Effects from Decelerators/Parachutes Under Alternative 2

The only difference between Alternatives 1 and 2 in use of decelerators/parachutes is that the number of decelerators/parachutes expended would be greater under Alternative 2 (Table 3.0-19). Even though the number of decelerators/parachutes in Alternative 2 would be greater than Alternative 1, potential effects on fishes are not expected to be meaningfully different.

Therefore, activities that include the use of decelerators/parachutes under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.6.3.5.3 Nets

3.6.3.5.3.1 Effects from Nets Under Alternative 1

Training and Testing. Nets would only be used during testing activities. The description for net deployments that occur during XLUUV testing is described in Section 3.0.3.3.5.1. Net dimensions are anticipated to be a maximum size of 300 ft. wide and 100 ft. deep, with a one-inch maximum mesh size. Areas where nets would be deployed would not overlap sensitive areas, and nets would not contact bottom substrates. Net deployment and retrieval are estimated to take approximately 30 minutes. Nets would be deployed four times for up to 4 hours per deployment (not to exceed 16 hours) during a given

48-hour period. Nets would only be deployed during daylight hours, would be tethered to one or two support vessel(s), and would be continuously monitored when in the water.

Larger pelagic fish (sharks, rays, dorado, steelhead, and tuna) would likely be able to detect this large net and avoid it (National Marine Fisheries Service, 2024a). Should they come in contact with the net, their risk of entanglement would be expected to be low due to their larger body size and the relatively small mesh size (National Marine Fisheries Service, 2024a). The potential for entanglement of demersal fish and fish associated with reef or kelp habitats is expected to be low because the net would avoid contact with the bottom and avoid these sensitive habitats.

Smaller pelagic fish (i.e., sardine, anchovy, mackerel) may also encounter the XLUUV nets, but are unlikely to experience bycatch levels consistent with commercial fisheries that utilize nets. The type of nets typically used to commercially harvest these species are of a round haul net or purse seine design, as opposed to a single pane of hanging mesh in gillnet fisheries. Fisheries for these species typically use a purse seine net that measure 1,110 ft. long, 132 ft. deep, and 165 ft. deep, and is comprised of 1.25-in. mesh (National Marine Fisheries Service, 2024b). Other commercial fisheries further offshore, also deploy purse seines, but for larger species. Purse seine vessels capture non-target fish species within these fisheries (Duffy et al., 2019; Lennert-Cody et al., 2008). Much of the other net/seine deployed fisheries bycatch that occurs in waters that overlap with XLUUV testing activity that includes nets is either associated with trawl fisheries (Matthews et al., 2022; Pikitch et al., 1998) or large-mesh gillnet fisheries (Hahlbeck et al., 2017; Larese & Coan, 2008; Le Fol, 2016; Matthews et al., 2022; Shester & Micheli, 2011).

While fish in the water column have the potential to encounter the hanging net panel, the smaller mesh size (not to exceed 1 in.) largely limits the risk of exposure to smaller pelagic species of fish that would be small enough to become entangled in these nets. However, the nets deployed during the XLUUV testing would be single pane mesh and would not encircle or entrap schooling fish compared to commercial nets and seines that catch fish by encircling them. The nets proposed would only be deployed for short periods at a time (not to exceed 4 hours) and would be continuously monitored by the vessels attached to the nets.

Due to their relatively large body size relative to the net design and mesh size, the potential risk of entanglement for ESA-listed fish is considered discountable (i.e., extremely unlikely to occur) (National Marine Fisheries Service, 2024a). In addition, the area where XLUUV net testing would occur does not overlap with designated green sturgeon critical habitat. Since the locations, number of events, and potential effects associated with nets deployed during XLUUV testing would be the same under both alternatives (Section 3.0.3.3.5.1), the potential effects on fishes would also be the same.

Modernization and Sustainment of Ranges. Nets associated with XLUUV training would not be deployed during modernization and sustainment of ranges activities.

Conclusion. Nets associated with XLUUV testing would result in less than significant effects because (1) for many pelagic species, including oceanic whitetip sharks, scalloped hammerhead sharks, and steelhead, the risk of entanglement is unlikely given their body shape and ability to avoid materials that could entangle them in the water column; (2) most of the sufficiently large body size that they would not be susceptible to entanglement of their gills in the one-inch mesh size nets proposed for use; (3) larger fish that encounter a submerged net would recognize it as an obstruction and quickly change course to avoid the net; and (4) the nets would only be deployed during daylight hours for no more than

4 hours per deployment, would be tethered to one or two support vessel(s), and would be monitored at all times when in the water.

3.6.3.5.3.2 Effects from Nets Under Alternative 2

The would be no difference between Alternatives 1 and 2 in use of nets. Therefore, activities that include the use of nets under Alternative 2 would be the same as Alternative 1 and would result in less than significant effects.

3.6.3.6 Ingestion Stressors

The various types of MEM used during training and testing activities within the Study Area may be broadly categorized as munitions and MEM other than munitions. Table 3.6-9 contains brief summaries of information relevant to the analyses of effects for each ingestion substressor (MEM – munitions, MEM – materials other than munitions). Aspects of ingestion stressors applicable to marine organisms in general are presented in Section 3.0.3.3.6. The number and location of targets expended in the Study Area that may result in fragments is presented in Table 3.0-24. Supporting information on ingestion stressors for fishes is provided in Appendix F.

It is reasonable to assume that any item of a size that can be swallowed by a fish could be eaten at some time; this analysis focuses on ingestion of materials in two locations: (1) at the surface or water column and (2) at the seafloor. The potential for fish to encounter and ingest expended materials is evaluated with respect to their feeding group and geographic range, which influence the probability that they would eat MEM (Table 3.6-10).

Table 3.6-9: Ingestion Stressors Information Summary

Substressor	*Information Summary*
Military Expended Materials	Fishes in the water column and at the seafloor could purposely or inadvertently ingest many types of expended materials with potentially adverse effects, but the number of individuals affected would be low in the context of population size: • Plastic items are the most commonly ingested anthropogenic materials and can cause digestive or toxicity issues. • Large filter-feeding fishes (e.g., whale sharks) could inadvertently ingest small or medium decelerators/parachutes. • Chaff fibers could be ingested by all lifestages of fishes. Fishes may ingest chaff cartridge and flare components; encounters would mostly occur on the seafloor except for the relatively few items that float or become entangled in floating vegetation.

Table 3.6-10: Ingestion Stressors Potential for Effect on Fishes Based on Feeding Guild

Feeding Guild	Representative Species	ESA-Protected Species	Overall Potential for Effect
Open-ocean Predators	Mahi mahi, most shark species, tunas, billfishes, swordfishes	Scalloped hammerhead sharks (Eastern Pacific DPS), adult Chinook and coho salmon, adult steelhead, oceanic whitetip sharks	These fishes may eat floating or sinking expended materials, but the encounter rate would be extremely low. May result in individual injury or death but is not anticipated to have population-level effects.
Open-ocean consumer of plankton	Basking sharks, whale sharks	Giant manta rays	These fishes may ingest floating expended materials incidentally as they feed in the water column, but the encounter rate would be extremely low. May result in individual injury or death but is not anticipated to have population-level effects.
Coastal bottom-dwelling predators	Rockfishes, groupers, jacks, sturgeon	Green sturgeon	These fishes may eat expended materials on the seafloor, but the encounter rate would be extremely low. May result in individual injury or death but is not anticipated to have population-level effects.
Coastal/estuarine bottom-dwelling predators and scavengers	Skates and rays, flatfishes	Green sturgeon	These fishes could incidentally eat some expended materials while foraging, especially in muddy waters with limited visibility. May result in individual injury or death but is not anticipated to have population-level effects.

Note: ESA = Endangered Species Act, DPS = Distinct Population Segment

3.6.3.6.1 Military Expended Materials

3.6.3.6.1.1 Effects from Military Expended Materials Under Alternative 1

Training and Testing. MEM from munitions associated with training and testing activities that could potentially be ingested by a fish include non-explosive practice munitions (small- and medium-caliber), small-caliber casings, and fragments from high explosives. These items could be expended throughout most of the Study Area but would be concentrated in the Hawaii and California Study Areas. A detailed analysis of potential MEM effects on fishes from training and testing activities is provided in Navy (U.S. Department of the Navy, 2018, 2022).

The potential effects of ingesting small-caliber projectiles, high explosive fragments, or end caps/pistons with the chaff cartridges would be limited to individual cases where a fish might suffer a negative response, for example, ingesting an item too large to be digested. While ingestion of munitions-related materials, or the other MEM identified here, could result in sublethal or lethal effects, the likelihood of ingestion is low based on the dispersed nature of the materials and the limited exposure of those items at the surface/water column or seafloor where certain fishes could be at risk of ingesting those items. Furthermore, a fish might taste an item then expel it before swallowing it (Felix et al., 1995), in the same manner that fish would temporarily take a lure into its mouth, then spit it out. Based on these factors, the number of fish potentially affected by ingestion of munitions-related materials would be low and population-level effects are not likely to occur.

Large, open-ocean predators (e.g., tunas, billfishes, pelagic sharks) have the potential to ingest self-protection flare end caps or pistons as they float on the water column for some time. A variety of plastic and other solid materials have been recovered from the stomachs of billfishes, mahi mahi (South Atlantic Fishery Management Council, 2011) and tuna (Hoss & Settle, 1990). Savoca et al. (2021) conducted a literature review of 129 studies investigating marine fish ingestion of plastics. They found that roughly two thirds (n= 386) of the marine fish investigated in these studies ingested plastics, while roughly one third (n= 148) did not. The potential to determine any statistically significant geographic trends across various bodies of water was limited by lack of data. Based on the low density of expended endcaps and pistons, the encounter rate would be extremely low, and the ingestion rate even lower. The number of fishes potentially affected by ingestion of end caps or pistons would be minimal based on the low environmental concentration. Population-level effects would not be expected.

Larger offshore species such as ESA-listed giant manta rays or oceanic whitetip sharks could mistake larger MEM other than munitions for prey, even though these species typically forage at or near the surface. It is likely that these species would "taste" and then spit it out if an item were accidentally ingested; if ingested, the item would most likely pass through the digestive tract without causing harm.

Mitigation would be implemented (e.g., not conducting gunnery activities within 350 yards of shallow-water coral reefs and precious coral beds) to avoid potential effects from MEM on seafloor resources in mitigation areas throughout the Study Area (Table 3.6-3; Section 5.7). This mitigation would consequently help avoid potential ingestion effects on fishes that feed on shallow-water coral reefs, precious coral beds, artificial reefs, and shipwrecks.

Overall, the potential effects of ingesting munitions (whole or fragments) would be limited to individual fish that might suffer a negative response from a given ingestion event. While ingestion of munitions or fragments identified here could result in sublethal or lethal effects on a small number of individuals, the likelihood of a fish encountering an expended item is dependent on where that species feeds and the amount of material expended. Furthermore, an encounter may not lead to ingestion, as a fish might "taste" an item, then expel it (Felix et al., 1995). Therefore, the number of fishes potentially affected by ingestion of munitions or fragments from munitions would be assumed to be low, and population-level effects would not be expected. As the locations, number of events, and potential ingestion effects associated of MEM would be similar under both alternatives, the potential effects on fishes would also be similar.

Modernization and Sustainment of Ranges. No MEM are expected during modernization and sustainment of ranges activities. Some anchors may not be recovered and would become MEM, but those are covered in the analysis of seafloor devices.

Conclusion. Activities that include the use of MEM under Alternative 1 would result in less than significant effects because (1) the likelihood of ingestion is low based on the dispersed nature of the materials and the limited exposure of those items at the surface/water column or seafloor; and (2) if ingested, a fish would temporarily take the expended material into its mouth, then spit it out.

3.6.3.6.1.2 Effects from Military Expended Materials Under Alternative 2

The only difference between Alternatives 1 and 2 in use of MEM is that the quantity of MEM expended would be greater under Alternative 2 (Tables 3.0-16 through 3.0-19). Even though the quantity of MEM in Alternative 2 would be greater than Alternative 1, potential effects on fishes are not expected to be meaningfully different.

Therefore, activities that include the use of MEM under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.6.3.7 Secondary Stressors

Fishes could be exposed to stressors indirectly through effects on prey availability and habitat (e.g., sediment or water quality, and physical disturbance). Indirect effects on fishes via sediment or water that do not require trophic transfer to be observed (e.g., bioaccumulation) are discussed below and in Section 3.2. It is important to note that the terms “indirect” and “secondary” do not imply reduced severity of environmental consequences, but instead describe how the effect may occur in an organism or its ecosystem. Secondary or indirect effects on fishes via habitat (e.g., sediment, and water quality) and prey availability could come from (1) explosives and explosion byproducts; (2) metals; (3) chemicals; and (4) other materials such as targets, chaff, and plastics. Supporting information on secondary stressors and their potential effects on fishes are provided in Appendix F.

Mitigation would be implemented to avoid potential effects from explosives and physical disturbance and strike stressors on seafloor resources in mitigation areas throughout the Study Area (Section 5.7). This mitigation would consequently help avoid potential effects on fishes that shelter in and feed on shallow-water coral reefs, precious coral beds, artificial reefs, and shipwrecks.

3.6.3.7.1 Effects on Habitat

Military readiness activities could result in localized and temporary changes to the benthic community during activities that effect fish habitat (see Section 3.5). Hard bottom is important habitat for many different species of fish, including those fishes managed by various fishery management plans. Fish habitat could become degraded during activities that would strike the seafloor or introduce MEM, bombs, projectiles, missiles, rockets, or fragments to the seafloor. The spatial area of habitat affected by the Proposed Action would be relatively small compared to the available habitat in the Study Area. However, there would still be vast expanses of habitat adjacent to the areas of habitat effect that would remain undisturbed by the military readiness activities.

The analysis conclusions for secondary effects on habitat associated with military readiness activities are consistent with a less than significant determination for fishes.

3.6.3.7.2 Effects on Prey Availability

Effects on fish prey availability resulting from explosives, explosives byproducts, unexploded munitions, metals, and chemicals would differ depending upon the type of prey species in the area but would likely be negligible overall and have no population-level effects on fishes. As discussed in Section 3.6.3.1, fishes with swim bladders are more susceptible to blast injuries than fishes without swim bladders. During or following activities where these items might be expended that effect benthic habitats, fish species may experience loss of available benthic prey. Additionally, plankton and zooplankton that are eaten by fishes may also be negatively affected by these same expended materials. Some species of zooplankton that occur in the Pacific such as Pacific oyster (*Crassostrea gigas*) larvae have been found feeding on microplastics (Cole & Galloway, 2015).

In addition to physical effects of an underwater blast such as being stunned, prey might have behavioral reactions to underwater sound. For instance, prey species might exhibit a strong startle reaction to detonations that might include swimming to the surface or scattering away from the source. This startle and flight response is the most common secondary defense among animals (Hanlon and Messenger, 1996). The sound from underwater explosions might induce startle reactions and temporary dispersal of schooling fishes if they are within close proximity (Bowman et al., 2024; Jenkins et al., 2022; Jenkins et al., 2023; Popper et al., 2014; Smith et al., 2022; Wright, 1982).

The abundances of fish and invertebrate prey species near the detonation point could be diminished for a short period of time before being repopulated by animals from adjacent waters. The sound from underwater explosions might induce startle reactions and temporary dispersal of schooling fishes, potentially increasing visibility to predators, if they are within close proximity (Kastelein et al., 2008). Alternatively, any prey species that would be directly injured or killed by the blast could attract predators and scavengers from the surrounding waters that would feed on those organisms, and in turn could be susceptible to becoming directly injured or killed by subsequent explosions. Any of these scenarios would be temporary, only occurring during activities involving explosives, and no lasting effect on prey availability or the food web would be expected. Indirect effects of underwater detonations and high explosive munitions use under the Proposed Action would not result in a decrease in the quantity or quality of fish populations in the Study Area.

The analysis conclusions for secondary effects on prey availability associated with military readiness activities are consistent with a less than significant determination for fishes.

3.6.4 Summary of Potential Effects on Fishes

3.6.4.1 Combined Effects of All Stressors

Additive Stressors – There are generally two ways that a fish could be exposed to multiple stressors. The first would be if a fish were exposed to multiple sources of stress from a single event or activity (e.g., a mine warfare activity may include the use of a sound source and a vessel). The potential for a combination of these effects from a single activity would depend on the range of effects of each stressor and the response or lack of response to that stressor. Most of the activities as described in the Proposed Action involve multiple stressors; therefore, it is likely that if a fish were within the potential effect range of those activities, it may be affected by multiple stressors simultaneously. This would be even more likely to occur during large-scale exercises or activities that span a period of days or weeks (such as a sinking exercises or composite training unit exercise).

Secondly, a fish could also be exposed to a combination of stressors from multiple activities over the course of its life. This is most likely to occur in areas where military readiness activities are more concentrated (e.g., near naval ports, testing ranges, and routine activity locations) and in areas that individual fish frequent because it is within the animal's home range, migratory corridor, spawning or feeding area. However, as described in Appendix C, many fish that school, exhibit this behavior in nearshore, coastal waters. For example, juvenile and adult salmonids occur in their greatest densities in marine waters as they are migrating out of or into their natal estuaries. For Chinook and coho salmon, figures C.51 and C.52 in Appendix C show that these systems occur at least 20 miles from the NOCAL portion of the California Study Area. For steelhead, Figure C.53 in Appendix C shows that only the South Central California Coast DPS and the Southern California DPS have natal estuaries adjacent to the Study Area. Low population levels for these two DPSs have made it difficult to understand their distribution in the marine environment. However, adults may congregate in the nearshore environment waiting for seasonal storms to breach barriers to upstream migration (Crozier et al., 2019; Moyle et al., 2017). Except for in the few concentration areas mentioned above, combinations are unlikely to occur because activities are generally separated in space and time in such a way that it would be very unlikely that any individual fish would be exposed to stressors from multiple activities. However, animals with a home range intersecting an area of concentrated activity would have elevated exposure risks relative to animals that simply transit the area through a migratory corridor. Most of the military readiness activities occur over a small spatial scale relative to the entire Study Area, have few participants, and are of a short duration (on the order of a few hours or less).

Synergistic Stressors – Multiple stressors may also have synergistic effects. For example, fishes that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors via a decreased ability to detect and avoid threats. Fishes that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to entanglement and physical strike stressors via malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple stressors, the synergistic effects from the combination of stressors are difficult to predict in any meaningful way. Navy research and monitoring efforts include data collection through conducting long-term studies in areas of Navy activity, occurrence surveys over large geographic areas, biopsy of animals occurring in areas of Navy activity, and tagging studies where animals are exposed to Navy stressors. These efforts are intended to contribute to the overall understanding of what effects may be occurring to animals in these areas.

The combined effects of all stressors are consistent with a less than significant determination because (1) activities involving more than one stressor are generally short in duration, and (2) such activities are dispersed throughout the Study Area. Existing conditions would not change considerably under Alternative 1; therefore, no detectable effects on fish populations would occur with implementation of Alternative 1.

3.6.5 Endangered Species Act Determinations

Pursuant to the ESA, NMFS will be consulted on potential effects on ESA-listed fish species from military readiness activities, as required by section 7(a)(2) of the ESA. Determinations for each stressor on ESA-listed fish species is presented in Table 3.6-11.

Table 3.6-11: Fishes ESA Effect Determinations for Military Readiness Activities Under Alternative 1

Species		Acoustic Stressors						Explosive Stressors		Energy Stressors		Physical Disturbance and Strike Stressors				Entanglement Stressors		Ingestion Stressors	
	Overall Determination	Sonar & Other Transducers	Air Guns	Pile Driving	Vessel Noise	Aircraft Noise	Weapons Noise	In-Air Explosions	In-Water Explosions	In-Water Electromagnetic Devices	High Energy Lasers	Vessels & In-Water Devices	Military Expended Material	Seafloor Devices	Pile Driving	Wires & Cables	Decelerators/Parachutes	Military Expended Materials	Indirect Effects
ESA-Listed Species																			
Chinook salmon	MA	MA	N/A	N/A	MA	MA	MA	N/A	MA	MA	MA	MA	MA	MA	N/A	MA	MA	MA	MA
Coho salmon	MA	MA	N/A	N/A	MA	MA	MA	N/A	MA	MA	MA	MA	MA	MA	N/A	MA	MA	MA	MA
Steelhead	MA	MA	N/A	N/A	MA	MA	MA	N/A	MA	MA	MA	MA	MA	MA	N/A	MA	MA	MA	MA
Green sturgeon	MA	MA	N/A	N/A	MA	MA	MA	N/A	MA	MA	MA	MA	MA	MA	N/A	MA	MA	MA	MA
Eulachon	MA	MA	N/A	N/A	MA	MA	MA	N/A	MA	MA	MA	MA	MA	MA	N/A	MA	MA	MA	MA
Oceanic whitetip shark	MA	MA	N/A	N/A	MA	MA	MA	N/A	MA	MA	NE	MA	MA	MA	N/A	MA	MA	MA	MA
Scalloped hammerhead shark	MA	MA	N/A	N/A	MA	MA	MA	N/A	MA	MA	NE	MA	MA	MA	N/A	MA	MA	MA	MA
Giant manta ray	MA	MA	N/A	N/A	MA	MA	MA	N/A	MA	MA	NE	MA	MA	MA	N/A	MA	MA	MA	MA
Critical Habitat																			
Green sturgeon	MA	MA	N/A	N/A	MA	MA	MA	N/A	MA	MA	N/A	MA	MA	MA	N/A	MA	MA	MA	MA

Notes: MA = may affect; N/A = not applicable, activity related to the stressor does not occur during specified military readiness events (e.g., there are no testing activities that involve the use of pile driving);
The determinations for likelihood of adverse effects are pending consultation with the National Marine Fisheries Service.

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3.7 Marine Mammals

MARINE MAMMALS SYNOPSIS

Stressors on marine mammals that could result from the Proposed Action were considered, and the following conclusions have been reached for the Preferred Alternative (Alternative 1).

- Acoustics: Marine mammals may be exposed to multiple acoustic stressors, including sonars and other transducers (hereinafter called sonars), air guns, pile driving, vessel noise, aircraft noise, and weapons noise. The potential for exposure varies for each marine mammal population present in the Study Area. Exposures to sound-producing activities may cause auditory masking, physiological stress, or minor behavioral responses. Exposure to some sonars, air guns, and pile driving may also affect hearing (TTS or AINJ) and cause a range of behavioral reactions. The number of auditory and behavioral effects are estimated for each stock. Susceptibility to these effects differs among marine mammal auditory and behavioral groups. Although individual marine mammals would be affected, no adverse effects to marine mammal populations are anticipated. Therefore, activities that include the use of acoustics would result in less than significant effects.
- Explosives: The potential for exposure to explosives (in the water or near the water's surface) varies for each marine mammal population present in the Study Area. The impulsive, broadband sounds from explosions introduced into the marine environment may cause auditory effects (TTS or AINJ), auditory masking, physiological stress, and behavioral responses. Explosions in the water or near the water's surface present a risk to marine mammals located near the explosion, because the resulting shock waves can result in the injury or mortality of an animal. The number of auditory (TTS and AINJ), non-auditory injury and mortality, and behavioral effects are estimated for each stock. Susceptibility to these effects differs among marine mammal species and auditory groups. Although individual marine mammals would be affected, no adverse effects to marine mammal populations are anticipated. Therefore, activities that include the use of in-water explosives would result in less than significant effects.
- Energy: Based on the relatively weak strength of the electromagnetic field created by Navy activities, a marine mammal would have to be in close proximity for there to be any effect, and adverse effects on marine mammal migratory behaviors and navigational patterns are not anticipated. Potential adverse effects from high-energy lasers are not expected due to the automatic shut-off feature of the system. Adverse effects from and high-power microwave devices would only be possible for marine mammals directly struck by the microwave beam. Statistical probability analyses demonstrate with a high level of certainty that no marine mammals would be struck by a high-power microwave device. Energy stressors are temporary and localized in nature, limiting any potential interaction between the stressor and a marine mammal. Therefore, there would be no reasonably foreseeable adverse effects from energy stressors on marine mammals.
- Physical disturbance and strike: Historical data on Navy and USCG ship strike records demonstrate a low occurrence of interactions with marine mammals relative to the level of vessels use. Since vessel use will remain similar to vessel use over the past decade, the potential for striking a marine mammal remains similarly low. The probability of whale strikes by Navy and USCG vessels was calculated based on an analysis of past strike data and anticipated future training and testing vessel use at-sea. The results of the analysis indicate a non-zero probability

Results of the MEM strike probability analysis indicated a very low probability that a marine mammal would be struck by any MEM. Adverse effects to individuals or long-term consequences to marine mammal populations from physical disturbance and strike stressors associated with miliary readiness activities are not anticipated. The use of vessels and in-water devices and MEM during military readiness activities would have less than significant adverse effects on marine mammals. A vessel strike on an individual marine mammal would be considered a significant adverse effect on the individual even if the strike does not result in mortality. Nevertheless, the probability of a vessel strike remains low, and even if a strike were to occur the effects on the population would be less than significant.

- Entanglement: Physical characteristics of wires and cables, decelerators/parachutes, and nets and other obstacles, combined with the sparse distribution of these items throughout the Study Area indicate a very low potential for marine mammals to encounter and become entangled in them. The installation of seafloor cables during range sustainment and modernization activities would occur from slowly moving vessels over a brief period (several days) and under observation. Nets deployed during obstacle avoidance activities would be tethered to a vessel, monitored continuously, and retrieved immediately following the activity. Therefore, marine mammals are not likely to be exposed to entanglement stressors, and there would be no reasonably foreseeable adverse effects.
- Ingestion: Adverse effects from ingestion of MEM would be limited to the unlikely event that a marine mammal would be harmed by ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system. The likelihood that a marine mammal would encounter and subsequently ingest a military expended item residing in deep water on the seafloor is considered low. Large buoyant MEM (e.g., parachutes) that remain at the surface or in the water column before sinking to the seafloor have a greater potential to be encountered; however, ingestion of MEM that is dissimilar to prey is unlikely. Therefore, marine mammals are not likely to be exposed to ingestion stressors, and there would be no reasonably foreseeable adverse effects.

3.7.1 Introduction

The following sections describe marine mammal species and populations occurring in the Study Area and the analysis of potential adverse effects from the proposed military readiness activities on marine mammals.

3.7.2 Affected Environment

The affected environment provides the context for evaluating the effects of the proposed military readiness activities on marine mammals occurring in the Study Area. The affected environment includes training and testing activities previously analyzed in the 2018 HSTT EIS/OEIS and the 2022 PMSR EIS/OEIS. The potential effects on marine mammals from military readiness activities conducted in the NOCAL Range Complex have not previously been analyzed; however, the activities that occur there are same types of activities occurring in the SOCAL Range Complex and PMSR. Additionally, the species and stocks occurring in the NOCAL Range Complex are the same species and stocks that occur in the PMSR and HSTT Study Areas.

Information describing each marine mammal species and stock or DPS is presented in Section C.6 of Appendix C. The content of the section is focused on information necessary to support the analysis of adverse effects on marine mammals from the Proposed Action. A summary of the types of background information described in Section C.6 is shown in Table 3.7-1.

While all potential adverse effects from the Proposed Action are analyzed in this section, the primary quantitative analysis focuses on potential effects from acoustic stressors, explosive stressors, and ship strike.

Table 3.7-1: Information on Marine Mammals Presented in Appendix C

Appendix C Section C.6 Topic	Section Content Description
Status and Management	Includes Endangered Species Act (ESA) listing status and stock or Distinct Population Segment information. If applicable, information on critical habitat and recovery goals are described.
Habitat and Distribution	Includes a brief description of the habitat features a species associates with (e.g., seamounts, bathymetry, substrate type, temperature ranges, upwelling zones, sea grasses, kelp, rocky shoreline). Foraging habitat and behaviors are described to support a discussion of ingestion and entanglement stressors. Migratory routes and Biologically Important Areas are described in this section. Distribution is briefly discussed with details presented in the *U.S. Navy Marine Species Density Database Phase IV for the Hawaii-California Training and Testing Study Area* (U.S. Department of the Navy, 2024d).
Population Trends	Describes population abundance and trends, if data are available. The primary source of information is the National Marine Fisheries Service's marine mammal stock assessment reports (e.g., Carretta et al. (2023)). Unusual mortality events, if applicable, are discussed.
Population Threats	Describes natural and anthropogenic threats. For many marine mammal species, threats are similar and are discussed generally. For ESA-listed species, some quantitative information may be presented, if available in species' recovery plans.

3.7.2.1 Marine Mammals in the Study Area

There are 40 marine mammal species with known occurrence in the Study Area and an additional group of six Mesoplodont beaked whale species analyzed collectively within the California Study Area. Survey data are insufficient to estimate species-specific abundances and densities for those six species off California. The forty species include 7 mysticetes (baleen whales), 25 odontocetes (dolphins, porpoises, and toothed whales), 7 pinnipeds (seals, fur seals, and sea lions), and the southern sea otter. Among these species, there are multiple stocks and DPSs managed by NMFS in the U.S. EEZ, and one species, the southern sea otter, is managed by the USFWS.

These species, stocks, and DPSs are presented in Table 3.7-2 with an abundance estimate, an associated coefficient of variation (CV) value (if available) measuring uncertainty, and a minimum abundance estimate. The information is based mainly on the NMFS 2022 Stock Assessment Reports (SARs) (Carretta et al., 2023; Young, 2023) but does include recent information from the draft 2023 SARs for those species with updated reports (Carretta et al., 2024; Young, 2024). Out of the 40 species, 11 are listed under the ESA as either threatened or endangered, and 4 species are organized into DPSs, which identify discrete subpopulations that are particularly vulnerable and distinguishes them from more robust subpopulations not listed under the ESA.

Table 3.7-2: Marine Mammal Occurrence Within the Study Area

Common Name	***Scientific Name***	***Stock/DPS***	***Status***		***Occurrence in the Study Area***	***Seasonal Absence***	***Stock Abundance (CV)/Minimum Population***
			MMPA	***ESA***			
Blue whale	*Balaenoptera musculus*	Eastern North Pacific	Depleted	Endangered	California	-	1,898 (0.085)/ 1,767
		Central North Pacific	Depleted	Endangered	Hawaii	Summer	133 (1.09)/63
Bryde's whale	*Balaenoptera edeni*	Eastern Tropical Pacific	-	-	California	-	Unknown
		Hawaii	-	-	Hawaii	-	791 (0.29)/623
Fin whale	*Balaenoptera physalus*	California, Oregon, and Washington	Depleted	Endangered	California	-	11,065 (0.405)/7,970
		Hawaii	Depleted	Endangered	Hawaii	Summer	203 (0.99)/101
Gray whale	*Eschrichtius robustus*	Eastern North Pacific stock/DPS	-	-	California	-	29,960 (0.05)/25,849
		Western North Pacific stock/DPS	Depleted	Endangered	California	-	290 (271-311)/271
Humpback whale	*Megaptera novaeangliae*	Central America/ Southern Mexico - California-Oregon-Washington Stock[1]	Depleted	Endangered	California	-	1,496 (0.171)/ 1,284
		Mainland Mexico - California-Oregon-Washington Stock[1]	Depleted	Threatened	California	-	3,477 (0.101)/3,185
		Hawaii	-	-	Hawaii	Summer	11,278 (0.56)/7,265
Minke whale	*Balaenoptera acutorostrata*	California, Oregon, and Washington	-	-	California	-	915 (0.792)/509
		Hawaii	-	-	Hawaii	Summer	438 (1.05)/212
Sei whale	*Balaenoptera borealis*	Eastern North Pacific	Depleted	Endangered	California	-	864 (0.40)/625
		Hawaii	Depleted	Endangered	Hawaii	Summer	391 (0.90)/204

Table 3.7-2: Marine Mammal Occurrence Within the Study Area (continued)

Common Name	*Scientific Name*	*Stock/DPS*	*Status*		*Occurrence in the Study Area*	*Seasonal Absence*	*Stock Abundance (CV)/Minimum Population*
Sperm whale	*Physeter macrocephalus*	California, Oregon, and Washington	Depleted	Endangered	California	-	2,606 (0.135)/2,011
		Hawaii	Depleted	Endangered	Hawaii	-	5,707 (0.23)/4,486
Pygmy sperm whale	*Kogia breviceps*	California, Oregon, and Washington	-	-	California	-	4,111 (1.12)/1,924
		Hawaii	-	-	Hawaii	-	42,083 (0.64)/25,695
Dwarf sperm whale	*Kogia sima*	California, Oregon, and Washington	-	-	California	-	Unknown
		Hawaii	-	-	Hawaii	-	37,440 (0.78) but estimate considered outdated /20,593
Baird's beaked whale	*Berardius bairdii*	California, Oregon, and Washington	-	-	California	-	1,363 (0.533)/894
Blainville's beaked whale	*Mesoplodon densirostris*	Hawaii	-	-	Hawaii	-	1,132 (0.99)/564
Cuvier's (goose-) beaked whale[3]	*Ziphius cavirostris*	California, Oregon, and Washington	-	-	California	-	5,454 (0.27)/4,214
		Hawaii	-	-	Hawaii	-	4,431 (0.41)/3,180
Longman's beaked whale	*Indopacetus pacificus*	Hawaii	-	-	Hawaii	-	2,550 (0.67)/1,527
Mesoplodont beaked whales[4]	*Mesoplodon spp.*	California, Oregon, and Washington	-	-	California	-	3,044 (0.54)/1,967

Table 3.7-2: Marine Mammal Occurrence Within the Study Area (continued)

Common Name	*Scientific Name*	*Stock/DPS*	*Status*		*Occurrence in the Study Area*	*Seasonal Absence*	*Stock Abundance (CV)/Minimum Population*
Common Bottlenose dolphin	*Tursiops truncatus*	California Coastal	-	-	California	-	453 (0.06)/346
		California, Oregon, and Washington Offshore	-	-	California	-	3,477 (0.696)/2,048
		Hawaiian Pelagic	-	-	Hawaii	-	24,669 (0.57)/15,783
		Kauai and Niihau	-	-	Hawaii	-	112 (0.24)/92
		Oahu	-	-	Hawaii	-	112 (0.17)/97
		Maui Nui	-	-	Hawaii	-	64 (0.15)/56
		Hawaii Island	-	-	Hawaii	-	136 (0.43)/96
False killer whale	*Pseudorca crassidens*	Main Hawaiian Islands Insular stock/DPS	Depleted	Endangered	Hawaii	-	138 (0.08)/129
		Hawaii Pelagic	-	-	Hawaii	-	2,038 (0.35)/1,531
		Northwestern Hawaiian Islands	-	-	Hawaii	-	477 (1.71)/178
		Eastern Tropical Pacific[2,5]	-	-	California[9]	-	2,962 (0.71)[8]/NA
Fraser's dolphin	*Lagenodelphis hosei*	Hawaii	-	-	Hawaii	-	40,960 (0.70)/24,068
Killer whale	*Orcinus orca*	Eastern North Pacific Offshore	-	-	California	-	300 (0.10)/276
	Orcinus rectipinnus	Eastern North Pacific Transient/West Coast Transient	-	-	California	-	349 (0)/349
	Orcinus ater	Eastern North Pacific Southern Resident stock/DPS	Depleted	Endangered	California	Summer & Fall	73 (0)/73
	Orcinus orca	Hawaii	-	-	Hawaii	-	161 (1.06)/78
Long-beaked common dolphin	*Delphinus delphis bairdii*	California	-	-	California	-	83,379 (0.216)/ 69,636
Melon-headed whale	*Peponocephala electra*	Hawaiian Islands	-	-	Hawaii	-	40,647 (0.74)/23,301
		Kohala Resident	-	-	Hawaii	-	447 (0.12) but estimate considered outdated/NA

Table 3.7-2: Marine Mammal Occurrence Within the Study Area (continued)

Common Name	Scientific Name	Stock/DPS	Status		Occurrence in the Study Area	Seasonal Absence	Stock Abundance (CV)/Minimum Population
Northern right whale dolphin	*Lissodelphis borealis*	California, Oregon, & Washington	-	-	California	-	29,285 (0.717)/17,024
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	California, Oregon, & Washington	-	-	California	-	34,999 (0.222)/29,090
Pantropical spotted dolphin	*Stenella attenuata*	Oahu	-	-	Hawaii	-	Unknown
		Maui Nui	-	-	Hawaii	-	Unknown
		Hawaiian Island	-	-	Hawaii	-	Unknown
		Hawaii Pelagic	-	-	Hawaii	-	67,313 (0.67)/53,839
		Eastern Tropical Pacific[5]	-	-	California[9]	-	105,416 (0.46)[8]/NA
Pygmy killer whale	*Feresa attenuata*	Eastern Tropical Pacific[5]	-	-	California	Winter & Spring	229 (1.11)[10]/NA
		Hawaii	-	-	Hawaii	-	10,328 (0.75)/5,885
Risso's dolphins	*Grampus griseus*	California, Oregon, & Washington	-	-	California	-	6,336 (0.32)/4,817
		Hawaii	-	-	Hawaii	-	6,979 (0.29)/5,283
Rough-toothed dolphin	*Steno bredanensis*	Hawaii	-	-	Hawaii	-	83,915 (0.49)/5,6782
Short-beaked common dolphin	*Delphinus delphis delphis*	California, Oregon, and Washington	-	-	California	-	1,056,308 (0.207)/888,971
Short-finned pilot whale	*Globicephala macrorhynchus*	California, Oregon, & Washington	-	-	California	-	836 (0.79)/466
		Hawaii	-	-	Hawaii	-	19,242 (0.23)/15,894

Table 3.7-2: Marine Mammal Occurrence Within the Study Area (continued)

Common Name	*Scientific Name*	*Stock/DPS*	*Status*		*Occurrence in the Study Area*	*Seasonal Absence*	*Stock Abundance (CV)/Minimum Population*
Spinner dolphin	*Stenella longirostris*	Hawaii Pelagic	-	-	Hawaii	-	3,351 (0.74) but estimate considered outdated/ NA
		Hawaii Island	-	-	Hawaii	-	665 (0.09)/617
		Oahu and 4-Islands	-	-	Hawaii	-	355 (0.09) but estimate considered outdated/NA
		Kauai and Niihau	-	-	Hawaii	-	601 (0.20) but estimate considered outdated/NA
		Kure and Midway	-	-	Hawaii	-	260 (NA) but estimate considered outdated /NA
		Pearl and Hermes	-	-	Hawaii	-	Unknown
Striped dolphin	*Stenella coeruleoalba*	California, Oregon, and Washington	-	-	California	-	29,998 (0.299)/23,448
		Hawaii	-	-	Hawaii	-	64,343 (0.28)/51,055
Dall's porpoise	*Phocoenoides dalli*	California, Oregon, and Washington	-	-	California	-	16,498 (0.608)/10,286
Harbor Porpoise	*Phocoena phocoena*	Northern California-Southern Oregon	-	-	California	-	15,303 (0.575)/9,759
		San Francisco- Russian River	-	-	California	-	7,777 (0.620)/4,811
		Monterrey Bay	-	-	California	-	3,760 (0.561)/2,421
		Morro Bay	-	-	California	-	4,191 (0.561)/2,698
Harbor seal	*Phoca vitulina*	California	-	-	California	-	30,968 (0.157)/27,348
Hawaiian monk seal	*Neomonachus schauinslandi*	N/A	Depleted	Endangered	Hawaii	-	1,564 (0.05)/1,444
Northern elephant seal	*Mirounga angustirostris*	California Breeding	-	-	California	-	187,386 (161,876–214,418)/85,369
California sea lion	*Zalophus californianus*	U.S.	-	-	California	-	257,606 (233,515—273,211)/233,515

Table 3.7-2: Marine Mammal Occurrence Within the Study Area (continued)

Common Name	*Scientific Name*	*Stock/DPS*	*Status*		*Occurrence in the Study Area*	*Seasonal Absence*	*Stock Abundance (CV)/Minimum Population*
Stellar sea lion	*Eumetopias jubatus*	Eastern[6]	-	-	California	Summer	Unknown/36,308
Guadalupe fur seal[7]	*Arctocephalus townsendi*	N/A	Depleted	Threatened	California	-	48,780 (NA)/37,940
Northern fur seal	*Callorhinus ursinus*	California	-	-	California	-	14,050 (NA)/7,524
		Eastern Pacific	Depleted	-	California	Summer	626,618 (0.2)/530,376
Southern sea otter	*Enhydra lutris nereis*	N/A	Depleted	Threatened[11]	California	-	2,962 (NA)/2,962

Note: Unless otherwise noted, abundance estimates are from the Final 2022 or Draft 2023 Pacific stock assessment reports (Carretta et al., 2024; Carretta et al., 2023), the draft 2023 Pacific stock assessment report (Carretta et al., 2024), or the Alaska stock assessment reports (Young, 2024). NA = Not Applicable

[1]Humpback whales in the Central America/Southern Mexico - California-Oregon-Washington Stock make up the endangered Central America DPS, and humpback whales in the Mainland Mexico - California-Oregon-Washington Stock are part of the threatened Mexico DPS, along with whales from the Mexico-North Pacific Stock, which do not occur in the Study Area.

[2]Abundance estimate is from Wade and Gerrodette (1993) derived specifically for waters off Southern California.

[3]The species *Ziphius cavirostris* is known by two common names: Cuvier's beaked-whale and goose-beaked whale.

[4]Mesoplodont beaked whales are analyzed as a group in the California Study Area due to insufficient data available to estimate species-specific densities. The six species known to occur in the California Study Area are: Blainville's beaked whale (*M. densirostris*), Perrin's beaked whale (*M. perrini*), Lesser beaked whale (M. *peruvianus*), Stejneger's beaked whale (*M. stejnegeri*), Gingko-toothed beaked whale (*M. gingkodens*), and Hubbs' beaked whale (*M. carlhubbsi*).

[5]The Eastern Tropical Pacific populations of false killer whale, pantropical spotted dolphin, and pygmy killer whales are not recognized stocks in NMFS Pacific stock assessment report (Carretta et al., 2024), but separate density estimates were derived to support the Navy's analysis.

[6]The Alaska SARs (Young, 2024, 2023) do not provide an abundance estimate for the Eastern stock of Steller sea lions. However, the 2022 pup count for only the U.S. portion of the Eastern stock was 10,667 and the non-pup count was 26,158 for a total of 36,308 sea lions. The counts do not include sea lions at sea and therefore are not an accurate estimate of abundance but can be considered the minimum abundance.

[7]Unpublished abundance estimate for Guadalupe fur seal provided by Norris (2022).

[8]Abundance estimate is from Ferguson and Barlow (2003), derived specifically for waters off the Baja California Peninsula, Mexico.

[9]Regular occurrence is only expected in waters off the Baja California Peninsula, Mexico.

[10]Abundance estimate for pygmy killer whale is from Barlow (2016) derived specifically for waters off Southern California.

[11]Refer to Appendix C for information on the exempted status under the ESA of the subpopulation of southern sea otter at SNI.

3.7.2.2 Critical Habitat in the Study Area

Critical habitat has been designated for four ESA-listed marine mammal species in the Study Area: Humpback whale Central America and Mexico DPSs, Southern Resident killer whale DPS, main Hawaiian Islands (MHI) insular false killer whale, and Hawaiian monk seal. A description of the essential features defining critical habitat for each species and maps showing where the critical habitat occurs in relation to the Study Area is presented in Appendix C.

3.7.2.3 Biologically Important Areas in the Study Area

Biologically Important Areas (BIAs) for specific marine mammal behaviors have been identified in the Study Area for several species in both Hawaii and California waters (Calambokidis et al., 2024; Kratofil et al., 2023). Table 3.7-3 lists the species with BIAs identified in the Study Area and the specific behavior for which the BIA is defined. A more detailed description of each BIA is provided in Appendix C along with a map showing the extent of the BIA in relation to the Study Area and the timeframe during the year when the BIA is relevant.

Table 3.7-3: Biologically Important Areas Identified in the HCTT Study Area

Species	BIA Behavior	Location	Timeframe
California Study Area			
Blue Whale	Feeding (Parent & Core)	West Coast	June–November
Humpback Whale	Feeding (Parent & Core)	West Coast	March–November
Fin Whale	Feeding (Parent & Core)	West Coast	June–November
Gray Whale (Eastern North Pacific)	Feeding (Parent & Core)	Pacific Feeding Group	June–November
	Migratory (Parent)	West Coast to Gulf of Alaska	November–June
	Migratory (Child)	West Coast (Southbound)	November–February
	Migratory (Child)	West Coast (Northbound Phase A)	January–May
	Migratory (Child)	West Coast (Northbound Phase B)	March–May
	Reproductive	West Coast (Northbound Phase B)	March–May
Killer Whale	Small and Resident (Parent & Core)	West Coast	Year-round
Harbor Porpoise	Small and Resident	Morro Bay and Monterey Bay	Year-round
Hawaii Study Area			
Rough-toothed dolphin	Small and Resident (Parent & Child)	Kauai/Niihau-Oahu	Year-round
	Small and Resident	Maui Nui-Hawaii Island	Year-round

Table 3.7-3: Biologically Important Areas Identified in the HCTT Study Area

Species	BIA Behavior	Location	Timeframe
Common Bottlenose Dolphin	Small and Resident	Hawaii island	Year-round
	Small and Resident (Parent & Child a, b, & c)	Kauai/Niihau-Oahu-Maui Nui	
Pantropical Spotted Dolphin	Small and Resident (Parent & Child a, b, & c)	Oahu-Maui Nui-Hawaii Island	Year-round
Spinner Dolphin	Small and Resident	Hawaii island	Year-round
		Kauai and Niihau	Year-round
		Kuaihelani/Hōlanikū (Midway/Kure Atolls)	Year-round
		Manawai (Pearl and Hermes Reef)	Year-round
		Oahu and Maui Nui	Year-round
Pygmy Killer Whale	Small and Resident	Hawaii island	Year-round
Melon-Headed Whale	Small and Resident	Kohala Residents - Hawaii Island	Year-round
False Killer Whale	Small and Resident Parent & Child)	Main Hawaiian Islands Insular Stock	Year-round
	Small and Resident	Northwestern Hawaiian Islands Insular Stock	Year-round
Short-Finned Pilot Whale	Small and Resident (Parent & Child a, b, & c)	Main Hawaiian Islands	Year-round
Dwarf Sperm Whale	Small and Resident (Parent & Child)	Hawaii island	Year-round
Cuvier's (Goose-) Beaked Whale	Small and Resident (Parent & Child)	Hawaii island	Year-round
Blainville's Beaked Whale (Parent and Child)	Small and Resident	Oahu-Maui Nui-Hawaii Island	Year-round
Humpback Whale	Reproductive (Parent & Child)	Main Hawaiian Islands	December–May

Note: A core BIA is defined as a core area of use. A child BIA does not represent a core area of use but rather a phase-specific important area (Calambokidis et al., 2024).

3.7.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, baseline conditions of the existing environment for marine mammals would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section evaluates how, and to what degree, the activities and stressors described in Chapter 2 and Section 3.0.3.3 potentially affect marine mammals within the Study Area. The proposed military readiness activities and the locations where they would take place in the Study Area are presented in a series of tables in Chapter 2 for both Alternatives 1 and 2 and described in greater detail in Appendix A.

A review of changes in regulatory status and scientific information since 2018 that could alter the results of the stressor-based analysis presented in the 2018 HSTT and 2022 PMSR EIS/OEISs was conducted. The same stressor-based analysis was used in the analysis of adverse effects from the Proposed Action, and for most stressors, the adverse effects were generally similar to the previous analyses. The most substantive differences between the results of the previous analyses and the results from the analysis of the Proposed Action were from acoustic, explosives, and physical disturbance and strike stressors. New research on the affected environment and how marine mammals respond to underwater sound prompted the reanalysis of adverse effects from acoustic and explosives stressors. Vessel strikes off California by naval vessels since 2018 resulted in the reinitiation of consultations with NMFS and a reanalysis of the probability of vessels strikes in the Study Area.

The stressors on marine mammals listed below would vary in intensity, frequency, duration, and location within the Study Area coincident with the varying characteristics and locations of activities conducted in the Study Area (see above referenced tables in Chapter 2). General characteristics of all stressors were introduced in Section 3.0.3.3, and living resources' general susceptibilities to stressors are discussed in Appendix F, Section F.1. The stressors analyzed with updated information and data for marine mammals are:

- **acoustic** (sonar and other transducers; air guns; pile driving; vessel noise; aircraft noise; and weapons noise)
- **explosives** (explosions in-water)
- **physical disturbance and strike** (vessels and in-water devices; MEM; seafloor devices; pile driving)
- **secondary** (adverse effects on habitat; adverse effects on prey availability)
- **combined** (adverse effects from all stressors)

The analyses for these stressors and sub-stressors are derived from the 2018 HSTT and 2022 PMSR EIS/OEISs and updated as appropriate for changes to the Proposed Action.

The analyses for the following stressors (i.e., energy, entanglement, and ingestion) and any associated sub-stressors are also derived from the 2018 HSTT and 2022 PMSR EIS/OEISs and were reevaluated for the Proposed Action. A summary of these stressors and their potential adverse effects is provided in this section, but a complete reanalysis under each alternative was deemed unnecessary.

- **energy** (in-water electromagnetic devices; high-energy lasers; high-power microwave devices)
- **entanglement** (decelerators/parachutes; wires and cables)
- **ingestion** (MEM–munitions; MEM other than munitions)

Energy, entanglement, and ingestion stressors have been analyzed by the Navy since 2001 in multiple study areas across the Pacific and Atlantic, and the analysis has repeatedly and consistently concluded that there would be no significant adverse effects from these stressors on marine mammals. Regulations and authorizations issued pursuant to the MMPA by NMFS, Biological Opinions from NMFS and findings from the USFWS issued pursuant to the ESA, and the review of applicable best available since those analyses were conducted have continued to support those conclusions. The Navy and NMFS have repeatedly determined in previous analyses pursuant to the MMPA spanning more than a decade that these stressors are not likely to result in incidental takes of marine mammals as defined by the MMPA and are likely to have only discountable, less than significant, or negligible effects on ESA-listed marine mammals (National Oceanic and Atmospheric Administration, 2022; U.S. Department of the Navy, 2002, 2008, 2010a, 2010b, 2012, 2013a, 2013b, 2013c, 2013d, 2014, 2018, 2021b, 2022c).

The Navy's analysis and conclusions for the 2018 HSTT and 2022 PMSR EIS/OEISs (U.S. Department of the Navy, 2018, 2022c), which comprise the majority of the HCTT Study Area, were found by NMFS to be complete and supportable. NMFS also determined that ESA-listed marine mammals in the HSTT Study Area and PMSR Study Area were not likely to be adversely affected by these same stressors (National Marine Fisheries Service, 2018, 2022).

There are no substantive differences in the way military readiness activities with these stressors are conducted in the HSTT Study Area or the PMSR Study Area compared to how they would be conducted under the Proposed Action in the HCTT Study Area. While the HCTT Study Area would be expanded off California compared to the size of the California portion of the HSTT Study Area, a large part of that expansion is the inclusion of the PMSR, and, as noted above, the analysis of effects on marine mammals from energy, entanglement, and ingestion stressors due to activities in the PMSR concluded that there would be no reasonably foreseeable adverse effects on marine mammals. Fewer activities potentially effecting marine mammals are conducted in the NOCAL Range Complex and the airspace extensions W-293 and W-294 compared with the level of activity in the PMSR and SOCAL Range Complex, so the potential for adverse effects is lower from activities in those areas, which are predominantly used for aircraft activities. In addition, all marine mammal species occurring in the HCTT Study Area were previously analyzed in either or both the 2018 HSTT and 2022 PMSR EIS/OEISs (U.S. Department of the Navy, 2018, 2022c).

As stated in Section 3.0.2, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in 40 CFR 1501.3(d). The same conclusions reached repeatedly over the last decade by the Navy and NMFS regarding energy, entanglement, and ingestion stressors found that there were no reasonably foreseeable adverse effects on the human environment from those stressors. Therefore, only acoustic, explosives, and physical disturbance and strike stressors, would have a reasonably foreseeable adverse effect, thus requiring further analysis in this section and a significance determination.

A stressor is considered to have a significant effect on the human environment based on an examination of the context of the action and the intensity of the effect. Regarding marine mammals, the effects of acoustic, explosives, and physical disturbance and strike stressors would be considered significant if the effects have short-term or long-term changes well outside the limits of natural variability in terms of space and the species' ability to meet nutritional, physiological, or reproductive requirements within the Study Area. A significant effect finding would be appropriate if a marine mammal species would be adversely affected over the long term or permanently such that the population in the Study Area would no longer be sustainable.

In this analysis, marine mammal species may be grouped together based on similar biology (e.g., hearing sensitivity) or behaviors (e.g., feeding or expected reaction to stressors) when most appropriate for the analysis. For some stressors, species are grouped based on their taxonomic relationship and discussed as follows: mysticetes (baleen whales), odontocetes (toothed whales, dolphins, and porpoises), pinnipeds (seals, fur seals, and sea lions), and the southern sea otter. When adverse effects are expected to be similar for all species or when it is determined there would be no adverse effect on any species, the discussion will be general and not species-specific. However, when adverse effects are not the same to certain species or groups of species, the discussion will be as specific as the best available science allow. In addition, if military readiness activities only occur in or will be concentrated in certain areas, the discussion will be geographically focused. Based on acoustic thresholds and criteria developed with NMFS, adverse effects from sound sources as acoustic and explosive stressors will be quantified at the species or stock level as is required pursuant to authorization under the MMPA.

3.7.3.1 Mitigation Summary

The analysis considers standard operating procedures and mitigation measures that would be implemented under Alternative 1 and Alternative 2 of the Proposed Action.

Mitigation measures are specifically applicable to activities with explosives, acoustic, and physical disturbance and strike stressors as summarized in Table 3.7-4, along with standard operating procedures, and discussed in detail in Chapter 5. The development of geographic mitigation measures are discussed in detail in Appendix K.

Table 3.7-4: Summary of Standard Operating Procedures and Mitigation for Marine Mammals

Applicable Stressor	Requirements Summary and Protection Focus	Section Reference
Explosives	The Action Proponents will not detonate any in-water explosives within a horizontal distance of 350 yd from shallow-water coral reefs and precious coral beds.	Section 5.7.1 (Shallow-Water Coral Reef and Precious Coral Bed Mitigation Areas)[1]
	The Action Proponents will not detonate any in-water explosives within a horizontal distance of 350 yd from artificial reefs, biogenic habitat, and shipwrecks, except in designated locations where these resources will be avoided to the maximum extent practical.	Section 5.7.2 (Artificial Reef, Hard Bottom Substrate, and Shipwreck Mitigation Areas)[1]
	The Action Proponents will conduct visual observations for large schools of fish during events with the largest net explosive weights involving explosive torpedoes and ship shock trials.	Section 5.6 (Activity-based Mitigation)[2]
	The Action Proponents will not deploy non-explosive ordnance against surface targets too close to shallow-water coral reefs	Section 5.7.1 (Shallow-Water Coral Reef and Precious Coral Bed Mitigation Areas)[1]
	The Action Proponents will not place non-explosive seafloor devices directly on artificial reefs, biogenic hard bottom, submerged aquatic vegetation, or shipwrecks	Section 5.7.2 (Artificial Reef, Hard Bottom Substrate, and Shipwreck Mitigation Areas)[1]
	Conduct visual observations for events involving 10 explosive mitigation categories.	Section 5.6 (Activity-based Mitigation)

Table 3.7-4: Summary of Standard Operating Procedures and Mitigation for Marine Mammals (continued)

Applicable Stressor	Requirements Summary and Protection Focus	Section Reference
Explosives (continued)	Restrictions on use of explosive stressors within mitigation areas, marine mammal foraging, reproduction, migration, and critical habitat.	Section 5.7.3 (Hawaii Island Marine Mammal Mitigation Area) Section 5.7.4 (Hawaii 4-Islands Marine Mammal Mitigation Area) Section 5.7.6 (Hawaii Humpback Whale Awareness Messages) Section 5.7.9 (Southern California Blue Whale Mitigation Area) Section 5.7.10 (California Large Whale Awareness Messages)
Acoustics	Conduct visual observations for events involving active acoustic sources, air guns, pile driving, and weapons firing noise.	Section 5.6 (Activity-based Mitigation)
	Restrictions on use of active acoustic stressors within mitigation areas, marine mammal foraging, reproduction, migration, and critical habitat.	Section 5.7.3 (Hawaii Island Marine Mammal Mitigation Area) Section 5.7.4 (Hawaii 4-Islands Marine Mammal Mitigation Area) Section 5.7.5 (Hawaii Humpback Whale Special Reporting Mitigation Area) Section 5.7.6 (Hawaii Humpback Whale Awareness Messages) Section 5.7.8 (Central California Large Whale Mitigation Area) Section 5.7.9 (Southern California Blue Whale Mitigation Area) Section 5.7.9 (California Large Whale Awareness Messages)
Physical disturbance and strike	The Action Proponents will not 1. set vessel anchors within an anchor swing circle radius that overlaps shallow-water coral reefs (except in designated anchorages) 2. place other seafloor devices too close to shallow-water coral reefs	Section 5.7.1 (Shallow-Water Coral Reef and Precious Coral Bed Mitigation Areas)[1]
	The Action Proponents will not 1. set vessel anchors within an anchor swing circle radius that overlaps artificial reefs, biogenic hard bottom, submerged aquatic vegetation, and shipwrecks (except in designated anchorages) 2. place other seafloor devices (that are not precisely placed) too close to artificial reefs, biogenic hard bottom, submerged aquatic vegetation, and shipwrecks (except for vessel anchors, precisely placed seafloor devices, and as described in Section 5.7.2, Table 5-8)	Section 5.7.2 (Artificial Reef, Hard Bottom Substrate, and Shipwreck Mitigation Areas)[1]
	Conduct visual observations for events involving 8 mitigation categories.	Section 5.6 (Activity-based Mitigation)

Table 3.7-4: Summary of Standard Operating Procedures and Mitigation for Marine Mammals (continued)

Applicable Stressor	Requirements Summary and Protection Focus	Section Reference
Physical disturbance and strike (continued)	Restrictions on use of physical disturbance and strike stressors within mitigation areas for marine mammal foraging, reproduction, and migration, and critical habitat.	Section 5.7.6 (Hawaii Humpback Whale Awareness Messages) Section 5.7.10 (California Large Whale Awareness Messages) Section 5.7.11 (California Real-Time Notification Large Whale Mitigation Area)
In-air missile or air vehicle launch noise	Restrictions on launch noise (e.g., seasonal scheduling and annual caps) and physical disturbance to pinnipeds hauled out on beaches.	Section 5.7.12 (San Nicholas Island Pinniped Haulout Mitigation Area)

[1]The mitigation was developed to protect specific habitats, which also protects fish that are associated with those habitats.
[2]The mitigation was developed to protect possible indicators of marine mammal presence, which includes large schools of fish.

3.7.3.2 Acoustic Stressors

This section summarizes the potential adverse effects of acoustic stressors used during military readiness activities within the Study Area. The acoustic sub-stressors included for analysis are (1) sonar and other transducers (hereafter referred to as sonars), (2) air guns, (3) pile driving, (4) vessel noise, (5) aircraft noise, and (6) weapons noise. Table 3.7-5 contains brief summaries of background information relevant to the analyses of adverse effects for each acoustic sub-stressor. Detailed information on acoustic terminology used in this analysis and acoustic effects categories in general, as well as a summary of best available science on effects to marine mammals specific to each sub-stressor, are provided in Appendix D.

Due to updated criteria and thresholds used to assess auditory and behavioral effects; densities (animals per unit area); and acoustic effects modeling, as well as changes to the proposed use of certain acoustic sub-stressors, the quantitative analyses of effects due to sonars, air guns, and pile driving in this section supplant the quantitative analyses in the 2018 HSTT EIS/OEIS. The detailed assessment of these acoustic stressors under this Proposed Action is in Appendix E.

In addition to changes in the Proposed Action, changes in the predicted acoustic effects due to sonars, air guns, and pile driving are due to the following:

- Improvements to criteria used to determine if exposures to acoustic stressors may cause auditory effects and behavioral responses. Changes to the auditory effects criteria include changes to some hearing group divisions and names. The Low Frequency (LF) cetacean group containing mysticete cetaceans was split into two auditory groups: Very Low Frequency (VLF) cetaceans and LF cetaceans. The group previously called the Mid-frequency (MF) cetaceans (most odontocetes) is now called the High Frequency (HF) cetaceans. The group previously called the HF cetaceans (harbor porpoises and *kogia* species) is now called the Very High Frequency (VHF) cetaceans. For non-impulsive sounds like sonars, the HF cetacean, Phocid in

Water (PCW), and Otariid in Water (OCW) groups have increased susceptibility to auditory effects; the VHF cetaceans have decreased susceptibility to auditory effects; and the new LF group is more susceptible to effects at higher frequencies than the VLF group. For impulsive sounds like air guns and impact pile driving, HF cetaceans are more susceptible to auditory effects, especially at low to mid-frequencies, where most explosive energy is concentrated. Peak pressure thresholds increased for VLF and LF cetaceans (mysticetes) and decreased for PCW. For behavioral response criteria, the behavioral response functions for sonars were revised to include experimental behavioral response data available since the prior analysis. Beaked whales and harbor porpoises were placed in a new Sensitive behavioral group with an associated behavioral response function. The cut-off conditions for the behavioral response functions were also revised. A summary of these changes is in Appendix E. For additional details see the technical report *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase IV)* (U.S. Department of the Navy, 2024a).

- Revisions to the modeling of acoustic effects due to sonars and air guns in the Navy Acoustic Effects Model, including incorporation of a new sonar avoidance model. A summary of these changes is in Appendix E. For additional details see the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (U.S. Department of the Navy, 2024c).
- Updates to data on marine mammal presence, including estimated density of each species or stock (number of animals per unit area), group size, and depth distribution. For additional details see the technical reports *U.S. Navy Marine Species Density Database Phase IV for the Hawaii-California Training and Testing Study Area* (U.S. Department of the Navy, 2024d) and *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii- California Training and Testing Study Areas* (U.S. Department of the Navy, 2024b).
- Changes in how mitigation is considered in reducing predicted effects. The number of model-predicted auditory injuries are not reduced due to activity-based mitigation, unlike in prior analyses.

As discussed in Chapter 5, the Action Proponents will implement activity-based mitigation under Alternative 1 and Alternative 2 to reduce potential adverse effects from acoustic stressors on marine mammals. The Action Proponents will also implement geographic mitigation to reduce potential acoustic effects within important marine mammal habitats as identified in the geographic mitigation section of Chapter 5.

Table 3.7-5: Acoustic Stressors Information Summary

Sub-Stressor	Summary
Sonar and other transducers	Sonar and other transducers may result in hearing loss, masking, physiological stress, or behavioral reactions. Behavioral responses can depend on the characteristics of the signal, behavioral state of the animal, sensitivity and previous experience of an individual, and other contextual factors including distance of the source, movement of the source, physical presence of vessels, time of year, and geographic location. Different groups of marine mammals may respond in different ways to sonar and other transducers: • Mysticetes: Mysticetes are in the Low Frequency (LF) hearing group. LF and mid-frequency active sonar may cause masking, behavioral responses, and adverse auditory effects. Mysticetes are less like to be affected by high frequency sonars, and very high frequency sonars are outside of their hearing range. Mysticetes are more adaptive while migrating, while sonar could have a greater effect to whale behavior on seasonal foraging and breeding grounds. Little is known about possible physiological stress responses. • Odontocetes: Odontocetes are in the High Frequency (HF) and Very High Frequency (VHF) hearing groups. Active sonars may result in masking, behavioral responses, noise-induced vocal modification, and adverse auditory effects. Mid-frequency active and high-frequency active sonars are more likely to result in masking and adverse auditory effects than other sonars. Harbor porpoises and beaked whales are more sensitive to disturbance than other odontocetes. • Pinnipeds: Pinnipeds are in two hearing groups: the phocid carnivores in water and in air (PCW and PCA: true seals) and otariid carnivores and other non-phocid marine carnivores in water and air (OCW and OCA: sea lions, fur seals, walruses, sea otters, polar bears). Compared to LF active sonars, mid-frequency and HF active sonars are more likely to result in hearing loss. In addition, mid-frequency active sonar could mask underwater vocalizations. VHF active sonars are outside of the hearing range of pinnipeds and other marine carnivores. Pinnipeds are most likely to respond to nearby or approaching sonar, although reactions to sonar, pingers or seal scarers have been reported. • Sea otter: Sea otters are in the otariid hearing group. Mid-frequency and HF active sonar may result in hearing loss and masking; however, sea otters spend considerable time resting and feeding at the water’s surface with their heads above water. Little information is available on sea otter responses to sonars and other transducers.

Table 3.7-5: Acoustic Stressors Information Summary (continued)

Sub-Stressor	Summary
Vessel noise	Vessel noise may result in masking, physiological stress, or behavioral reactions. Behavioral responses to vessels can be caused by multiple factors. Vessel sound exposure is rarely decoupled from the physical presence of a surface vessel. In some more industrialized or populated areas, vessel noise is a chronic and frequent stressor. Different groups of marine mammals may respond in different ways to vessels disturbance. • Mysticetes: Vocalizations are likely to be masked or otherwise affected (noise-induced vocal modification) by vessel noise, resulting in decreased communication space. Responses to vessel noise is varied and include not responding at all to approaching vessels, as well as both horizontal (swimming away) and vertical (increased diving) avoidance. • Odontocetes: Communication calls are more likely to be masked by vessel noise than echolocation, but masking of echolocation is possible. Responses to vessel noise includes both attraction (e.g., bowriding) and avoidance behaviors by more sensitive species (e.g., Kogia whales and beaked whales) or individuals. Many noise-induced vocal modifications and short-term response to boat traffic have been documented. • Pinnipeds: Underwater vocalizations may be masked by vessel noise. Responses to vessel noise is varied and include avoidance, alerting, and reduced time feeding, resting, or nursing. Others demonstrate in-water attraction or a lack of significant reaction when hauled out, suggesting habituation to or tolerance of vessels. • Sea otters: Sea otters occur close to shore in habitat typically less than 50 m in depth and often adjacent to kelp beds. Large military vessels would not occur in these areas. Smaller boats approaching rafting sea otters may cause them to dive, interrupting feeding or resting behaviors. Visual cues from an approaching vessel may also cause a similar response. Avoidance by sea otters or a lack of response is more likely when vessels are moving more slowly.
Aircraft noise	Aircraft noise may result in masking, physiological stress, or behavioral reactions. Aircraft sound exposure is rarely decoupled from the physical presence of an aircraft. Different groups of marine mammals may respond in different ways to aircraft noise. • Mysticetes: Typically whales either ignore or occasionally dive in response to aircraft overflights. Some whales may avoid helicopters or fixed-wing aircraft, but UAVs have not produced responses in any mysticete species. • Odontocetes: Responses to aircraft noise is varied, but overall little change in behavior has been observed. Some odontocetes will fluke, flipper slap or avoid the noise source, particularly sensitive species like beaked whales or Kogia whales. Although for deep-diving species not frequently at the surface (beaked whales), adverse effects would be less expected. Helicopters may elicit a greater reaction in odontocetes, but do not appear responsive to smaller UAVs except at low altitudes. • Pinnipeds: Responses are dependent on aircraft variables (e.g., altitude, distance, noise abruptness), and pinniped life cycle stage (e.g., breeding and molting). Pinnipeds may be more responsive to UAVs at low altitudes since they could resemble predatory birds, but have generally the same possible reactions to all type of aircraft. They may startle, orient towards the sound source, increase vigilance, or briefly re-enter the water, but are generally unresponsive to crewed overflights and typically remain hauled out or immediately return to their haul out location. • Sea Otters: Sea otters spend most of their time on the surface of the water and will most likely be exposed to aircraft noise. They may flush into the water and dive below the surface to avoid aircraft noise or remain unresponsive as dive behaviors are very energetically costly to sea otters. Helicopter noise does not seem to affect sea otter foraging success or daily activity patterns, and no adverse effects have been reported for a colony of sea otters near a Naval landing field at San Nicolas Island.

Table 3.7-5: Acoustic Stressors Information Summary (continued)

Sub-Stressor	Summary
Impulsive noise (includes air guns, pile driving, and weapons noise)	Impulsive noise may result in hearing loss, masking, physiological stress, or behavioral reaction. The intermittent nature of most impulsive sounds would result in very limited probability of any masking effects. Due to the rapid rise time and higher instantaneous peak pressure of impulsive noise, nearby noise is more likely to cause startle or avoidance responses. Different groups of marine mammals may respond in different ways to impulsive noise: • Mysticetes: LF species are likely affected since low frequency explosive noise propagates long distances and overlaps with the range of best hearing for mysticetes. They have shown a variety of responses to impulsive noise, including avoidance, habitat displacement, reduced surface intervals, altered swimming behavior, and changes in vocalization rates. • Odontocetes: Impulsive noise can result in hearing loss for VHF and HF odontocetes, with the VHF group exhibiting greater sensitivity. Masking effects are possible but release from masking during the silent period between sounds is likely. Most odontocetes are behaviorally less sensitive to impulsive noise than mysticetes, with responses occurring at much closer distances, with the exception of harbor porpoises that avoid both stationary and moving impulsive sources. • Pinnipeds: Pinnipeds may experience hearing effects from underwater and in-air noises. Pinnipeds are among the least behaviorally sensitive taxonomic group in the Study Area and are only likely to respond to loud impulsive noises at close ranges by startling, jumping into the water when hauled out, or ceasing foraging (in the water), but only for brief periods before returning to their previous behavior. • Behavioral responses from hauled-out pinnipeds on SNI due to noise from land-based missile or air vehicle launches have been documented and are likely to continue. Responses observed at SNI have included flushing into the water, moving down the beach, alert reactions, or no reaction, largely dependent on species. • Behavioral responses from Hawaiian monk seals at PMRF may occur from air vehicle and missile launches and artillery firing from land-based sites. No AINJ or TTS effects on hauled out monk seals are anticipated. Like pinnipeds on SNI, behavioral responses could include an alert response (lifting the head), moving on the beach, flushing into the water, or no response. • Sea Otters: Like pinnipeds, sea otters show little if any response to noise. Sea otters require long periods of undisturbed rest to counterbalance the high metabolic costs of their foraging strategy. Responses to underwater noises may also be reduced since sea otters spend most of their time on the surface and have less hearing sensitivity underwater compared to pinnipeds. If responsive, otters may raise their heads, focus attention on the sound source, swim away, or startle dive.

Notes: OCA = other marine carnivores in air, OCW = other marine carnivores in Water, PCA = phocid carnivores in air, PCW = phocid carnivores in water, UAV = unmanned aerial vehicle, TTS = temporary threshold shift, AINJ = auditory injury, SNI = San Nicolas Island

3.7.3.2.1 Effects from Sonars and Other Transducers

Table 3.7-5 contains a summary of the background information used to analyze the potential effects of sonars and other transducers (hereinafter inclusively referred to as sonars) on marine mammals. Other transducers include items such as acoustic projectors and countermeasure devices. As discussed, in Section 3.0.3.3.1, a detailed comparison of sonar quantities analyzed in the 2018 HSTT EIS/OEIS with sonar quantities under this Proposed Action is not feasible due to changes in the source binning process.

The below information briefly summarizes information relevant to the assessment of the effects of sonars on marine mammals under the Proposed Action. A more extensive assessment of the effects on marine mammals due to exposure to sonars under this Proposed Action is in Appendix E.

Sonars have the potential to affect marine mammals by causing auditory injuries, TTS, masking, non-injurious physiological responses (such as stress), or behavioral reactions. Low- (less than 1 kHz), mid- (1 to 10 kHz) frequency sonars, and some high (10 to 100 kHz) frequency sonars are within hearing range of all marine mammals. Additionally, all high- and very high-frequency (100 to 200 kHz) sonars are in the hearing range of all odontocetes (HF and VLF hearing groups).

Sonars with higher source levels, longer durations, higher duty cycles, and frequencies near the best range of hearing are more likely to affect hearing. Due to their high source levels and low transmission loss (compared to higher frequency sources), anti-submarine warfare sonar sources, including hull-mounted sonar (MF1) and high duty cycle hull-mounted sonar (MF1C), have large zones of effects. The ranges to auditory effects for MF1, MF1C, and other selected sonars are in in Appendix E.

In general, the estimated number of predicted auditory effects have increased since the 2018 HSTT EIS/OEIS. While some increases may be attributable to changes in the Proposed Action and increase in action areas (e.g., inclusion of NOCAL Range Complex), many increases are due to changes in methodologies used to model effects that are listed in Section 3.7.3.1. Notably, the updated criteria for the HF cetacean auditory group, which includes delphinids and most other odontocetes, and the PCW auditory group indicate increased susceptibility to auditory effects at low and mid-frequencies compared to the prior auditory criteria. Consequently, predicted auditory effects due to most anti-submarine warfare sonars are substantially higher for these groups than in prior analyses of the same activities. The change in susceptibility to auditory effects due to sonars is less pronounced for other auditory groups. For most auditory groups, the revision to the avoidance model, which assumes that some marine mammals may avoid sound levels that can cause auditory injury, has also resulted in increased estimates of auditory injuries for certain activities, particularly certain high duty cycle sources. The revised avoidance method bases the initiation of an avoidance response on the behavioral response criteria. The ability to avoid a sonar exposure that may cause auditory effects in the model depends on a species' susceptibility to auditory effects, a species' sensitivity to behavioral disturbance, and characteristics of the sonar source, including duty cycle, source level, and frequency. Thus, predicted auditory effects for species that are less sensitive to disturbance compared to susceptibility to auditory effects have increased.

Most anti-submarine warfare sonars are composed of individual sounds which are short, lasting up to a few seconds each. Systems typically operate with low-duty cycles for most tactical sources, but some systems may operate nearly continuously or with higher duty cycles. Some testing activities may also use sonars with high duty cycles. These higher duty cycle sources would pose a greater risk of masking than intermittent sources. Most anti-submarine warfare activities are geographically dispersed, have a limited duration, and intermittently use sonars with a narrow frequency band. These factors reduce the potential for significant or extended masking in marine mammals.

The number of predicted behavioral effects has changed for all stocks since the prior analysis. These changes are primarily due to revisions to the behavioral response functions. The updated behavioral response functions predict greater sensitivity for the pinniped behavioral group and lower sensitivity for the odontocete and mysticete behavioral groups compared to the previous behavioral response functions. The new function for the sensitive species behavioral group predicts greater sensitivity at lower received levels for beaked whales and harbor porpoises. In addition, the cut-off conditions for predicting behavioral responses have been revised. These factors interact in complex ways that make comparing the predicted behavioral responses in this analysis to the prior analyses challenging.

As discussed in Section 3.7.3, the Action Proponents will implement activity-based mitigation under Alternative 1 and Alternative 2 to reduce potential effects from sonar on marine mammals. While model-predicted effects are not reduced to account for activity-based mitigation, opportunities to mitigate model-predicted effects were identified by determining if the closest points of approach associated with predicted auditory injuries were also within the mitigation zone. This analysis is presented in Appendix E.

The Action Proponents will also implement geographic mitigation to reduce potential acoustic effects within important marine mammal habitats as identified in Table 3.7-4.

3.7.3.2.1.1 Effects from Sonar and Other Transducers Under Alternative 1

Training and Testing. Under Alternative 1, the overall use of sonar and other transducers would increase from the 2018 HSTT EIS/OEIS for both training and testing activities for most sources. For regular duty cycle (MF1) hull-mounted sonar, the maximum year of training and testing activities includes greater than 20 percent more hours in the California Study Area and greater than 10 percent hours more in the Hawaii Study Area compared to the prior analysis. For high duty cycle (MF1C) hull-mounted sonar, the maximum year of training and testing activities includes approximately 50 percent more hours in the California Study Area and greater than 60 percent more hours in the Hawaii Study Area compared to the prior analysis.

The number of effects to each stock due to exposure to sonar during testing and training under Alternative 1 are shown in Table 3.7-6 for a maximum year of activities and in Table 3.7-7 for 7 years of activities. Depending on the stock, effects on individuals may be permanent (auditory injuries) or temporary (TTS, masking, stress, or behavioral response). Behavioral patterns of some individuals, which may include communication, foraging, or breeding, are likely to be temporarily disrupted. Individuals or groups may avoid areas around sonar activities and be temporarily displaced from a preferred habitat. Displacement may be brief for short duration activities or extended for multi-day events and would depend on the behavioral sensitivity of the species. Sensitive species, particularly beaked whales, may avoid for farther distances and for longer durations. Most activities do not occur for extended multi-day periods and would occur over small areas relative to population ranges. The average rate of predicted effects on individuals in most populations would range from less than once per year to several times per year. Individuals of some behaviorally sensitive species or in populations concentrated near range complexes in the Pacific may have higher repeated effects. These effects are not expected to interfere with feeding, reproduction, or other biologically important functions such that the continued viability of the population would be threatened.

Modernization and Sustainment of Ranges. Sonar would not be used during modernization and sustainment of ranges.

Conclusion. Because effects are not expected to interfere with feeding, reproduction, or other biologically important functions, activities that include the use of sonar and other transducers under Alternative 1 would result in less than significant effects.

3.7.3.2.1.2 Effects from Sonar and Other Transducers Under Alternative 2

Under Alternative 2, there would be no meaningful difference in the use of sonar during testing and training activities compared to Alternative 1. Slightly more very high frequency sonar sources (185–205 dB), high-frequency sonar sources (185–205 dB), mid-frequency sources (> 185 dB), and low frequency sources (185–205 dB) would be used. However, the increases would not result in substantive changes to the potential for or types of effects on marine mammals. Overall effects are not meaningfully different from Alternative 1 for marine mammals’ stocks. Therefore, activities that include the use of sonar and other transducers under Alternative 2 would result in less than significant effects.

The number of effects to each marine mammal stock due to exposure to sonar during testing and training under Alternative 2 are shown in Table 3.7-6 for a maximum year of activities and in Table 3.7-7 for seven years of activities.

Table 3.7-6: Effects Due to a Maximum Year of Sonar Testing and Training Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
ESA-Listed							
Blue whale	Eastern North Pacific	1,360	3,018	24	1,361	3,019	25
	Central North Pacific	16	75	1	16	75	1
Fin whale	Hawai'i	19	65	1	19	65	1
	California/Oregon/Washington	3,530	9,614	43	3,543	9,622	43
Gray whale	Western North Pacific	69	95	2	70	95	2
Humpback whale	Mainland Mexico - California/Oregon/Washington	1,207	3,061	39	1,210	3,062	39
	Central America/Southern Mexico - California/Oregon/Washington	516	1,303	17	517	1,304	17
Sei whale	Hawai'i	37	214	2	37	214	2
	Eastern North Pacific	76	216	2	76	216	3
False killer whale	Main Hawaiian Islands Insular	104	63	-	104	63	-
Killer whale	Southern Resident	0	-	-	0	-	-
Sperm whale	Hawai'i	1,234	410	0	1,234	410	0
	California/Oregon/Washington	2,995	887	1	2,998	887	1
Guadalupe fur seal	Mexico	128,555	39,296	17	128,651	39,299	17
Hawaiian monk seal	Hawai'i	516	128	1	516	132	1
Non ESA-Listed							
Bryde's whale	Hawai'i	65	338	3	65	338	3
	Eastern Tropical Pacific	96	169	3	96	169	3
Gray whale	Eastern North Pacific	6,794	9,112	129	6,794	9,113	130
Humpback whale	Hawai'i	1,135	1,716	15	1,136	1,723	17
Minke whale	Hawai'i	41	250	3	41	250	3
	California/Oregon/Washington	904	1,960	22	906	1,961	22
Bottlenose dolphin	O'ahu	7,079	102	1	7,079	102	2
	Maui Nui (formerly 4-Islands)	307	14	0	309	15	0
	Kaua'i/Ni'ihau	1,221	238	-	1,221	238	-
	Hawai'i Pelagic	37,096	5,882	4	37,155	5,921	6
	Hawai'i Island	5	3	-	5	3	-
	California/Oregon/Washington Offshore	21,186	6,778	4	21,194	6,778	4
	California Coastal	1,297	28	-	1,297	28	-
Dall's porpoise	California/Oregon/Washington	12,790	45,151	744	12,821	45,211	746
Dwarf sperm whale	Hawai'i	10,462	33,778	702	10,463	33,780	702
	California/Oregon/Washington	1,471	4,089	63	1,472	4,091	63

Table 3.7-6: Effects Due to a Maximum Year of Sonar Testing and Training Activity Under Alternative 1 and Alternative 2 (continued)

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
False killer whale	Northwest Hawaiian Islands	128	63	-	128	63	-
	Hawai'i Pelagic	935	733	1	935	733	1
	Eastern Tropical Pacific [Nsd]	1,709	825	1	1,709	825	1
Fraser's dolphin	Hawai'i	19,838	15,613	2	19,842	15,613	3
Killer whale	West Coast Transient	27	28	-	27	28	-
	Hawai'i	57	70	-	57	70	-
	Eastern North Pacific Offshore	822	185	0	822	185	0
Long-beaked common dolphin	California	253,603	42,536	26	253,789	42,555	26
Melon-headed whale	Kohala Resident	40	14	-	40	14	-
	Hawaiian Islands	16,179	15,264	10	16,180	15,264	11
Northern right whale dolphin	California/Oregon/Washington	23,855	21,634	15	23,901	21,638	15
Pacific white-sided dolphin	California/Oregon/Washington	45,468	23,535	16	45,523	23,542	17
Pantropical spotted dolphin	O'ahu	6,238	155	2	6,238	155	2
	Northeastern Offshore [Nsd]	60,767	36,786	39	60,767	36,786	39
	Maui Nui (formerly 4-Islands)	2,169	171	1	2,181	186	1
	Hawai'i Pelagic	24,205	20,140	11	24,211	20,146	11
	Hawai'i Island	2,899	3,113	3	2,899	3,113	3
Pygmy killer whale	Hawai'i	4,650	4,239	2	4,650	4,239	2
	California [Nsd]	620	171	-	621	171	-
Pygmy sperm whale	Hawai'i	10,534	34,247	723	10,535	34,248	723
	California/Oregon/Washington	1,506	3,990	66	1,507	3,992	66
Risso's dolphin	Hawai'i	3,561	2,991	2	3,561	2,991	2
	California/Oregon/Washington	33,156	10,593	4	33,177	10,595	5
Rough-toothed dolphin	Hawai'i	57,829	38,838	21	57,860	38,860	21
Short-beaked common dolphin	California/Oregon/Washington	1,498,000	668,121	447	1,499,057	668,226	448
Short-finned pilot whale	Hawai'i	11,613	5,665	3	11,617	5,669	3
	California/Oregon/Washington	3,345	918	2	3,347	918	2
Spinner dolphin	O'ahu/4 Islands	1,151	41	0	1,154	44	1
	Kaua'i Ni'ihau	3,561	882	1	3,561	882	1
	Hawai'i Pelagic	2,176	2,365	2	2,176	2,365	2
	Hawai'i Island	59	49	-	59	50	-
Striped dolphin	Hawai'i Pelagic	18,606	19,153	7	18,606	19,153	8
	California/Oregon/Washington	81,017	52,307	34	81,047	52,310	34

Table 3.7-6: Effects Due to a Maximum Year of Sonar Testing and Training Activity Under Alternative 1 and Alternative 2 (continued)

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Baird's beaked whale	California/Oregon/Washington	10,111	60	-	10,132	60	-
Blainville's beaked whale	Hawai'i	7,507	33	-	7,507	33	-
Cuvier's (goose-) beaked whale	Hawai'i	30,225	126	-	30,228	126	-
	California/Oregon/Washington	166,190	596	-	166,313	596	-
Harbor porpoise	San Francisco Russian River	9,894	35	0	9,894	35	1
	Northern California/ Southern Oregon	481	0	-	482	1	-
	Morro Bay	4,078	49	1	4,127	50	1
	Monterey Bay	2,179	0	-	2,179	0	-
Longman's beaked whale	Hawai'i	18,217	95	-	18,219	95	-
Mesoplodont beaked whales	California/Oregon/Washington	92,410	412	0	92,517	412	0
California sea lion	United States	1,606,187	253,948	131	1,608,326	254,025	132
Harbor seal	California	49,041	16,918	6	49,048	16,921	6
Northern elephant seal	California Breeding	64,685	52,856	22	64,894	52,891	22
Northern fur seal	Eastern Pacific	23,084	10,059	3	23,211	10,064	3
	California	15,836	6,221	2	15,961	6,225	2
Steller sea lion	Eastern	832	153	1	832	153	1

Notes: BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury
A dash (-) indicates a (true zero), and zero (0) indicates a rounded value less than 0.5.
Stocks are not shown if no effects are estimated.
Nsd = No stock designation under MMPA.

Table 3.7-7: Effects Due to Seven Years of Sonar Testing and Training Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
ESA-Listed							
Blue whale	Eastern North Pacific	7,962	15,664	132	8,671	18,951	165
	Central North Pacific	91	432	2	97	503	2
Fin whale	Hawai'i	110	374	1	116	445	1
	California/Oregon/Washington	20,282	46,161	225	22,713	58,169	281
Gray whale	Western North Pacific	423	415	5	435	427	6
Humpback whale	Mainland Mexico - California/Oregon/Washington	7,288	14,923	196	7,746	18,795	254
	Central America/Southern Mexico - California/Oregon/Washington	3,110	6,345	88	3,316	8,053	110
Sei whale	Hawai'i	223	1,208	5	233	1,446	5
	Eastern North Pacific	442	1,110	8	485	1,367	10
False killer whale	Main Hawaiian Islands Insular	634	369	-	665	429	-
Killer whale	Southern Resident	0	-	-	0	-	-
Sperm whale	Hawai'i	7,303	2,299	0	8,007	2,749	0
	California/Oregon/Washington	16,284	4,271	1	19,177	5,607	1
Guadalupe fur seal	Mexico	720,161	197,760	88	855,905	258,368	111
Hawaiian monk seal	Hawai'i	3,473	791	1	3,506	887	1
Non ESA-Listed							
Bryde's whale	Hawai'i	384	1,955	11	407	2,265	13
	Eastern Tropical Pacific	575	931	9	619	1,078	10
Gray whale	Eastern North Pacific	41,395	40,761	763	42,491	41,847	818
Humpback whale	Hawai'i	7,225	10,496	97	7,473	11,731	112
Minke whale	Hawai'i	249	1,437	13	261	1,686	15
	California/Oregon/Washington	5,495	9,789	124	5,830	12,101	148
Bottlenose dolphin	O'ahu	49,365	667	1	49,495	704	2
	Maui Nui (formerly 4-Islands)	2,036	84	0	2,077	87	0
	Kaua'i/Ni'ihau	7,657	1,656	-	8,051	1,661	-
	Hawai'i Pelagic	249,778	35,045	27	254,912	40,374	33
	Hawai'i Island	27	16	-	28	18	-
	California/Oregon/Washington Offshore	121,747	35,289	17	134,836	43,006	21
	California Coastal	8,443	154	-	8,578	154	-
Dall's porpoise	California/Oregon/Washington	73,069	221,810	3,812	81,091	293,698	4,844
Dwarf sperm whale	Hawai'i	65,282	190,808	3,772	67,954	223,799	4,109
	California/Oregon/Washington	8,376	21,082	337	9,453	26,647	399

Table 3.7-7: Effects Due to Seven Years of Sonar Testing and Training Activity Under Alternative 1 and Alternative 2 (continued)

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
False killer whale	Northwest Hawaiian Islands	775	390	-	823	432	-
	Hawai'i Pelagic	5,717	4,143	1	6,133	4,931	1
	Eastern Tropical Pacific Nsd	9,539	4,341	1	11,249	5,402	2
Fraser's dolphin	Hawai'i	122,161	88,199	9	130,513	106,038	10
Killer whale	West Coast Transient	137	124	-	182	190	-
	Hawai'i	337	396	-	366	473	-
	Eastern North Pacific Offshore	5,007	983	0	5,326	1,209	0
Long-beaked common dolphin	California	1,586,668	213,496	138	1,660,182	262,964	162
Melon-headed whale	Kohala Resident	246	79	-	268	88	-
	Hawaiian Islands	98,184	85,528	61	105,922	103,519	73
Northern right whale dolphin	California/Oregon/Washington	125,910	97,976	69	154,101	141,024	96
Pacific white-sided dolphin	California/Oregon/Washington	253,644	106,095	81	289,015	150,332	113
Pantropical spotted dolphin	O'ahu	42,963	1,018	4	43,327	1,074	5
	Northeastern Offshore Nsd	341,124	194,080	199	401,032	240,600	257
	Maui Nui (formerly 4-Islands)	13,958	1,018	1	14,520	1,151	2
	Hawai'i Pelagic	148,173	113,705	59	158,107	136,209	71
	Hawai'i Island	17,809	17,707	9	19,218	21,454	11
Pygmy killer whale	Hawai'i	28,287	23,744	5	30,368	28,641	6
	California Nsd	3,497	857	-	3,855	1,026	-
Pygmy sperm whale	Hawai'i	65,566	193,260	3,889	68,266	226,831	4,258
	California/Oregon/Washington	8,564	20,559	347	9,685	25,821	420
Risso's dolphin	Hawai'i	21,353	16,666	3	23,110	20,091	3
	California/Oregon/Washington	187,838	52,471	24	207,015	64,590	27
Rough-toothed dolphin	Hawai'i	366,233	220,198	117	384,568	262,158	138
Short-beaked common dolphin	California/Oregon/Washington	8,461,512	3,320,903	2,347	9,459,620	4,190,410	2,922
Short-finned pilot whale	Hawai'i	72,239	32,374	13	76,621	38,216	14
	California/Oregon/Washington	19,642	4,791	2	21,015	5,887	2
Spinner dolphin	O'ahu/4 Islands	7,910	241	0	7,961	259	1
	Kaua'i Ni'ihau	22,186	6,136	5	23,368	6,169	5
	Hawai'i Pelagic	13,143	13,391	4	14,164	16,011	5
	Hawai'i Island	355	280	-	403	346	-
Striped dolphin	Hawai'i Pelagic	112,635	106,837	42	120,995	128,655	50
	California/Oregon/Washington	453,023	270,669	172	530,989	338,036	220
Baird's beaked whale	California/Oregon/Washington	55,853	285	-	67,165	392	-

Table 3.7-7: Effects Due to Seven Years of Sonar Testing and Training Activity Under Alternative 1 and Alternative 2 (continued)

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Blainville's beaked whale	Hawai'i	45,808	193	-	49,325	230	-
Cuvier's (goose-) beaked whale	Hawai'i	184,300	712	-	198,316	861	-
	California/Oregon/Washington	935,914	2,907	-	1,070,470	3,682	-
Harbor porpoise	San Francisco Russian River	48,533	163	0	67,427	237	1
	Northern California/ Southern Oregon	2,339	0	-	3,311	1	-
	Morro Bay	24,414	240	1	28,540	345	1
	Monterey Bay	10,934	0	-	14,908	0	-
Longman's beaked whale	Hawai'i	111,608	536	-	119,855	640	-
Mesoplodont beaked whales	California/Oregon/Washington	518,845	1,991	0	597,667	2,557	0
California sea lion	United States	9,199,575	1,157,268	724	9,920,558	1,496,394	857
Harbor seal	California	266,058	89,926	27	274,603	90,747	32
Northern elephant seal	California Breeding	376,726	243,548	109	416,179	324,578	146
Northern fur seal	Eastern Pacific	114,097	44,387	10	157,486	67,771	15
	California	78,458	27,594	8	108,018	41,882	12
Steller sea lion	Eastern	4,570	693	1	5,373	1,002	2

Notes: BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury
A dash (-) indicates a (true zero), and zero (0) indicates a rounded value less than 0.5.
Stocks are not shown if no effects are estimated.
Nsd = No stock designation under MMPA.
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3.7.3.2.2 Effects from Air Guns

Table 3.7-5 contains a summary of the background information used to analyze the potential effects of air guns on marine mammals. Air guns create intermittent, broadband, impulsive sounds.

The below information briefly summarizes information relevant to the assessment of the effects of air guns on marine mammals under the Proposed Action. A more extensive assessment of the effects on marine mammals due to exposure to air guns under this Proposed Action is in Appendix E.

The broadband impulses from air guns are within the hearing range of all marine mammals. Potential effects from air guns could include auditory injuries, TTS, behavioral reactions, physiological response, and masking. Single, small air guns lack the peak pressures that could cause auditory injuries for most auditory groups. The ranges to auditory effects and behavioral responses for air guns are in in Appendix E.

While studies have observed marine mammal responses to large, commercial air gun arrays, the small single air guns used in the Proposed Action would be used over a much shorter period and more limited area. Reactions to air gun use in the Proposed Action are less likely to occur or rise to the same level of severity as observed during seismic use.

As discussed in Section 3.7.3, the Action Proponents will implement activity-based mitigation under Alternative 1 and Alternative 2 to reduce potential effects from air guns on marine mammals.

3.7.3.2.2.1 Effects from Air Guns Under Alternative 1

Training and Testing. Air guns would not be used during training activities. The proposed use of air guns increased for testing from the 2018 HSTT EIS/OEIS. Air gun use during military readiness activities is limited and unlike large-scale seismic surveys that use multiple large air guns. Air gun use would occur nearshore in the SOCAL Range Complex and greater than 3 NM from shore in the Hawaii, NOCAL, and SOCAL Range Complexes.

The number of effects on each stock due to exposure to air guns during testing under Alternative 1 is shown in Table 3.7-8 for a maximum year of activities and in Table 3.7-9 for seven years of activities. Appendix E provides additional detail on modeled effects on each stock, including seasons and regions in which effects are most likely to occur; which activities are most likely to cause effects; overlap with biologically important areas; and analysis of effects to designated critical habitat for ESA-listed species, where applicable. Appendix E also explains how effects are summed to estimate maximum annual and seven-year total effects.

Table 3.7-8: Effects Due to a Maximum Year of Air Gun Testing Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
ESA-Listed							
Blue whale	Eastern North Pacific	0	-	-	0	-	-
Fin whale	California/Oregon/Washington	0	0	-	0	0	-
Humpback whale	Mainland Mexico - California/Oregon/Washington	0	0	-	0	0	-
	Central America/Southern Mexico - California/Oregon/Washington	0	-	-	0	-	-
Sperm whale	Hawai'i	1	-	-	1	-	-
Guadalupe fur seal	Mexico	1	-	-	1	-	-
Non ESA-Listed							
Gray whale	Eastern North Pacific	0	-	-	0	-	-
Humpback whale	Hawai'i	1	-	-	1	-	-
Minke whale	California/Oregon/Washington	0	-	-	0	-	-
Bottlenose dolphin	Hawai'i Pelagic	1	-	-	1	-	-
	California/Oregon/Washington Offshore	1	-	-	1	-	-
Dall's porpoise	California/Oregon/Washington	9	8	1	10	8	1
Dwarf sperm whale	Hawai'i	8	5	1	8	6	1
	California/Oregon/Washington	1	1	-	1	1	-
Long-beaked common dolphin	California	3	-	-	3	-	-
Melon-headed whale	Hawaiian Islands	1	-	-	1	-	-
Northern right whale dolphin	California/Oregon/Washington	1	-	-	1	-	-
Pacific white-sided dolphin	California/Oregon/Washington	1	-	-	1	-	-
Pantropical spotted dolphin	Northeastern Offshore [Nsd]	2	-	-	2	-	-
	Hawai'i Pelagic	1	-	-	1	-	-
	Hawai'i Island	1	-	-	1	-	-
Pygmy killer whale	California [Nsd]	1	-	-	1	-	-
Pygmy sperm whale	Hawai'i	6	6	1	6	6	1
	California/Oregon/Washington	1	1	-	1	1	-
Risso's dolphin	California/Oregon/Washington	1	-	-	1	-	-
Rough-toothed dolphin	Hawai'i	1	-	-	1	-	-
Short-beaked common dolphin	California/Oregon/Washington	17	-	-	17	-	-
Short-finned pilot whale	Hawai'i	1	-	-	1	-	-
Striped dolphin	Hawai'i Pelagic	-	1	-	-	1	-
	California/Oregon/Washington	1	-	-	1	-	-
Cuvier's (goose-) beaked whale	Hawai'i	1	-	-	1	-	-

Table 3.7-8: Effects Due to a Maximum Year of Air Gun Testing Activity Under Alternative 1 and Alternative 2 (continued)

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Harbor porpoise	San Francisco Russian River	1	2	1	1	2	1
Mesoplodont beaked whales	California/Oregon/Washington	0	-	-	0	-	-
California sea lion	United States	8	1	-	8	1	-
Northern elephant seal	California Breeding	1	-	-	1	-	-
Northern fur seal	Eastern Pacific	1	-	-	1	-	-
	California	1	-	-	1	-	-

Notes: BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury
A dash (-) indicates a (true zero) and zero (0) indicates a rounded value less than 0.5.
Stocks are not shown if no effects are estimated.
Nsd = No stock designation under MMPA.

Table 3.7-9: Effects Due to Seven Years of Air Gun Testing Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
ESA-Listed							
Blue whale	Eastern North Pacific	0	-	-	0	-	-
Fin whale	California/Oregon/Washington	0	0	-	0	0	-
Humpback whale	Mainland Mexico - California/Oregon/Washington	0	0	-	0	0	-
	Central America/Southern Mexico - California/Oregon/Washington	0	-	-	0	-	-
Sperm whale	Hawai'i	1	-	-	1	-	-
Guadalupe fur seal	Mexico	3	-	-	3	-	-
Non ESA-Listed							
Gray whale	Eastern North Pacific	0	-	-	0	-	-
Humpback whale	Hawai'i	1	-	-	1	-	-
Minke whale	California/Oregon/Washington	0	-	-	0	-	-
Bottlenose dolphin	Hawai'i Pelagic	3	-	-	3	-	-
	California/Oregon/Washington Offshore	2	-	-	2	-	-
Dall's porpoise	California/Oregon/Washington	58	48	4	66	54	5
Dwarf sperm whale	Hawai'i	50	34	1	56	38	1
	California/Oregon/Washington	4	3	-	5	4	-
Long-beaked common dolphin	California	13	-	-	14	-	-
Melon-headed whale	Hawaiian Islands	2	-	-	2	-	-
Northern right whale dolphin	California/Oregon/Washington	2	-	-	2	-	-

Table 3.7-9: Effects Due to Seven Years of Air Gun Testing Activity Under Alternative 1 and Alternative 2 (continued)

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Pacific white-sided dolphin	California/Oregon/Washington	5	-	-	5	-	-
Pantropical spotted dolphin	Northeastern Offshore Nsd	9	-	-	9	-	-
	Hawai'i Pelagic	1	-	-	1	-	-
	Hawai'i Island	1	-	-	1	-	-
Pygmy killer whale	California Nsd	1	-	-	1	-	-
Pygmy sperm whale	Hawai'i	34	37	3	39	42	4
	California/Oregon/Washington	3	6	-	3	7	-
Risso's dolphin	California/Oregon/Washington	6	-	-	6	-	-
Rough-toothed dolphin	Hawai'i	1	-	-	1	-	-
Short-beaked common dolphin	California/Oregon/Washington	85	-	-	92	-	-
Short-finned pilot whale	Hawai'i	1	-	-	1	-	-
Striped dolphin	Hawai'i Pelagic	-	1	-	-	1	-
	California/Oregon/Washington	5	-	-	6	-	-
Cuvier's (goose-) beaked whale	Hawai'i	1	-	-	1	-	-
Harbor porpoise	San Francisco Russian River	6	12	1	7	13	1
Mesoplodont beaked whales	California/Oregon/Washington	0	-	-	0	-	-
California sea lion	United States	33	1	-	35	1	-
Northern elephant seal	California Breeding	3	-	-	3	-	-
Northern fur seal	Eastern Pacific	2	-	-	2	-	-
	California	1	-	-	1	-	-

Notes: BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury
A dash (-) indicates a (true zero), and zero (0) indicates a rounded value less than 0.5.
Stocks are not shown if no effects are estimated.
Nsd = No stock designation under MMPA.

Overall, the number of potential effects to marine mammals is very low. A small number of auditory effects are predicted for species in the most sensitive hearing group, the VHF cetaceans, which has a substantially lower threshold for auditory effects than other auditory groups for exposure to peak pressures from impulsive sounds. A small number of behavioral responses are also predicted for several species, especially those with large population abundances (e.g., short-beaked common dolphins, California sea lions).

Although air gun effects are limited, there is a potential for long-term effects on any individual with an auditory injury. Most effects, however, are expected to be TTS or temporary behavioral responses. The average risk of effect on individuals in any population is extremely low. Effects due to air guns are unlikely to affect survival, growth, recruitment, or reproduction of any marine mammal populations.

Modernization and Sustainment of Ranges. Air guns would not be used during modernization and sustainment of ranges.

Conclusion. Because air gun use would be unlikely to affect survival, growth, recruitment, or reproduction of any marine mammal populations, activities that include the use of air guns under Alternative 1 would result in less than significant effects.

3.7.3.2.2.2 Effects from Air Guns Under Alternative 2

Air guns would not be used during training activities. Under Alternative 2, there would be no meaningful difference in amount of air gun use during training activities compared to Alternative 1. However, since the level of activities in Alternative 1 are expected to fluctuate from year to year, and the level in Alternative 2 is proposed to be a maximum level every year, there are a greater number of air gun counts in Alternative 2 compared to Alternative 1 over a seven-year period. Effects from air guns under Alternative 2 are not meaningfully different from Alternative 1 and therefore the analysis conclusions are the same for testing activities using air guns under Alternative 2.

The number of effects on each stock due to exposure to air guns during testing under Alternative 2 is shown in Table 3.7-8 for a maximum year of activities and in Table 3.7-9 for seven years of activities.

3.7.3.2.3 Effects from Pile Driving

Table 3.7-5 contains a summary of the background information used to analyze the potential effects of pile driving noise on marine mammals. Only the Port Damage Repair training activity includes pile driving. Additional information on the assessment of these acoustic stressors under this Proposed Action is in Appendix E.

The below information briefly summarizes information relevant to the assessment of the effects of pile driving on marine mammals under the Proposed Action. A more extensive assessment of the effects on marine mammals due to exposure to pile driving under this Proposed Action is in Appendix E.

The impact and vibratory pile driving hammers would expose marine mammals to impulsive and continuous non-impulsive broadband sounds, respectively. Potential effects could include auditory injuries, TTS, behavioral reactions, physiological responses (stress), and masking. This analysis applies NMFS' recommended thresholds for behavioral responses to impact and vibratory pile driving. The ranges to auditory effects and behavioral responses for pile driving are in in Appendix E.

As discussed in Section 3.7.3, the Action Proponents will implement activity-based mitigation under Alternative 1 and Alternative 2 to reduce potential effects from pile driving on marine mammals.

3.7.3.2.3.1 Effects from Pile Driving Under Alternative 1

Training and Testing. Impact and vibratory pile driving would not occur during testing activities. Pile driving would occur as part of Port Damage Repair activities in Port Hueneme, California. Impact and vibratory pile driving during Port Damage Repair training activities can occur over a period of 14 days during each training event, and up to 12 times per year. Pile driving activities would occur intermittently in very limited areas and would be of temporary duration. The activity location is in a highly urbanized all quay wall port. Only two species are anticipated to be present in the nearshore waters by Port Hueneme: California sea lions and harbor seals.

The pile driving mitigation zone encompasses the relatively short ranges to auditory injuries and TTS for the OCW and PCW hearing groups and soft start procedures are employed. Auditory effects are unlikely, but masking, physiological responses, or behavioral reactions may occur over limited periods at farther distances. Pile driving would occur in an industrialized location with existing higher ambient noise levels. Depending on where the activity occurs at Port Hueneme, transmission of pile driving noise may be reduced by existing pier structures. The number of effects on each stock due to exposure to pile driving during training under Alternative 1 are shown in Table 3.7-10 for a maximum year of activities and in Table 3.7-11 for seven years of activities.

Due to the low number of days the activity would occur and the intermittent use of pile driving hammers, effects are expected to be minor and temporary (lasting minutes to hours) or short-term (day).

Modernization and Sustainment of Ranges. Pile driving would not be used during modernization and sustainment of ranges.

Conclusions. Because pile driving activities would be infrequent, localized, and temporary, effects under Alternative 1 would be less than significant.

3.7.3.2.3.2 Effects from Pile Driving Under Alternative 2

Pile driving would not occur during testing activities. The number of effects to each stock due to exposure to pile driving during training under Alternative 2 is shown in Table 3.7-10 for a maximum year of activities and in Table 3.7-11 for seven years of activities. Effects from pile driving during training under Alternative 2 are no different from Alternative 1 and therefore the analysis conclusions are the same for training activities with pile driving under Alternative 2.

Table 3.7-10: Effects Due to a Maximum Year of Pile Driving Training Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Non ESA-Listed							
California sea lion	United States	16,992	1,891	61	16,992	1,891	61
Harbor seal	California	952	183	20	952	183	20

Notes: BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury

Stocks are not shown if no effects are estimated.

Table 3.7-11: Effects Due to Seven Years of Pile Driving Training Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
Non ESA-Listed							
California sea lion	United States	118,938	13,237	423	118,938	13,237	423
Harbor seal	California	6,664	1,281	138	6,664	1,281	138

Notes: BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury

Stocks are not shown if no effects are estimated.

3.7.3.2.4 Effects from Vessel Noise

Table 3.7-5 contains a summary of the background information used to analyze the potential effects of vessel noise on marine mammals. Vessels produce broadband, non-impulsive, continuous noise during operation and transit. Additional information on the assessment of this acoustic stressor under the Proposed Action is in Appendix E.

3.7.3.2.4.1 Effects from Vessel Noise Under Alternative 1

Training or Testing. This section analyzes the potential effects of vessel noise during training or testing activities within the Study Area. Marine mammals may be exposed to vessel-generated noise throughout the Study Area. Military readiness activities with vessel-generated noise would be conducted as described in the *Proposed Activities* and *Activity Descriptions* sections.

Based on the updated background and previous analysis for training and testing under Alternative 1, vessel noise effects on marine mammals could include brief behavioral reactions and short periods of masking while in the proximity of a vessel. Vessels do not purposefully approach marine mammals and are not expected to elicit significant behavioral responses (entanglement response is not a military readiness activity).

Modernization and Sustainment of Ranges. Vessel noise would be produced during SOAR modernization activities; SWTR installation; Sustainment of Undersea Ranges; deployment of fiber optic cables and instrumentation off SCI, Oahu, and Kauai; installation and maintenance of mine warfare and other training areas; and installation and maintenance of the underwater platform. Vessel noise may result in masking, physiological stress, or behavioral reactions. During installation activities, vessels would move slowly (1–5 knots) which would limit ship-radiated noise from propeller cavitation and water flow across the hull.

Conclusion. Activities that include the use of vessels under Alternative 1 would result in less than significant effects.

3.7.3.2.4.2 Effects from Vessel Noise Under Alternative 2

Although the number of activities with associated vessel noise would increase in all range complexes under Alternative 2 compared to Alternative 1, effects from vessel noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the analysis conclusions are the same for training and testing activities under Alternative 2.

3.7.3.2.5 Effects from Aircraft Noise

Table 3.7-5 contains a summary of the background information used to analyze the potential effects of aircraft noise on marine mammals. Aircrafts produce broadband, non-impulsive, continuous noise during operation and transit. Additional information on the assessment of this acoustic stressor under the Proposed Action is in Appendix E.

3.7.3.2.5.1 Effects from Aircraft Noise Under Alternative 1

Training or Testing. This section analyzes the potential effects of aircraft noise during military readiness activities within the Study Area. Fixed- and rotary-wing (e.g., helicopters) aircraft are used for a variety of military readiness activities, and marine mammals may be exposed to aircraft-generated noise throughout the Study Area. Military readiness activities with aircraft would be conducted as described in the *Proposed Activities* and *Activity Descriptions* sections.

Based on the updated background and previous analysis for training and testing under Alternative 1, aircraft noise may cause brief temporary changes in the behavior of marine mammals. Marine mammals at or near the surface when an aircraft flies overhead at low altitude may startle, divert their attention to the aircraft, or avoid the immediate area by swimming away or diving. No long-term consequences for individuals would be expected.

Modernization and Sustainment of Ranges. Aircraft would not be used during modernization and sustainment of ranges.

Conclusion. Activities that include the use of aircraft under Alternative 1 would result in less than significant effects.

3.7.3.2.5.2 Effects from Aircraft Noise Under Alternative 2

Effects from aircraft noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the analysis conclusions are the same for training and testing activities under Alternative 2.

3.7.3.2.6 Effects from Weapons Noise

Table 3.7-5 contains a summary of information used to analyze the potential effects of weapons noise on marine mammals in-water and in-air. Firing of guns, vibrations from the hull of ships, items that impact the water's surface, and items launched from underwater may produce weapons noise and affect marine mammals in the water or underwater. Missile and air vehicle launches and artillery firing at PMRF and air vehicle and missile launches at SNI would result in in-air noise that may affect hauled out pinnipeds hauled out at SNI and Hawaiian monk seals at PMRF.

As discussed in Section 3.7.3, the Action Proponents will implement activity-based mitigation under Alternative 1 and Alternative 2 to reduce potential effects from weapons noise on marine mammals. The Action Proponents will also implement geographic mitigation to reduce potential acoustic effects within important marine mammal habitats as identified in Table 3.7-4.

3.7.3.2.6.1 Effects from Weapons Noise Under Alternative 1

Training or Testing. This section analyzes the potential effects of weapons noise during military readiness activities within the Study Area. Marine mammals may be exposed to sounds caused by the firing of weapons, objects in flight, and impact of non-explosive munitions on the water surface during activities conducted at sea. This incidental noise is collectively called weapons noise. Military readiness activities using gunnery and other weapons that generate firing noise would be conducted as described in the *Proposed Activities* and *Activity Descriptions* sections.

Based on the updated background and previous analysis for training and testing under Alternative 1, the effect of weapon noise on marine mammals would be limited to temporary behavioral responses. Marine mammals may startle or avoid the immediate area. Because firing of medium and large caliber gunnery would occur greater than 12 NM from shore, effects to coastal species are unlikely.

Pinnipeds hauled out on the shoreline of SNI have been observed to behaviorally react to the sound of launches of targets and missiles from launch pads on the island (Naval Air Warfare Center Weapons Division, 2018; U.S. Department of the Navy, 2020c, 2022c, 2023). The estimation of the number of behavioral responses that would be expected to occur as a result of in-air noise from launches was based on observations of pinnipeds over three monitoring seasons (2015–2017) divided by the number of launch events over that time period. The Navy determined that the numbers presented in Table 3.7-12 represent the number of pinnipeds expected to be hauled out at SNI based on surveys in the five-year period between 2014 and 2019 (U.S. Department of the Navy, 2020b) and the average number of effects observed per launch event (U.S. Department of the Navy, 2020c, 2022c, 2023).

Table 3.7-12: Behavioral Effects From In-Air Weapons Noise Due to Launches of Targets and Missiles from San Nicolas Island Under Alternative 1 and Alternative 2

Species	Stock	Annual	7-Year Total
Family Otariidae (eared seals)			
California sea lion	U.S.	11,000	77,000
Family Phocidae (true seals)			
Harbor seal	California	480	3,360
Northern elephant seal	California Breeding	40	280

Hawaiian monk seals hauled out on the beach at PMRF on the island of Kauai, Hawaii, may be exposed to sound from aerial target and missile launches and artillery firing occurring at launch sites located inland of the beach.

Based on an analysis of acoustic data collected at sites on the beach during a missile launch, the ranges to TTS and AINJ effects were estimated, and the results of the analysis showed that the ranges to auditory effects would not extend to the beach where monks seals could haulout (see Appendix E.1). The range to behavioral effects would extend to the beach, and, if a monk seal were to be present during a launch, the seal could be disturbed and respond to the noise as summarized in Table 3.7-5. No acoustic data have been collected at PMRF during artillery firing events. However, data presented by Wiri et al. (2023) were used to estimate a range to TTS and AINJ effects from artillery firing, and the results of the analysis showed that the ranges to auditory effects would not reach haulout sites on the beach (Appendix E.1). The range to behavioral effects would include haulout sites on the beach, and a seal present during an artillery firing event could be disturbed by the noise (Appendix E.1).

From 2020 to 2023, an annual average of 215 monk seals were counted hauled out on the beach at PMRF (unpublished Navy data). The maximum number of seals observed during a single observation was five and the minimum was zero; on most observations no hauled out seals were observed. Based on the observational data, the Action Proponents estimate that weapons firing noise at PMRF would result in 215 behavioral effects annually on hauled out monk seals (Table 3.7-13). The analysis conservatively assumes that 1) at least one monk seal is hauled out when a launch or firing event would occur, an assumption contradicted by the observational data, which indicates that most frequently no monk seals are hauled out on the beach and 2) that a monk seal would be disturbed and behavioral respond during each event. Monk seal in-air hearing is less sensitive than hearing in other phocid seals (Ruscher et al., 2021; Ruscher, In Review), suggesting that monk seals may be less likely to respond to in-air noise (Appendix E.1).

Table 3.7-13: Behavioral Effects From In-Air Weapons Noise Due to Launches of Targets and Missiles and Artillery Firing from PMRF Under Alternative 1 and Alternative 2

Species	Stock	Annual	7-Year Total
Family Phocidae (true seals)			
Hawaiian monk seal	NA	215	1,505

Modernization and Sustainment of Ranges. Weapons would not be used during modernization and sustainment of ranges.

Conclusion. Activities that include weapons noise under Alternative 1 would result in less than significant effects on marine mammals. Weapons noise would result in a negligible effect on marine mammals in the water and a minor effect on four pinniped species when hauled out at SNI during a launch or at PMRF during a launch or artillery firing event.

3.7.3.2.6.2 Effects from Weapons Noise Under Alternative 2

Effects from weapons noise under Alternative 2 are not meaningfully different from Alternative 1 and therefore the analysis conclusions are the same for training and testing activities under Alternative 2.

3.7.3.3 Explosive Stressors

This section summarizes the potential effects of explosives used during military readiness activities within the Study Area. Explosives analyzed for effects to marine mammals include those in water and those that detonate within 10 m of the water surface, which are analyzed as in-water explosives. Table 3.7-14 contains brief summaries of background information that is relevant to the analyses of effects for explosives. New applicable and emergent science regarding explosive effects is presented in Appendix D.

Due to updates to criteria and thresholds used to assess effects, densities (animals per unit area), acoustic effects modeling, and changes to the proposed use of explosives, the quantitative analyses effects due to explosives in this section supplant the analyses in the 2018 HSTT and 2022 PMSR EIS/OEISs. The detailed assessment of explosive stressors under this Proposed Action is in Appendix E.

In addition to changes in the Proposed Action, changes in the predicted explosive effects since the 2018 HSTT EIS/OEIS are due to the following:

- Updates to criteria used to determine if an exposure to explosive energy may cause auditory effects; non-auditory injury (including mortality); and behavioral responses. Changes to auditory criteria for explosives are the same as for other impulsive sounds. Behavioral response thresholds are related to TTS thresholds and were revised accordingly. Non-auditory injury criteria are unchanged, but the onset thresholds were applied. A summary of these changes is in Appendix. For additional details see the technical report *Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase IV) (U.S. Department of the Navy, 2024a)*.

- Revisions to the modeling of explosive effects in the Navy Acoustic Effects Model, including an updated explosive propagation model. See the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing (U.S. Department of the Navy, 2024c)*.

- Updates to data on marine mammal presence, including estimated density of each species or stock (number of animals per unit area), group size, and depth distribution. For additional details see the technical reports *U.S. Navy Marine Species Density Database Phase IV for the Hawaii-California Training and Testing Study Area* (U.S. Department of the Navy, 2024d) and *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii-Southern California Training and Testing Study Areas* (Oliveira et al., 2024).

- Changes in how mitigation is considered in reducing predicted effects. The number of model-predicted mortalities are not reduced due to activity-based mitigation, unlike in prior analyses.

Table 3.7-14: Explosive Stressors Information Summary

Stressor	Summary
Explosives	Explosives may result in mortality and non-auditory injury. Direct injury due to explosives depends on the charge size, the geometry of the exposure (e.g., distance and depth), and the size of the animal. The intermittent nature of most impulsive sounds would result in very limited probability of any masking effects. Due to the rapid rise time and higher instantaneous peak pressure of impulsive noise, nearby noise is more likely to cause startle or avoidance responses. Few studies on reactions to explosives exist, but responses to seismic surveys, pile driving and other impulsive noises have been recorded. Different groups of marine mammals may respond in different ways to impulsive noise, as summarized in Table 3.7-5.

As discussed in Chapter 5 the Action Proponents will implement activity-based mitigation under Alternative 1 and Alternative 2 to reduce potential effects from explosives on marine mammals. The Action Proponents will also implement geographic mitigation to reduce potential explosive effects within important marine mammal habitats as identified in the geographic mitigation discussion in Chapter 5.

3.7.3.3.1 Effects from Explosives

For information on the size and quantity of explosives under each alternative, see Table 3.0-10.

The below information briefly summarizes information relevant to the assessment of the effects of explosives on marine mammals under the Proposed Action. A more extensive assessment of the effects on marine mammals due to exposure to explosives under this Proposed Action is in Appendix E.

Explosions produce loud, impulsive, broadband sounds with sharp pressure peaks that can be injurious. Potential effects from explosive energy and sound include non-auditory injury (including mortality), auditory effects (AINJ and TTS), behavioral reactions, physiological response, and masking. Ranges to effects for mortality, non-auditory injury, and behavioral responses are shown in Appendix E.

Explosive noise is very brief and intermittent. Detonations usually occur in a limited area over a brief period rather than being widespread. The potential for masking is limited. Marine mammals may behaviorally respond, but responses to single detonations or clusters may be limited to startle responses.

As discussed in Section 3.7.3, the Action Proponents will implement activity-based mitigation under Alternative 1 and Alternative 2 to reduce potential effects from explosives on marine mammals. An assessment of the potential opportunities to mitigate mortalities due to explosives under this Proposed Action is in Appendix E.

The Action Proponents will also implement geographic mitigation to reduce potential acoustic effects within important marine mammal habitats as identified in Table 3.7-4.

3.7.3.3.2 Effects from Explosives Under Alternative 1

Training or Testing. The use of in-water explosives would increase from the 2018 HSTT EIS/OEIS for training activities and would decrease slightly for testing. There is an overall reduction in the use of most of the largest explosive bins (bin E8 [> 60–100 lb. NEW] and above) for training and a decrease in two of the largest explosive bins (bin E10 [> 250–500 lb. NEW] and E11 [> 500–650 lb. NEW]) under testing activities. There would be notable increases in the smaller explosive bins (E7 [> 20–60 lb. NEW] and below) under training and testing activities, except for bin E1 (0.1–0.25 lb. NEW) which would decrease under testing activities. Small ship shock trials (bin E16 [> 7,250–14,500 lb. NEW]) not previously analyzed are currently proposed under testing activities.

Most activities involving in-water (including surface) explosives associated with large caliber naval gunfire, missiles, bombs, or other munitions are conducted more than 12 NM from shore. This includes Small Ship Shock Trials that could occur in the SOCAL Range Complex. Sinking Exercises are conducted greater than 50 NM from shore. Certain activities with explosives may be conducted close to shore at locations identified in Appendix A and Appendix H, including certain Mine Warfare and Expeditionary Warfare activities. In the Hawaii Range Complex explosive activities could occur at specified ranges and designated locations around Oahu, including the Puuloa Underwater Range and designated locations in and near Pearl Harbor. In the SOCAL Range Complex, explosive activities could occur near San Clemente Island, in the SSTC, and in other designated mine training areas along the southern California coast.

The number of effects to each stock due to exposure to explosives during testing and training under Alternative 1 is shown in Table 3.7-15 for a maximum year of activities and in Table 3.7-16 for seven years of activities. Appendix E provides additional detail on modeled effects to each stock, including seasons and regions in which effects are most likely to occur; which activities are most likely to cause effects; and analysis of effects to designated critical habitat for ESA-listed species, where applicable. Appendix E also shows total effects to each stock due to training or testing activities under this alternative and explains how effects are summed to estimate maximum annual and seven-year total effects. The number of effects to marine mammals are over-estimated in this analysis by modeling explosions at or near the water surface as underwater explosions.

Nearly all predicted training mortalities and a portion of the testing mortalities are attributable to Mine Warfare. A large portion of the testing mortalities are attributable to Small Ship Shock Trial. Both activities have extensive pre- and during event visual observation requirements as described in Chapter 5 that would reduce the risk that these mortalities would occur. The Action Proponents conduct extensive visual observations for ship shock trials in accordance with NMFS-reviewed activity-based mitigation and monitoring plans (see Chapter 5). Adherence to these plans increases the likelihood that Lookouts would sight surface active marine mammals within the ship shock trial mitigation zone. For other explosive activities, the Action Proponents will also implement mitigation to relocate, delay, or cease detonations when a marine mammal is sighted within or entering a mitigation zone to avoid or reduce potential explosive effects.

Depending on the stock, effects to individuals may be permanent (auditory injuries or mortality) or temporary (non-auditory injury, TTS, masking, stress, or behavioral response). The behavioral patterns of a limited number of individuals may be interrupted. Individuals or groups may temporarily avoid areas around explosive activities if multiple detonations occur. Activities would be relatively brief and occur over small areas relative to population ranges. Permanent effects would be present in low enough numbers such that the continued viability of populations is not threatened. The total effects are not expected to interfere with feeding, reproduction, or other biologically important functions such that the continued viability of the population would be threatened.

Modernization and Sustainment of Ranges. Explosives would not be used during modernization and sustainment of ranges.

Conclusion. Because effects are not expected to interfere with feeding, reproduction, or other biologically important functions of marine mammals, activities that include the use of in-water explosives under Alternative 1 would result in less than significant effects.

Table 3.7-15: Effects Due to a Maximum Year of Explosive Testing and Training Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
ESA-Listed											
Blue whale	Eastern North Pacific	87	106	3	-	-	87	106	3	-	-
	Central North Pacific	1	-	-	-	-	1	-	-	-	-
Fin whale	Hawai'i	2	0	0	-	-	2	0	0	-	-
	California/Oregon/Washington	174	183	11	1	-	175	184	12	1	-
Gray whale	Western North Pacific	3	2	0	-	-	3	2	0	-	-
Humpback whale	Mainland Mexico - California/Oregon/Washington	67	114	4	1	-	67	114	4	1	-
	Central America/Southern Mexico - California/Oregon/Washington	31	38	2	-	-	32	38	2	-	-
Sei whale	Hawai'i	1	1	0	-	-	1	1	0	-	-
	Eastern North Pacific	7	3	1	-	-	7	3	1	-	-
False killer whale	Main Hawaiian Islands Insular	1	1	-	-	-	1	1	-	-	-
Sperm whale	Hawai'i	2	2	1	-	-	2	2	1	-	-
	California/Oregon/Washington	4	5	2	-	-	4	5	2	-	-
Guadalupe fur seal	Mexico	60	72	8	2	0	62	73	8	2	0
Hawaiian monk seal	Hawai'i	20	25	3	1	0	20	25	3	1	0
Non ESA-Listed											
Bryde's whale	Hawai'i	3	3	0	-	-	3	3	0	-	-
	Eastern Tropical Pacific	15	42	2	-	-	15	42	2	-	-
Gray whale	Eastern North Pacific	357	448	38	0	-	357	448	38	0	-
Humpback whale	Hawai'i	91	91	9	-	-	91	91	9	-	-
Minke whale	Hawai'i	3	2	0	-	-	3	2	0	-	-
	California/Oregon/Washington	38	91	10	-	0	38	91	10	-	0
Bottlenose dolphin	O'ahu	29	22	4	1	1	29	22	4	1	1
	Maui Nui (formerly 4-Islands)	2	3	-	-	-	2	3	-	-	-
	Kaua'i/Ni'ihau	0	1	0	0	-	0	1	0	0	-
	Hawai'i Pelagic	187	147	19	2	1	187	147	19	2	1
	Hawai'i Island	0	1	-	-	-	0	1	-	-	-
	California/Oregon/Washington Offshore	45	48	10	1	0	45	48	10	1	0
	California Coastal	9	16	6	1	-	9	16	6	1	-
Dall's porpoise	California/Oregon/Washington	595	1,066	490	2	0	603	1,074	491	2	0

Table 3.7-15: Effects Due to a Maximum Year of Explosive Testing and Training Activity Under Alternative 1 and Alternative 2 (continued)

Species	Stock or Population	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
Dwarf sperm whale	Hawai'i	410	561	211	1	0	422	573	212	1	0
	California/Oregon/Washington	33	69	31	-	0	33	70	31	-	0
False killer whale	Hawai'i Pelagic	1	1	0	-	-	1	1	0	-	-
	Eastern Tropical Pacific Nsd	1	2	1	0	-	2	2	1	0	-
Fraser's dolphin	Hawai'i	16	13	4	2	-	16	13	4	2	-
Killer whale	Hawai'i	-	0	0	-	-	-	0	0	-	-
	Eastern North Pacific Offshore	8	8	4	0	-	8	8	4	0	-
Long-beaked common dolphin	California	346	390	102	24	4	346	390	102	24	4
Melon-headed whale	Kohala Resident	1	1	-	-	-	1	1	-	-	-
	Hawaiian Islands	7	5	3	0	0	7	5	3	0	0
Northern right whale dolphin	California/Oregon/Washington	11	13	4	2	1	12	13	4	2	1
Pacific white-sided dolphin	California/Oregon/Washington	102	104	22	4	2	102	104	22	4	2
Pantropical spotted dolphin	O'ahu	17	16	3	1	-	17	16	3	1	-
	Northeastern Offshore Nsd	40	31	6	2	2	40	32	6	2	2
	Maui Nui (formerly 4-Islands)	22	11	3	0	-	22	11	3	0	-
	Hawai'i Pelagic	25	19	5	3	0	25	19	5	3	0
	Hawai'i Island	2	9	3	1	-	2	9	3	1	-
Pygmy killer whale	Hawai'i	4	2	1	0	-	4	3	1	0	-
	California Nsd	1	2	0	0	-	1	2	0	0	-
Pygmy sperm whale	Hawai'i	414	580	211	1	0	427	592	212	1	0
	California/Oregon/Washington	42	75	41	0	-	42	76	41	0	-
Risso's dolphin	Hawai'i	3	3	2	0	-	3	3	2	0	-
	California/Oregon/Washington	34	49	13	4	0	34	49	13	4	0
Rough-toothed dolphin	Hawai'i	117	88	10	5	2	117	89	10	5	2
Short-beaked common dolphin	California/Oregon/Washington	1,844	1,572	359	71	18	1,850	1,578	360	71	18
Short-finned pilot whale	Hawai'i	12	13	3	1	0	12	13	3	1	0
	California/Oregon/Washington	8	8	7	2	1	8	8	7	2	1
Spinner dolphin	O'ahu/4 Islands	5	4	1	0	0	5	4	1	0	0
	Kaua'i Ni'ihau	0	3	1	0	0	0	3	1	0	0
	Hawai'i Pelagic	1	2	0	0	-	1	2	0	0	-
	Hawai'i Island	1	1	1	0	-	1	1	1	0	-
Striped dolphin	Hawai'i Pelagic	14	8	3	2	-	14	8	3	2	-
	California/Oregon/Washington	28	46	8	2	1	29	46	8	2	1

Table 3.7-15: Effects Due to a Maximum Year of Explosive Testing and Training Activity Under Alternative 1 and Alternative 2 (continued)

Species	Stock or Population	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
Baird's beaked whale	California/Oregon/Washington	1	2	0	-	-	1	2	0	-	-
Blainville's beaked whale	Hawai'i	1	1	-	-	-	1	1	-	-	-
Cuvier's (goose-) beaked whale	Hawai'i	4	3	0	-	-	4	3	0	-	-
	California/Oregon/Washington	14	16	2	0	-	14	16	2	0	-
Harbor porpoise	San Francisco Russian River	3	25	25	-	-	3	26	25	-	-
	Morro Bay	74	172	86	1	0	74	172	86	1	0
	Monterey Bay	0	-	-	-	-	0	-	-	-	-
Longman's beaked whale	Hawai'i	2	2	1	-	-	2	2	1	-	-
Mesoplodont beaked whales	California/Oregon/Washington	9	8	2	0	0	9	8	2	0	0
California sea lion	United States	4,098	5,624	474	57	5	4,102	5,629	475	57	5
Harbor seal	California	1,681	2,208	228	7	1	1,681	2,208	228	7	1
Northern elephant seal	California Breeding	369	563	87	2	0	373	566	87	2	0
Northern fur seal	Eastern Pacific	20	31	8	1	0	21	32	8	1	0
	California	16	24	7	1	0	16	25	7	1	0
Steller sea lion	Eastern	5	9	2	-	-	5	9	2	-	-

Notes: BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury, INJ = Non-Auditory Injury, MORT = Mortality
A dash (-) indicates a (true zero) and zero (0) indicates a rounded value less than 0.5.
Stocks are not shown if no effects are estimated.
Nsd = No stock designation under MMPA.

Table 3.7-16: Effects due to Seven Years of Explosive Testing and Training Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
ESA-Listed											
Blue whale	Eastern North Pacific	551	631	18	-	-	552	632	18	-	-
	Central North Pacific	1	-	-	-	-	1	-	-	-	-
Fin whale	Hawai'i	3	0	0	-	-	3	0	0	-	-
	California/Oregon/Washington	1,084	1,031	74	1	-	1,087	1,037	75	1	-
Gray whale	Western North Pacific	11	3	0	-	-	11	3	0	-	-
Humpback whale	Mainland Mexico - California/Oregon/Washington	413	746	23	1	-	416	749	23	1	-
	Central America/Southern Mexico - California/Oregon/Washington	195	248	8	-	-	196	250	8	-	-
Sei whale	Hawai'i	4	2	0	-	-	4	2	0	-	-
	Eastern North Pacific	45	14	1	-	-	46	14	1	-	-
False killer whale	Main Hawaiian Islands Insular	3	3	-	-	-	3	3	-	-	-
Sperm whale	Hawai'i	9	7	1	-	-	9	7	1	-	-
	California/Oregon/Washington	20	31	4	-	-	20	31	4	-	-
Guadalupe fur seal	Mexico	386	463	49	7	0	398	469	49	7	0
Hawaiian monk seal	Hawai'i	122	162	18	1	0	122	162	19	1	0
Non ESA-Listed											
Bryde's whale	Hawai'i	8	9	0	-	-	8	10	0	-	-
	Eastern Tropical Pacific	89	279	5	-	-	89	279	5	-	-
Gray whale	Eastern North Pacific	2,204	2,932	247	0	-	2,205	2,939	249	0	-
Humpback whale	Hawai'i	602	621	54	-	-	603	622	54	-	-
Minke whale	Hawai'i	10	2	0	-	-	11	2	0	-	-
	California/Oregon/Washington	240	592	69	-	0	240	593	69	-	0
Bottlenose dolphin	O'ahu	200	143	26	3	1	200	144	26	3	1
	Maui Nui (formerly 4-Islands)	13	18	-	-	-	13	18	-	-	-
	Kaua'i/Ni'ihau	0	1	0	0	-	0	1	0	0	-
	Hawai'i Pelagic	1,284	1,009	124	12	2	1,284	1,011	124	12	2
	Hawai'i Island	0	1	-	-	-	0	1	-	-	-
	California/Oregon/Washington Offshore	281	309	63	3	0	281	309	64	3	0
	California Coastal	59	105	41	1	-	59	105	41	1	-
Dall's porpoise	California/Oregon/Washington	3,794	6,653	2,965	5	0	3,850	6,731	2,982	5	0

Table 3.7-16: Effects due to Seven Years of Explosive Testing and Training Activity Under Alternative 1 and Alternative 2 (continued)

Species	Stock or Population	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
Dwarf sperm whale	Hawai'i	2,601	3,626	1,329	1	0	2,687	3,719	1,345	1	0
	California/Oregon/Washington	203	425	180	-	0	206	432	181	-	0
False killer whale	Hawai'i Pelagic	2	3	0	-	-	2	3	0	-	-
	Eastern Tropical Pacific Nsd	1	7	1	0	-	2	7	1	0	-
Fraser's dolphin	Hawai'i	87	79	23	2	-	87	80	23	2	-
Killer whale	Hawai'i	-	0	0	-	-	-	0	0	-	-
	Eastern North Pacific Offshore	46	53	23	0	-	46	53	23	0	-
Long-beaked common dolphin	California	2,114	2,502	666	148	17	2,116	2,507	666	148	17
Melon-headed whale	Kohala Resident	4	3	-	-	-	4	3	-	-	-
	Hawaiian Islands	34	25	7	0	0	35	26	7	0	0
Northern right whale dolphin	California/Oregon/Washington	72	79	21	6	1	76	82	22	6	1
Pacific white-sided dolphin	California/Oregon/Washington	631	674	137	24	2	636	676	138	24	2
Pantropical spotted dolphin	O'ahu	118	101	18	1	-	118	101	18	1	-
	Northeastern Offshore Nsd	264	204	33	7	2	268	207	34	7	2
	Maui Nui (formerly 4-Islands)	149	67	17	0	-	149	67	17	0	-
	Hawai'i Pelagic	155	121	18	4	0	157	122	18	4	0
	Hawai'i Island	10	57	14	2	-	12	57	14	2	-
Pygmy killer whale	Hawai'i	15	13	3	0	-	16	14	3	0	-
	California Nsd	1	2	0	0	-	1	2	0	0	-
Pygmy sperm whale	Hawai'i	2,637	3,788	1,328	1	0	2,729	3,888	1,344	1	0
	California/Oregon/Washington	263	473	262	0	-	266	479	264	0	-
Risso's dolphin	Hawai'i	11	10	2	0	-	11	10	2	0	-
	California/Oregon/Washington	217	315	83	18	0	218	316	83	18	0
Rough-toothed dolphin	Hawai'i	787	600	58	21	2	789	603	59	22	2
Short-beaked common dolphin	California/Oregon/Washington	11,815	10,108	2,287	441	107	11,862	10,159	2,301	443	107
Short-finned pilot whale	Hawai'i	75	83	12	1	0	76	83	12	1	0
	California/Oregon/Washington	49	50	42	12	4	49	50	42	12	4
Spinner dolphin	O'ahu/4 Islands	32	22	2	0	0	32	22	2	0	0
	Kaua'i Ni'ihau	0	12	1	0	0	0	12	2	0	0
	Hawai'i Pelagic	2	3	0	0	-	2	3	0	0	-
	Hawai'i Island	7	2	1	0	-	7	2	1	0	-

Table 3.7-16: Effects due to Seven Years of Explosive Testing and Training Activity Under Alternative 1 and Alternative 2 (continued)

Species	Stock or Population	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
Striped dolphin	Hawai'i Pelagic	75	46	6	4	-	77	47	6	4	-
	California/Oregon/Washington	181	296	50	9	1	185	300	51	9	1
Baird's beaked whale	California/Oregon/Washington	5	6	0	-	-	5	6	0	-	-
Blainville's beaked whale	Hawai'i	2	1	-	-	-	2	1	-	-	-
Cuvier's (goose-) beaked whale	Hawai'i	18	8	0	-	-	19	8	0	-	-
	California/Oregon/Washington	86	105	4	0	-	86	106	4	0	-
Harbor porpoise	San Francisco Russian River	15	171	168	-	-	20	176	169	-	-
	Morro Bay	495	1,167	587	2	0	495	1,174	589	2	0
	Monterey Bay	0	-	-	-	-	0	-	-	-	-
Longman's beaked whale	Hawai'i	4	4	4	-	-	4	4	4	-	-
Mesoplodont beaked whales	California/Oregon/Washington	47	55	6	0	0	48	55	7	0	0
California sea lion	United States	25,621	36,466	3,056	369	27	25,661	36,566	3,066	369	27
Harbor seal	California	10,255	13,645	1,433	44	7	10,259	13,794	1,456	44	7
Northern elephant seal	California Breeding	2,371	3,612	534	2	0	2,398	3,637	535	2	0
Northern fur seal	Eastern Pacific	118	192	43	2	0	124	197	44	2	0
	California	94	151	36	3	0	96	153	37	3	0
Steller sea lion	Eastern	31	52	12	-	-	31	53	12	-	-

Notes: BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury, INJ = Non-Auditory Injury, MORT = Mortality
A dash (-) indicates a (true zero), and zero (0) indicates a rounded value less than 0.5.
Stocks are not shown if no effects are estimated.
Nsd = No stock designation under MMPA.

3.7.3.3.3 Effects from Explosives Under Alternative 2

Under Alternative 2, the use of explosives during training activities would be nearly identical to Alternative 1. Under Alternative 2, there would be a very slight increase in use of a few low explosive weight bins (E1 and E3) compared to Alternative 1. This would not result in an increase in effects to any stock as shown in Table 3.7-15 and Table 3.7-16. Still, effects from explosives in water under Alternative 2 are not meaningfully different from Alternative 1 and therefore the analysis conclusions are the same for training and testing activities under Alternative 2.

3.7.3.4 Energy Stressors

Table 3.7-17 summarizes the potential adverse effects of energy stressors used during military readiness activities within the Study Area, which includes an analysis of the potential adverse effects of (1) in-water electromagnetic devices, (2) high-energy lasers, and (3) high-power microwave devices. For information on the types of training and testing activities that create an in-water electromagnetic field, refer to Appendix B, and for information on locations and the number of activities proposed for each alternative, see Table 3.0-11. There are no reasonably foreseeable adverse effects from energy stressors on marine mammals, and therefore further analysis is not warranted. Background information on energy stressors is provided in Appendix F.

Table 3.7-17: Energy Stressors Information Summary

Sub-Stressor	Summary
In-water electromagnetic devices	Adverse effects to marine mammals from the use of in-water electromagnetic devices are not expected for the following reasons: (1) The in-water devices designed to produce an electromagnetic field are towed by a vessel or unmanned mine countermeasure systems, (2) the electromagnetic field is produced to simulate a vessel's magnetic field. In an actual mine-clearing operation, the intent is that the electromagnetic field would trigger an enemy mine designed to sense a vessel's magnetic field, (3) adverse effects from the use of in-water electromagnetic devices are not anticipated, because the electromagnetic field is the simulation of a ship's magnetic field, having no greater effect than that of a passing ship, a common occurrence in the marine environment, and (4) there is no evidence to suggest the magnetic field from a passing vessel would adversely affect marine mammals.
High-energy lasers	High-energy lasers would have no effect marine mammals for the following reasons: (1) precision targeting high-energy lasers are fired over relatively short ranges, (2) marine mammals spend up to 90 percent of their time under the water limiting opportunities to be exposed to the laser beam, (3) marine mammals are unlikely to remain stationary and may avoid activities at the target area prior to and during the military readiness activity, (4) the very small diameter of the laser beam limits the probability of exposure, and (5) the laser is designed not to miss the intended target and would automatically shut down if target-lock is lost, preventing the laser from striking anything but the target.
High-power microwave devices	High-power microwave devices are used in a similar manner and with a similar purpose as high-energy lasers, and some of the same reasoning explaining why adverse effects are unlikely applies to the analysis of effects from high-power microwave devices. Specifically, reasons 1 through 4 for high-energy laser are also applicable for high-power microwave devices. High-power microwave devices do not have an automated shutdown capability if target-lock is lost and would need to be turned off by the operator. While it is possible to miss the target, if only briefly, the probability analysis is Appendix I shows that the likelihood is extremely low and is considered discountable.

3.7.3.5 Physical Disturbance and Strike Stressors

This section analyzes the potential adverse effects of the various types of physical disturbance, including the potential for strike during military readiness activities within the Study Area from (1) vessels; (2) in-water devices; (3) MEM, including non-explosive practice munitions and fragments from high-explosive munitions; (4) seafloor devices, including cables and equipment associated with range modernization; and (5) pile driving.

The way a physical disturbance may affect a marine mammal would depend in part on the relative size of the object, the speed of the object, the location of the marine mammal in the water column, and reactions of marine mammals to anthropogenic activity, which may include avoidance or attraction. It is not known at what point or through what combination of stimuli (visual, acoustic, or through detection in pressure changes) an animal becomes aware of a vessel or other potential physical disturbances before reacting or being struck. Refer to Appendix E for further discussion of the potential for disturbance from acoustic stimuli.

A physical disturbance should be very rare and brief, the cost from the response is likely to be within the normal variation experienced by an animal in its daily routine unless the animal is struck (see Table 3.7-18). If a strike does occur, the cost to the individual could range from slight injury to mortality. For a summary of background studies on physical disturbance and strike stressors, refer to Appendix F.

Table 3.7-18: Physical Disturbance and Strike Stressors Summary Information

Sub-Stressor	Summary
Vessels and in-water devices	Vessel strikes may adversely affect marine mammal species, particularly large whales, but mitigation measures are in place which should reduce the potential for a strike to occur. • Vessel strikes from commercial, recreational, and military vessels are known to have resulted in serious injury and occasional fatalities to cetaceans. Most military readiness activities under all alternatives involve some level of vessel activity. • An examination of vessel traffic within the Study Area determined that military vessel occurrence is approximately 4 percent of total vessel traffic in the Study Area. • Standard operating procedures for vessel safety will benefit marine mammals through a reduction in the potential for vessel strike, as well as additional mitigation measures. It is possible that marine mammal species that occur in areas that overlap with in-water device use associated with the Proposed Action may experience some level of physical disturbance, but it is not expected to result in more than a momentary behavioral response. • In-water devices are generally smaller (several inches to about 60 ft) and less massive than most vessels. • Devices that could pose a higher probability of collision risk to marine mammals are those operated at high speeds and are unmanned. Since some in-water devices are identical to support craft, which are typically less than 50 feet in length, marine mammals could respond to the physical presence of the device similar to how they respond to the physical presence of a vessel. • Some in-water devices are larger (e.g., large USVs) and can range up to about 300 feet. Larger devises typically travel between 1 and 15 knots, but can “sprint” up to 50 knots for brief periods of time.

Table 3.7-18: Physical Disturbance and Strike Stressors Summary Information (continued)

Sub-Stressor	Summary
Military expended materials	While no strike from MEM has ever been reported or recorded, the possibility of a strike still exists. • The primary concern is the potential for a marine mammal to be hit with a MEM at or near the water's surface, which could result in injury or death. • While disturbance or strike from an item falling through the water column is possible, it is not very likely given the objects generally sink slowly through the water and could be avoided by most marine mammals. Therefore, the discussion of MEM strikes focuses on the potential of a strike at the surface of the water. • The potential for marine mammals to be struck by MEM was evaluated using statistical probability modeling to estimate potential direct strike exposures to a marine mammal under a worst-case scenario. See Appendix I.
Seafloor devices	Seafloor devices are unlikely to affect marine mammals. • The likelihood of any marine mammal species encountering seafloor devices is considered low because these items are either stationary or move very slowly along the bottom and most marine mammals are do not interact with the bottom, particularly in deeper waters, and can maneuver easily in the water to avoid a stationary of slowly moving object. • In the unlikely event that a marine mammal is in the vicinity of a seafloor device, the stationary or very slowly moving devices would not be expected to physically disturb or alter natural behaviors of marine mammals. • The only time a seafloor device used during military readiness activities has the potential to strike a marine mammal at or near the surface or in the water column is during deployment from a surface vessel. Deployment is typically a controlled event to allow a level of precision in the placement of the device on the seafloor and a marine mammal is unlikely to encounter the device during the brief period that the device is in the water column. Cables installed on the seafloor as part of range sustainment and modernization activities are highly unlikely to adversely affect marine mammals. • The cables installed at underwater ranges are thick armored for durability and abrasion resistance and would remain on the seafloor after installation. • Most marine mammals do not forage on the seafloor and would not encounter the cables after installation. • The cable-laying process occurs once, not annually, and typically lasts for approximately 40 days. • The cable-laying vessel travels slowly (1–5 knots). • The fiber optic cables installed at Kaneohe Bay and off SCI would be secured to the seafloor in shallow water and are not expected to be entrained into the water column.
Pile Driving	Pile-driving activities at Port Hueneme are unlikely to affect marine mammals. • Sea lions and harbor seals spend much of their time hauled out on structures outside of the water. • When in the water, sea lions and harbor seals will likely avoid pile-driving sites due to acoustic stressors and pile-driving equipment at and above the surface. • Mitigation measures (Chapter 5) would be implemented to reduce the potential for adverse effects.

3.7.3.5.1 Effects from Vessels and In-Water Devices

Vessel strike to marine mammals is not associated with any specific training or testing activity but rather an inadvertent, limited, sporadic, and incidental result of Navy and USCG vessel movement within the Study Area. A detailed analysis of vessel strike data is presented in Appendix I and includes probability calculations used to predict the potential for a vessel strike in the 7-year period from December 2025 – December 2032.

The Navy and USCG do not anticipate vessel strikes to be a significant threat to marine mammal populations within the Study Area. This assessment is based on the probability of strike analysis presented in Appendix I (and summarized below), the cumulative low recent history of Navy vessel strikes from 2017 to 2023, establishment and updates to the Navy's Marine Species Awareness Training, and adaptation of additional mitigation measures since 2018.

In-water devices could pose a collision risk to marine mammals when operated at high speeds or are unmanned. In-water devices, such as unmanned underwater vehicles, and in-water devices towed from unmanned platforms that move slowly through the water are highly unlikely to strike marine mammals because the mammal could easily avoid the object. In-water devices towed by manned platforms would have observers stationed on the towing platform to implement mitigation and standard safety measures employed when towing in-water devices (see Chapter 5). Torpedoes (a type of in-water device) are generally smaller (several inches to 111 ft.) than most vessels. The Navy reviewed torpedo design features and a large number of previous anti-submarine warfare torpedo exercises to assess the potential of torpedo strikes on marine mammals. The tactical software that guides U.S. Navy torpedoes is sophisticated and would not identify a marine mammal as a target. All non-explosive torpedoes are recovered after being fired and are reconfigured for re-use. In thousands of exercises in which torpedoes were fired or in-water devices used, there have been no recorded or reported instances of a marine mammal strike.

Since some in-water devices are identical to support craft, marine mammals could respond to the physical presence of the device similar to how they respond to the physical presence of a vessel. It is possible that marine mammal species that occur in areas that overlap with in-water device use and may experience some level of physical disturbance, but it is not expected to result in more than a momentary behavioral response.

3.7.3.5.1.1 Effects from Vessels and In-Water Devices Under Alternative 1

Training and Testing. Table 3.0-17 provides estimates of relative vessel and in-water device use and locations in the Study Area. The concentration of vessels in the Study Area and the manner of training and testing would remain consistent with the levels and types of activities undertaken in the Study Area over the last decade even though the Study Area off California has been expanded to include the PMSR and NOCAL Range Complex. The analysis of adverse effects from in-water devices on marine mammals presented in the 2018 HSTT and 2022 PMSR EIS/OEISs remains valid and is applicable to the NOCAL Range Complex, considering the limited number of activities using in-water devices occurring there, and expanded warning areas adjacent to the SOCAL Range Complex.

The probability of whale strikes by Navy and USCG vessels was calculated based on an analysis of past strike data and anticipated future training and testing vessel use at-sea. The results of the analysis indicate a range of probabilities of strike that could result in injury or mortality to large whale species (Table 3.7-19). Details of the probability calculations are presented in Appendix I. Species potentially affected are: blue whale (Eastern North Pacific Stock), fin whale (California/Oregon/Washington Stock), gray whale (Eastern Pacific Stock), humpback whale (Mainland Mexico-California-Oregon-Washington Stock and Central North Pacific stock), and sperm whale (Hawaii stock).

Table 3.7-19: Probability of Vessel Strikes on Large Whales by Navy and USCG Vessels During Training and Testing Activities From 2025 to 2032

Number of Whales	Percent Probability of Strike by Navy Vessel in a 7-Year Period	Percent Probability of Strike by USCG Vessel in a 7-Year Period
0	3	7
1	11	20
2	19	25
3	22	22
4	19	14
5	13	NA

NA = Not applicable.

Physical disturbance and strike from large vessels and in-water devices would be more likely in waters over the continental shelf than in the open ocean farther from shore, because of the concentration of large vessel traffic and in-water device activities are greater as are marine mammal densities for most cetacean species (U.S. Department of the Navy, 2024d). Marine mammal species that tend to occur over the continental shelf would therefore have a greater potential to be adversely affected. Large vessels may occasionally be required to operate at speeds that are higher than average operating speeds, which may pose a greater strike risk to marine mammals, because there would be less time for the vessel crew to detect a marine mammal and maneuver to avoid a strike, and there would be less time over a given distance for the animal to react and avoid the vessel. Two of the three recent Navy vessel strikes of whales that occurred in the California Study Area were associated with vessels operating at higher speeds; however, the third strike in 2023 occurred when a vessel was traveling at a relatively low speed.

The use of small crafts traveling at higher speeds (i.e., greater than 10 knots) during military readiness activities occurs more frequently, although not exclusively, in nearshore waters, ports, and harbors than in offshore waters far from shore. One notable exception is the use of small range boats to recover torpedoes at SOAR and Barking Sands Tactical Underwater Range/Barking Sands Underwater Range Expansion underwater ranges. These ranges have both offshore and nearshore components. Nearshore waters in the Study Area are generally more confined waterways where species that prefer deep, offshore waters do not regularly occur. As stated in Section 3.7.3.5.1, odontocetes known to occur in nearshore waters, such as bottlenose dolphins and harbor porpoises, are not as susceptible to vessel strikes as mysticetes; although strikes are known to occur to these species. No vessel strikes of marine mammals have been reported due to vessel activities in nearshore waters and ports and harbors.

Physical disturbance from small crafts operating at higher speeds would be limited to areas where those vessels tend to operate on a regular basis, specifically, closer to shore, in ports and harbors, and at the offshore underwater ranges (see Table 3.0-17). Marine mammal species with the highest densities in these areas (e.g., bottlenose dolphins, harbor porpoises, and California sea lions off California, and humpback whales and spinner dolphins off Hawaii) would have a higher potential for vessel strike by small craft.

Military readiness activities involving vessels and in-water devices may occur year-round; therefore, adverse effects from physical disturbance would depend on each species' seasonal patterns of occurrence or degree of residency, primarily in the continental shelf portions of the Study Area. Refer to

Appendix C for species seasonal distribution patterns and migratory behavior. As previously indicated, any physical disturbance from vessel movements and use of in-water devices is not expected to result in more than a brief behavioral response (e.g., avoidance).

Pinniped occurrence within the California Study Area varies seasonally for most species (U.S. Department of the Navy, 2024d). The distribution of Hawaiian monk seals is consistent year-round but varies with distance from shore. While it is possible that vessels could encounter pinnipeds in offshore waters of the Study Area, in particular migrating northern elephant seals and Guadalupe fur seals that distribute widely offshore following breeding and molting, pinnipeds are highly mobile in the water and would likely be able to avoid an oncoming large vessel moving in nearshore channels. Movements of large vessel in nearshore waters would be at relatively slow speeds and would have limited overlap with pinniped occurrence. High-speed small craft movements in nearshore waters, including San Diego Bay and Pearl Harbor, would occur frequently; however, pinnipeds occurring in nearshore waters spend large amounts of time hauled out and display high maneuverability in the water, suggesting they could avoid interactions with small crafts as well. The only pinniped known to occur regularly in San Diego Bay is the California sea lion, and while frequently observed outside of Pearl Harbor, monk seals are far less common inside the harbor. Compared to cetaceans, pinnipeds are not as susceptible to vessel strikes; therefore, a pinniped strike is not anticipated during military readiness activities using vessels.

Encountering a sea otter during the use of in-water devices is not anticipated. Sea otters occur in a very limited portion of the Study Area, primarily close to shore off Central California and SNI in water depths less than 50 m, and there are few military readiness activities that may involve the use of vessels and in-water devices in these locations. The three amphibious landing areas used during selected training activities extend to shore in potential sea otter habitat and could pose a risk to sea otters, particularly if the lanes disturb kelp beds, a preferred habitat for sea otters.

Several characteristics of both the boats and devices and how these activities are conducted would reduce probability of effects on sea otters. Larger amphibious vessels would remain farther offshore during activities that use the landing areas; and only smaller boats, landing craft, and in-water devices (e.g., landing craft-utility boats, amphibious combat vehicles, and small combat rubber raider craft—similar to civilian zodiacs) would be used in the nearshore landing areas that overlap with sea otter habitat. Landing craft-utility boats and amphibious combat vehicles move very slowly (less than 8 knots), and the utility boats have a shroud around the propeller to prevent hitting the bottom, which also eliminates the potential for a propeller striking an otter. The amphibious combat vehicles do not have propellers, move the slowest of all boats and devices used during this activity, and have a front wave deflector when amphibious that would help to avoid direct contact with an otter. The small combat rubber raider craft are not any different than a civilian zodiac with an outboard motor. They would be the fastest of the boats operated in the landing areas, but they should be easily detected and avoided by a sea otter; and their hulls are made of rubber, which reduces the potential for injury from a direct strike. Any kelp beds located in the landing lanes would be avoided for the safety of equipment and personnel during these activities, further reducing the potential for an effect.

With the implementation of mitigation measures, including surveying the amphibious landing lanes prior to an activity and avoiding kelp beds, a sea otter strike is not anticipated. Disturbance due to the physical presence of vessels and in-water devices is not expected to result in more than a temporary behavioral response, which could include diving or leaving the area. Based on these considerations, there is a remote possibility that sea otters in the landing areas could be disturbed during amphibious landing events, including during preparations prior to the activity; however, sea otter strikes are not anticipated.

Modernization and Sustainment of Ranges. Vessels would be used to deploy seafloor cables and connected instrumentation for SOAR modernization activities and the SWTR installation off SCI as well as undersea fiber optic cables and connected instrumentation south and west of SCI, northeast of Oahu, and west of Kauai. The vessels would move very slowly during cable installation activities (1 to 5 knots) and would not pose a collision threat to marine mammals potentially occurring in the vicinity of the vessel.

Conclusion. Overall, the use of vessels and in-water devices during military readiness activities would have less than significant adverse effects on marine mammals. A vessel strike on an individual marine mammal would be considered a significant adverse effect on the individual even if the strike does not result in mortality. Nevertheless, the probability of a vessel strike remains low and even if a strike were to occur the effects on the population would be less than significant.

3.7.3.5.1.2 Effects from Vessels and In-Water Devices Under Alternative 2

As show in Table 3.0-17, the number of vessels and in-water devices used in the Study Area increases under Alternative 2. Training accounts for nearly 9 times the number of events with vessel and in-water device movements than testing, and, under Alternative 2 training events would increase by 11 percent in the California Study Area and 9 percent in the Hawaii Study Area. Therefore, the potential for adverse effects from the use of vessels and in-water devices under Alternative 2 is measurably greater than under alternative 1; however, more vessel movements do not necessarily equate to greater adverse effects. Therefore, the probability of vessel strikes on large whales would only be marginally higher than under Alternative 1, and the conclusions for significance are the same under both alternatives.

3.7.3.5.2 Effects from Military Expended Materials

This section analyzes the strike potential to marine mammals from the following categories of MEM: (1) all sizes of non-explosive practice munitions, (2) fragments from high-explosive munitions, (3) expendable targets and target fragments, and (4) expended materials other than munitions, such as sonobuoys, expended bathythermographs, and torpedo accessories. For a discussion of the types of activities that use MEM, refer to Appendix B and for a discussion on where items would be used or expended under each alternative, see Table 3.0-18 through Table 3.0-21. For physical disturbance and strike stressors as they relate to marine mammals, adverse effects from fragments from high-explosive munitions are included in the analysis presented in Section 3.7.3.3 and are not considered further in this section. Potential adverse effects from MEM as ingestion stressors to marine mammals are discussed in Section 3.7.3.7.

The primary concern is the potential for a marine mammal to be hit with a military expended material at or near the water’s surface. While disturbance or strike from an item falling through the water column is possible, it is not very likely given the objects generally sink slowly through the water and can be avoided by marine mammals. Therefore, the discussion of MEM strikes focuses on the potential of a strike at the surface of the water.

While no strike from MEM has ever been reported or recorded, the possibility of a strike still exists. Therefore, the potential for marine mammals to be struck by MEM was evaluated using statistical probability modeling to estimate potential direct strike exposures. The analysis is described in detail in Appendix I and briefly summarized below.

To estimate potential direct strike exposures, four scenarios were developed using marine mammal densities, including the species with the highest average monthly density in the California and Hawaii study areas, and the dimensions of an array of MEM types (e.g., bombs, targets). Estimates of impact probability and number of exposures for a given species of interest were made for areas with the highest annual number of MEM used. The number of predicted exposures in a single year for ESA-listed marine mammals and the species with the highest average monthly density in the Hawaii and California Study Areas are shown in Appendix I.

3.7.3.5.2.1 Impacts from Military Expended Materials Under Alternative 1

Training and Testing. Military readiness activities that involve MEM would occur in nearshore and offshore waters of the Hawaii Study Area and California Study Area. MEM are not expected to be used during activities in San Diego Bay, Pearl Harbor, or Port Hueneme.

In the Hawaii Study Area, the species with the highest average monthly density is rough toothed dolphin, and the number of predicted exposures was calculated to be 0.0053 per year based on the probability of strike. Predicted exposures for all other species would be lower, in many cases several orders of magnitude lower, because species densities are lower. For ESA-listed species, Hawaiian monk seal had the highest number of predicted exposures at 0.00048 per year. In the California Study Area, the species with the highest average monthly density is short-beaked common dolphin, and the number of predicted exposures was 1.958 per year. Predicted exposures for all other species would be lower, in most cases several orders of magnitude lower, because species' densities are substantially lower. For ESA-listed species, fin whale had the highest number of predicted exposures at 0.08367 per year.

The analysis is likely an overestimation of the probability of a strike for the following reasons: (1) it calculates the probability of a single military item (of all the items expended over the course of the year) hitting a single animal at its species' highest seasonal density; (2) it does not take into account the possibility that an animal may avoid military activities; (3) it does not take into account the possibility that an animal may not be at the water surface; (4) it does not take into account that most projectiles fired during training and testing activities are fired at targets, and so only a very small portion of those projectiles that miss the target would hit the water with their maximum velocity and force; and (5) it does not quantitatively take into account the Navy avoiding animals that are sighted through the implementation of mitigation measures.

Modernization and Sustainment of Ranges. No MEM are expected to be used during modernization and sustainment of ranges activities. Some anchors may not be recovered and become MEM, but those are analyzed as seafloor devices.

Conclusion. Activities that include the use of MEM under Alternative 1 would result in less than significant effects. The analysis of physical disturbance and strike due to the use of MEM during military readiness activities under Alternative 1 resulted in a low but measurable number of predicted exposures to marine mammals, and the probability of a direct strike is low.

3.7.3.5.2.2 Impacts from the Use of Military Expended Materials Under Alternative 2

Based on the probability analysis, effects from the use MEM under Alternative 2 would be higher, but effects are not meaningfully different from Alternative 1. For example, the number of predicted exposures for rough-toothed dolphin in the Hawaii Study Area was calculated to be 0.0058 per year under Alternative 2 (compared with 0.0053 per year under Alternative 1), and the number of predicted exposures to short-beaked common dolphin was 2.036 per year (compared with 1.958 per year under

Alternative 1) (Appendix I). Therefore, activities that include the use of MEM under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.7.3.5.3 Effects from Seafloor Devices

Training and Testing. Seafloor devices include items placed on, dropped on, or moved along the seafloor such as mine shapes, anchor blocks, anchors, bottom-placed devices, and bottom-crawling unmanned underwater vehicles. To identify the types of activities that use seafloor devices see Appendix B, and for a discussion on where they are used and how many activities would occur under each alternative, see Table 3.0-22. The likelihood of any marine mammal species encountering seafloor devices is considered low even for species that interact with benthic habitat, including humpback whales, gray whales, Hawaiian monk seals, and sea otters, because these devices are either stationary or move very slowly along the bottom. In the unlikely event that a marine mammal is in the vicinity of a seafloor device, the stationary or very slowly moving devices would not be expected to physically disturb or alter natural behaviors of marine mammals.

Modernization and Sustainment of Ranges. New range modernization and sustainment activities include installation of undersea cables integrated with hydrophones and underwater telephones to sustain the capabilities of the SOAR. Deployment of fiber optic cables along the seafloor would occur in three locations: south and west of SCI in the California Study Area, and to the northeast of Oahu and west of Kauai in the Hawaii Study Area. In all three locations the installations would occur completely within the water; no land interface would be involved.

The cables are deployed from a slow moving (1–5 knots) cable laying vessel, which operates continuously (day and night) until all cables are deployed and installed on the seafloor. While the duration the vessel is on site is dependent on the number and length of cables to be installed, the process is expected to be completed within a week for the installation of fiber option cables and over several weeks (less than 40 days) for undersea range cables, limiting the timeframe for a marine mammal to encounter the vessel or a cable in the water column. Mitigation to reduce the probability of physical disturbance or strike during cable laying activities would be implemented as part of the activity.

Fiber optic cables would be deployed and installed on the seafloor in the California Study Area off SCI, and in the Hawaii Study Area to the northeast of Oahu and west of Kauai. Fiber optic cables are narrower and lighter than the armored cables installed on underwater ranges and are less likely to affect a marine mammal through physically disturbance or strike while in the water column. Deployment would also occur continuously (night and day) from a slow-moving vessel over a relatively short time period, limiting any potential for a marine mammal to encounter and potentially be disturbed by either the vessel or the cable as it is lowered through the water column prior to installation on the seafloor. Cable installation activities are not annual activities and would only occur once over days to weeks between 2025 and 2032.

Conclusion. There are no reasonably foreseeable adverse effects from seafloor devices on marine mammals (Table 3.7-18), therefore further analysis is not warranted. Background information on physical disturbance and strike stressors is provided in Appendix F.

3.7.3.5.4 Effects from Pile Driving

Training and Testing. Only California sea lions and harbor seals occur regularly in Port Hueneme. Port Hueneme is an active port with both commercial and military vessels transiting through the port exposing California sea lions and harbor seals to anthropogenic stressors similar to physical disturbance stressors associated with pile driving activities. While in the port, both the sea lions and harbor seals spend much of their time hauled out on floating docks and other structures, limiting the potential for disturbance or strike by pile driving activities occurring in the water. When in the water, it is likely that both pinniped species would avoid sites where pile driving is actively occurring due to the potentially disturbing acoustic stressors and pile driving equipment operating at and above the surface. Avoidance of pile driving sites minimizes the potential for direct strike by vessels, which are generally stationary or moving slowing within the harbor. Based on these factors, it is not likely that any marine mammal would be struck by a piling or pile driving equipment during installation. Mitigation measures discussed in Chapter 5 would be conducted to further reduce any potential for adverse effects.

Modernization and Sustainment of Ranges. Pile driving would not be used during modernization and sustainment of ranges.

Conclusion. Therefore, there are no reasonably foreseeable adverse effects on marine mammals, specifically California sea lions and harbor seals, from pile driving as a physical disturbance and strike stressor. Background information on physical disturbance and strike stressors is provided in Appendix F. Adverse effects to marine mammals from pile driving activities as an acoustic stressor are addressed in Section 3.7.3.2.3.

3.7.3.6 Entanglement Stressors

Table 3.7-20 summarizes the potential adverse effects from entanglement stressors on marine mammals as the result of proposed military readiness activities within the Study Area. This analysis includes the potential adverse effects from three types of MEM: wires and cables, decelerators/parachutes, and subsurface objects (e.g., nets). The analysis is also applicable to cables installed as part of range sustainment and modernization activities. The number and location of wires and cable and decelerators/parachutes used during military readiness activities are provided in Table 3.0-24 (wires and cables) and Table 3.0-26 (decelerators/parachutes).

A small number of in-water training and testing activities would deploy subsurface obstacles, including nets, as part of an avoidance activity. The activities would avoid sensitive habitats and high vessel traffic areas, and all avoidance "targets" used in the activity would be recovered at the end of the exercise. Entanglement is extremely unlikely to occur for the reasons described in Table 3.7-20. Therefore, the effects of entanglement in submerged wires and cables, decelerators/parachutes, and nets or other obstacles on marine mammals are not reasonably foreseeable, and further analysis is not warranted. Background information on entanglement stressors is provided in Appendix F.

Table 3.7-20: Entanglement Stressors Summary Information

Sub-Stressor	Summary
Wires and cables	Wires and cables are unlikely to adversely affect marine mammals for the following reasons: • The chance that an individual animal would encounter expended cables or wires is low based on (1) the fact that the wires and cables will sink to the seafloor upon release, (2) relatively few marine mammal species forage on the seafloor, particularly in the deeper waters where wires and cables would be likely to reside, and (3) expended wires and cables would be sparsely distributed throughout the Study Area. • It is very unlikely that an animal would become entangled even if it encountered a cable or wire while it was sinking or upon settling to the seafloor. • A marine mammal would have to swim through loops, become twisted within the cable or wire, or in the case of mysticetes, get the cable or wire stuck in their baleen to become entangled, and given the properties of the expended wires (low breaking strength, sinking rates, and resistance to coiling or looping) this seems unlikely. Wires and cables resting on unconsolidated soft sediments (e.g., sand or silt) are likely to become partially or completely buried over time by shifting sediments, further reducing the likelihood that a marine mammal would encounter an expended wire or cable.
Decelerators/ parachutes	Entanglement of a marine mammal in a decelerator/parachute assembly at the surface, within the water column, or at the seafloor would be unlikely for the following reasons: • Most decelerators/parachutes are small and their distribution in the Study Area would be sparse. • A decelerator/parachute would have to land directly on an animal, or an animal would have to swim into a floating decelerator/parachute to become entangled within the cords or fabric while the decelerator/parachute is floating at the surface or sinking through the water column. • Most small and medium decelerators/parachutes would be expended in deep ocean areas and sink to the bottom relatively quickly, reducing the likelihood of encounter by marine mammals that occur predominantly in nearshore waters. • The main potential for entanglement is with large and extra-large decelerators/parachutes. While these larger parachutes would eventually sink and flatten on the seafloor, there is the potential that these decelerators/parachutes could remain suspended in the water column before sinking or billow at the seafloor for a longer period of time before flattening. The longer parachute lines pose an entanglement risk as well. Nevertheless, larger decelerators/parachutes would ultimately sink and become inaccessible in deeper waters to marine mammals, and the likelihood of encounter at the surface and in the water column is low. • Once on the seafloor, decelerators/parachutes on unconsolidated soft sediments (e.g., sand or silt) are likely to become partially or completely buried over time by shifting sediments, further reducing the likelihood that a marine mammal would encounter an expended decelerator/parachute.

Table 3.7-20: Entanglement Stressors Summary Information (continued)

Sub-Stressor	Summary
Cables Installed during Range Sustainment and Modernization Activities	Cables installed on the seafloor as part of this activity are highly unlikely to result in entanglement of a marine mammal for the following reasons: • The cables installed at underwater ranges are thick (approximately 3 inches in diameter), armored for durability and abrasion resistance, and inflexible, highly unlikely to loop or coil during installation. • Most marine mammals do not forage on the seafloor and would not encounter the cables after installation. • The cable laying process occurs once, not annually, and typically lasts for approximately 40 days for range installation, and about 1 week for the installation of fiber optic cables. • The fiber optic cables installed at Kaneohe Bay, west of Kauai, and off San Clemente Island are narrower (about 1 inch in diameter) but also relatively inflexible and resistant to looping in the water column. • The cables would be installed from a slowly moving (1 – 5 knots) cable laying vessel.
Nets used during obstacle avoidance activities	Although the use of submerged nets during military readiness activities represents a potential risk of entanglement to marine mammals, entanglement is extremely unlikely to occur for the following reasons: • Proposed mitigation and monitoring measures would reduce the potential that a marine mammal would encounter a net. • Nets are deployed in the water for a relatively brief period of time (hours), further reducing the likelihood of encounter. • Nets would always be tethered to one for more vessels and quickly retrievable if a marine mammal were to be sighted. • The area would be observed prior to and during net deployment. • There are relatively low densities of marine mammals, particularly ESA-listed species, in the vicinity of Navy obstacle avoidance exercises.

3.7.3.7 Ingestion Stressors

Table 3.7-21 summarizes the potential adverse effects of ingestion stressors due to the release of MEM used during military readiness activities within the Study Area. This analysis includes the potential adverse effects from the following types of MEM: non-explosive practice munitions (small- and medium-caliber), post detonation fragments from explosive munitions, fragments from targets hit by munitions, chaff, and flare casings and end caps. Refer to Tables 3.0-18 through 3.0-21 for numbers of MEM used in the Study Area. There are no reasonably foreseeable adverse effects from ingestion stressors on marine mammals (Table 3.7-21), therefore further analysis is not warranted. Background information on ingestion stressors is provided in Appendix F.

Table 3.7-21: Ingestion Stressors Summary Information

Sub-Stressor	Summary
Military expended materials – munitions	Ingestion of smaller expended munitions is not expected for any species of marine mammal. However, species that forage on the seafloor where expended munitions will reside are at greater risk of encountering and possibly ingesting smaller munitions. Ingestion of munitions is not expected for the following reasons: • General types of non-explosive practice munitions include projectiles, missiles, and bombs. Of these, only small- or medium-caliber projectiles (up to 2.25 inches in diameter) would be small enough for a marine mammal to ingest, reducing the quantity of expended munitions with the potential to be ingestions stressors. • Munitions are mainly composed of solid metal materials and would quickly and directly sink through the water column and settle on the seafloor, becoming inaccessible to most if not all marine mammals, depending on water depth. • Upon detonation explosive munitions (e.g., demolition charges, projectiles, missiles, and bombs) would release fragments of metal and other materials into the marine environment. Fragments would result from fractures in the munitions casing and would vary in size and quantity depending on the type and size of the munition. Typical sizes of fragments are unknown; however, some fragments would likely be too large for a marine mammal to ingest, and others would be so small as to be undetectable. • Solid metal fragments from explosive munitions would sink quickly to the seafloor, making them unavailable to marine mammals as ingestions stressors. • Munitions and munitions fragments residing on the seafloor in unconsolidated soft sediments (e.g., sand or silt) would likely become partially or complete buried over time as sediments shift. • Most explosive munitions and many non-explosive munitions are expended more than 12 NM from shore where waters throughout the Study Area are deeper than the foraging depths of marine mammals that forage on the seafloor, and under these circumstances there would be no potential for ingestion.
Military expended materials other than munitions	Most MEM other than munitions (e.g., chaff, plastic flare caps) that remain floating on the surface or in the water column are too small to pose a risk of intestinal blockage to any marine mammal that happened to encounter it and then ingested it. The adverse effects of ingesting MEM other than munitions would be limited to cases where an individual marine mammal might consume an indigestible item too large to be passed through the gut (e.g., a small decelerator/parachute). This is unlikely to occur for the following reasons: • With the possible exception of decelerators/parachutes that may appear similar to the prey of some species such as sperm whales and beaked whales, marine mammals would not be preferentially attracted to floating MEM as potential prey. • Most small and medium decelerators/parachutes would be expended in deep ocean areas and sink to the bottom relatively quickly, reducing the likelihood of encounter by marine mammals. • MEM would most likely only be incidentally ingested by individuals foraging on the bottom where these items were released, and most MEM are expended in deep offshore waters (i.e., more than 3 and often more than 12 NM from shore) where the seafloor is inaccessible to most marine mammals, and in particular benthic foraging species.

3.7.3.8 Secondary Stressors

The terms “indirect” and “secondary” do not imply reduced severity of environmental consequences but instead describe how a marine mammal may be exposed to the stressor. Potential indirect adverse effects on marine mammals would be through effects on their habitat or prey. Stressors from military readiness activities that could pose indirect effects on marine mammals via habitat or prey include (1) explosives, (2) explosives byproducts and unexploded munitions, (3) metals, (4) chemicals, and (5) transmission of disease and parasites (see Table 3.7-22).

Adverse effects on abiotic habitat, specifically sediments and water, are analyzed in Section 3.2. Indirect effects from explosive materials, byproducts, and unexploded munitions on marine mammals from chemical constituents in sediments are possible only if a marine mammal were to ingest the substantial amount of sediment. Section 3.7.3.7 explains why ingestion of MEM, which would include chemicals, in sediments is unlikely. Marine mammals as a group feed on a wide variety of prey ranging from small crustaceans, the primary prey for baleen whales, to other marine mammals (e.g., some killer whales prey on seals and even large whales). Appendix C describes foraging habitats and behaviors for marine mammals in the Study Area. For an adverse effect on prey to result in an indirect adverse effect on a marine mammal species, the population or a regional subpopulation of the prey (e.g., a fishery) would need to be significantly adversely affected. The analysis presented in Section 3.4 on invertebrates and Section 3.5 on fishes concluded that there would be less than significant to no direct adverse effects on those species. Therefore, there would be no potential for indirect adverse effects on marine mammals.

There are no reasonably foreseeable adverse effects from secondary stressors on marine mammals (Table 3.7-22), therefore further analysis is not warranted. Background information on secondary stressors is provided in Appendix F.

Table 3.7-22: Secondary Stressors Summary Information

Sub-Stressor	Summary
Explosives	Underwater explosions could adversely affect other species in the food web, including prey species that marine mammals feed upon. • The adverse effects of explosions would differ depending on the type of prey species and proximity to the detonation site. • In addition to physical effects of an underwater blast, prey might have behavioral reactions to underwater sound. For instance, prey species might exhibit a strong startle reaction to explosions that might include swimming to the surface or scattering away from the source. • Any of these scenarios would be temporary, only occurring as a result of the explosion and would only affect a small number of prey species, not a regional population. No lasting effects on the abundance or availability prey or the pelagic food web would be expected.
Explosives byproducts and unexploded munitions	Explosives byproducts are the materials remaining after the explosives in a munition combust. With a high-order detonation, all explosives materials are consumed leaving mostly non-toxic gasses including nitrogen, carbon dioxide, hydrogen, and water vapor with small amounts of other gases. No secondary effects on marine mammals from high-order detonations of explosives would occur. • Low-order detonations and unexploded munitions have the potential to indirectly affect marine mammals by introducing unconsumed explosives into marine sediments that degraded into chemical constituents over time and remain in benthic habitat. • Previous studies have shown that concentrations of explosives degradation products remain in close proximity to the degrading munition. • Only those species that commonly forage at the seafloor have the potential to encounter degrading munitions that could be leaching chemical constituents from exposed explosives materials. • Most munitions are expended in deep, offshore waters below the photic zone and far from benthic foraging habitat, limiting potential exposure to marine mammal prey.

Table 3.7-22: Secondary Stressors Summary Information (continued)

Sub-Stressor	Summary
Metals	Several military readiness activities expend items composed of metals into the marine environment that are potentially harmful in higher concentrations. • Metals on the seafloor would degrade slowly over years to decades, limiting any potential for concentrations to reach toxic levels in sediments. • Most metals used in MEM occur naturally in sediments.
Chemicals	Several military readiness activities introduce chemicals into the marine environment that are potentially harmful in higher concentrations; however, rapid dilution would occur, and toxic concentrations are unlikely to be encountered. • Chemicals introduced are principally from flares and propellants for missiles and torpedoes. Properly functioning flares, missiles, and torpedoes combust nearly all of their propellants, leaving benign or readily diluted soluble combustion byproducts (e.g., hydrogen cyanide). • Operational failures may allow propellants and their degradation products to be released into the marine environment. Flares and missiles that operationally fail may release perchlorate, which is highly soluble in water, persistent, and affects metabolic processes in many plants and animals if in sufficient concentration. • Such concentrations are not likely to persist in the ocean. • Torpedoes are typically recovered along with any remaining fuel.
Transmission of Marine Mammal Diseases and Parasites	Selected Navy training activities may include trained marine mammals as part of the activity, and these marine mammals have the potential to interact with wild animals and potentially transmit diseases or parasites. As summarized below, the Navy takes extensive precautions to ensure this would not happen.

3.7.4 Summary of Potential Effects on Marine Mammals

3.7.4.1 Combined Effects of All Stressors Under Alternative 1

This section evaluates the potential for combined adverse effects of all the stressors from the Proposed Action. The analysis and conclusions for the potential adverse effects from each of the individual stressors are discussed in Sections 3.7.3.2 through 3.7.3.7 and, for ESA-listed species, summarized in Section 3.7.5. Stressors associated with military readiness activities do not typically occur in isolation but rather occur in some combination. For example, mine neutralization activities include elements of acoustic, physical disturbance and strike, entanglement, ingestion, and secondary stressors that are all coincident in space and time. An analysis of the combined adverse effects of all stressors considers the potential consequences of additive stressors as described below. This analysis makes the reasonable assumption that most exposures to stressors are non-lethal, and instead focuses on consequences potentially affecting marine mammal fitness (e.g., physiology, behavior, reproductive potential).

There are generally two ways that a marine mammal could be exposed to multiple additive stressors. The first would be if a marine mammal were exposed to multiple sources of stress from a single event or activity within a single military readiness event (e.g., a mine warfare event may include the use of a sound source and a vessel). The potential for a combination of these adverse effects from a single activity would depend on the range to effects of each of the stressors and the response or lack of response to that stressor. Most of the proposed activities generally involve the use of moving platforms (e.g., ships, torpedoes, aircraft) that may produce one or more stressors; therefore, it is likely that if a marine mammal were within the potential range of those activities, it may be adversely affected by multiple stressors simultaneously. Individual stressors that would otherwise have minimal to no effect may combine to have a measurable response. However, due to the wide dispersion of stressors, speed of the platforms, general dynamic movement of many military readiness activities, and behavioral avoidance exhibited by many marine mammal species, it is very unlikely that a marine mammal would remain in the potential range of multiple sources or sequential events. Exposure to multiple stressors is more likely to occur at an instrumented range where military readiness activities using multiple platforms may be concentrated during a particular event. In such cases involving a relatively small area on an instrumented range, a behavioral reaction resulting in avoidance of the immediate vicinity of the activity would reduce the likelihood of exposure to additional stressors. Nevertheless, the majority of the proposed activities are unit-level training and small testing activities which are conducted in the open ocean. Unit-level exercises occur over a small spatial scale (one to a few square miles) and with few participants (usually one or two) or short duration (the order of a few hours or less). The majority of testing activities are similarly small in scale with one or two platforms and acoustic sources and short in duration.

Secondly, a marine mammal could be exposed to multiple military readiness activities over the course of its life, however, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individual marine mammal would be exposed to stressors from multiple activities within a short timeframe. However, animals with a home range intersecting an area of concentrated activity have elevated exposure risks relative to animals that simply transit the area through a migratory corridor.

Multiple stressors may also have synergistic effects. For example, marine mammals that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical disturbance and strike stressors via a decreased ability to detect and avoid threats, such as an approaching vessel. Marine mammals that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to entanglement and physical strike stressors via malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple stressors, the synergistic adverse effects from the combination of stressors are difficult to predict in any meaningful way.

Research and monitoring efforts have included: before-, during-, and after-event observations and surveys; data collection through conducting long-term studies in areas of military readiness activity; occurrence surveys over large geographic areas; biopsy of animals occurring in areas of military readiness activity; and tagging studies where animals are exposed to stressors from training and testing activities. These efforts are intended to contribute to the overall understanding of what effects may be occurring overall to animals in these areas. To date, the findings from the research and monitoring (Palacios et al., 2021; U.S. Department of the Navy, 2020a, 2021a, 2022a, 2022b) and the regulatory conclusions from previous analyses by NMFS (National Marine Fisheries Service, 2020a, 2020b, 2020c, 2022, 2023) are that majority of from military readiness activities are not expected to have adverse effects on the fitness of any individuals or long-term consequences to populations of marine mammals.

Although potential adverse effects on certain marine mammal species from military readiness activities may include behavioral responses, or injury to individuals, those injuries are not expected to lead to long-term consequences for populations.

The analysis conclusions for combined effects of all stressors on marine mammals resulting from military readiness activities are consistent with a determination of less than significant adverse effects on marine mammals.

3.7.4.2 Combined Effects of All Stressors Under Alternative 2

Under Alternative 2, there would be no meaningful difference in the combined effects of all stressors compared to Alternative 1. However, since the level of activities in Alternative 1 are expected to fluctuate from year to year, and the level in Alternative 2 is proposed to be a maximum level every year, the adverse effects from all stressors would be expected to be greater under Alternative 2 compared to Alternative 1 over a seven-year period. Nevertheless, the combined effects from all stressors under Alternative 2 are not meaningfully different from Alternative 1, and therefore the conclusions for significance, ESA-listed species, and critical habitat are the same under Alternative 2.

3.7.5 Endangered Species Act Determinations

Based on the potential co-occurrence of marine mammals and military readiness activities under Alternative 1, the activities may affect the blue whale, fin whale, western North Pacific gray whale, sei whale, humpback whale (Mexico and Central America DPSs), sperm whale, Southern Resident killer whale, Guadalupe fur seal, MHI insular false killer whale, Hawaiian monk seal, and southern sea otter as defined by the ESA. Military readiness activities may affect MHI insular false killer whale, humpback whale (Mexico and Central America DPSs), and Hawaiian monk seal critical habitats, because some activities are likely to occur in critical habitats and have the potential to temporarily affect one or more of the essential features defining those habitats. Military readiness activities would not result in the destruction or adverse modification of Southern Resident killer whale critical habitat, because the activities are not expected to occur in the critical habitat or affect the essential features of the critical habitat.

The summary of effects determinations for each ESA-listed species is provided in Table 3.7-23.

3.7.6 Marine Mammal Protection Act Determinations

Letters of Authorization are being sought in accordance with the MMPA from NMFS for certain military readiness activities (the use of sonar and other transducers, pile driving, vessels, and explosives), as described under the Alternative 1. The use of sonar and other transducers may result in Level A and Level B harassment of certain marine mammals. Pile driving may result in Level B harassment of California sea lions and harbor seals. The use of explosives may result in Level A harassment, Level B harassment, and mortality of certain marine mammals. The use of vessels may result in Level A harassment or mortality of certain large whales due to physical strike. Noise from the launch of missiles and aerial vehicles at SNI (PMSR) and PMRF and artillery firing at PMRF may results in Level B harassment of certain hauled-out pinnipeds.

Vessel noise, aircraft noise, the use of in-water electromagnetic devices, high-energy lasers, high-power microwave devices, in-water devices, seafloor devices, wires and cables, decelerators/parachutes, and MEM are not expected to result in Level A or Level B harassment of any marine mammals.

Table 3.7-23: Marine Mammal ESA Effect Determinations for Military Readiness Activities Under Alternative 1 (Preferred Alternative)

Species	*Designation Unit*	Overall Determination	Acoustic and Explosive Stressors							Energy Stressors			Physical Disturbance and Strike Stressors				Entanglement Stressors		Ingestion Stressors	Indirect Effects
			Sonar & Other Transducers	Air Guns	Pile Driving	Vessel Noise	Aircraft Noise	Weapons Noise	Explosives	In-Water Electromagnetic Devices	High Energy Lasers	High-Power Microwave	Vessels & In-Water Devices	Military Expended Material	Seafloor Devices	Pile Driving	Wires & Cables	Decelerators/Parachutes	Military Expended Materials	
Blue whale	Eastern North Pacific	MA	MA	MA	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
	Central North Pacific	MA	MA	MA	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
Fin whale	California, Oregon, and Washington	MA	MA	MA	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
	Hawaiian	MA	MA	MA	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
Gray whale	Western North Pacific	MA	MA	NE	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
Sei whale	Eastern North Pacific	MA	MA	NE	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
	Hawaii	MA	MA	NE	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
Humpback whale	Mexico and Central America DPSs	MA	MA	MA	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
	Critical habitat	MA	NE	NE	n/a	NE	NE	NE	MA	NE	NE	NE	NE	MA	MA	n/a	MA	MA	MA	MA
Sperm whale	California, Oregon, and Washington	MA	MA	MA	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
	Hawaii	MA	MA	MA	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
False killer whale	Main Hawaiian Islands Insular DPS	MA	MA	NE	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
	Critical habitat	MA	NE	MA	n/a	NE	NE	NE	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
Killer whale	Eastern North Pacific Southern Resident	MA	MA	MA	n/a	MA	MA	MA	MA	NE	NE	NE	NE	NE	NE	n/a	NE	NE	NE	MA
	Critical habitat	MA	NE	MA	n/a	NE	NE	NE	MA	NE	NE	NE	NE	NE	NE	n/a	NE	NE	NE	NE
Hawaiian monk seal	Throughout its range	MA	MA	MA	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
	Critical habitat	MA	NE	NE	n/a	NE	NE	NE	MA	NE	NE	NE	NE	MA	MA	n/a	MA	MA	MA	MA
Guadalupe fur seal	Throughout its range	MA	MA	MA	n/a	MA	MA	MA	MA	NE	NE	NE	MA	MA	MA	n/a	MA	MA	MA	MA
Southern sea otter	California	MA	NE	NE	n/a	NE	NE	NE	NE	NE	NE	NE	MA	NE	NE	n/a	NE	NE	NE	NE

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3.8 Reptiles

REPTILES SYNOPSIS

Stressors on reptiles that could result from the Proposed Action were considered, and the following conclusions have been reached for the Preferred Alternative (Alternative 1):

Acoustic: Military readiness activities have the potential to expose reptiles to multiple types of acoustic stressors, including sonars; other transducers; air guns; pile driving; and vessel, aircraft, and weapons noise. Reptiles could be affected by only a limited portion of acoustic stressors because reptiles have limited hearing abilities. Exposures to sound-producing activities present risks that could include hearing loss, auditory masking, physiological stress, and changes in behavior, while non-auditory injury and mortality are unlikely to occur under realistic conditions. As such, effects would be less than significant.

Explosive: Explosions in the water or near the water's surface present a risk to reptiles located in close proximity to the explosion, because the shock waves produced by explosives could cause injury or result in the death. If further away from the explosion, impulsive, broadband sounds introduced into the marine environment may cause hearing loss, masking, physiological stress, or changes in behavior. Effects would be less than significant.

Energy: All life stages of some sea turtles have been documented to orient to Earth's magnetic field for directional swimming, positioning within ocean currents, and imprinting on the magnetic field of their natal beaches as hatchlings when they return to nest at maturity. Sea snakes rely on environmental cues such as currents and visual orientation, and electromagnetic fields are likely less important. The magnetic fields generated by electromagnetic devices used in military readiness activities are of relatively minute strength. Responses to fields and electrical pulses by marine reptiles may include no reaction, avoidance, habituation, changes in activity level, or attraction, but the range of effects would be small and only occur near the source. High-energy lasers and microwaves are directed at surface targets and would only affect reptiles very near the surface if the laser missed its target, and the potential for exposure to these energy weapons is negligible. Energy stressors would not have reasonably foreseeable adverse effects on reptiles.

Physical Disturbance and Strike: Vessels, in-water devices, and seafloor devices present a risk for collision with sea turtles, particularly in coastal areas where densities are higher. Strike potential by expended materials is statistically small. Because of the low numbers of sea turtles potentially impacted by activities that may cause a physical disturbance and strike, population-level effects are unlikely. Sea snakes considered in this analysis rarely occur in the Study Area, and few, if any, effects are anticipated from physical disturbance and strike stressors on sea snakes. The effects of physical disturbance and strike stressors would be less than significant.

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Entanglement: Sea turtles could be exposed to multiple entanglement stressors associated with military readiness activities. The potential for effects is dependent on the physical properties of the expended materials and the likelihood that a sea turtle would encounter a potential entanglement stressor and then become entangled in it. Physical characteristics of wires and cables and decelerators/parachutes combined with the sparse distribution of these items throughout the Study Area indicates a very low potential for sea turtles to encounter and become entangled in them. Underwater cables used for range modernization in general are installed slowly and quickly fall to the seafloor where they are not an entanglement hazard. Long-term effects on individual sea turtles and sea turtle populations from entanglement stressors are not anticipated. Sea snakes considered in this analysis rarely occur in the Study Area; few, if any, effects are anticipated from entanglement stressors on individuals, and no population-level effects would occur. Entanglement stressors would not have reasonably foreseeable adverse effects on reptiles.

Ingestion: Military readiness activities have the potential to expose reptiles to multiple ingestion stressors and associated effects in nearshore and offshore training and testing locations. The likelihood and magnitude of effects depends on the physical properties of the military expended items, the feeding behaviors of sea turtles that occur in the Study Area, and the likelihood that a sea turtle would encounter and incidentally ingest the items. Adverse effects from ingestion of military expended materials would be limited to the unlikely event that a sea turtle would be harmed by ingesting an item that becomes embedded in tissue or is too large to be passed through the digestive system. The likelihood that a sea turtle would encounter and subsequently ingest a military expended item is considered low. Long-term consequences to sea turtle populations from ingestion stressors associated with the Proposed Action are not anticipated. Sea snakes considered in this analysis rarely occur in the Study Area; few, if any, effects are anticipated from ingestion stressors on individuals, and no population-level effects would occur. As such, effects would be less than significant.

3.8.1 Introduction

The following sections describe the reptiles found within the Study Area and evaluate the potential effects of the proposed military readiness activities on them.

The 2018 HSTT and 2022 PMSR EIS/OEISs provided a general overview of reptile behavior, sea turtle hearing and vocalizations, and general threats to reptile species. New information since the publication of the 2018 HSTT and 2022 PMSR EIS/OEISs is included below to better understand potential stressors and effects on reptiles resulting from military readiness activities. In addition to new information, this Draft EIS/OEIS considers additional activities and areas where military readiness activities may occur within the HCTT Study Area, and how the alternatives may potentially affect reptiles. For additional details on species discussed in this section, please see Appendix C.

3.8.2 Affected Environment

The affected environment provides the context for evaluating the effects of the proposed military readiness activities on reptiles. Background information provides brief summaries of group size, habitat use, dive behavior, hearing and vocalization, and threats that affect or have the potential to affect reptiles within the Study Area. Additional information is provided in Appendix C. Additional information on hearing and vocalization is provided in Appendix D. Protected species listed under the ESA are described in Section 3.8.2.2. Only one non-ESA-listed species, the yellow-bellied sea snake, is discussed in Section 3.8.2.3.

3.8.2.1 General Background

Sea turtles are highly migratory, long-lived reptiles that occur throughout the open-ocean and coastal regions of the Study Area. Generally, sea turtles are distributed throughout tropical to subtropical latitudes, with some species extending into temperate seasonal foraging grounds. Leatherback sea turtles are partially endothermic, where they can tolerate colder waters relative to other sea turtle species. This allows for a much greater range at higher latitudes than other sea turtles, which are generally exothermic and therefore less tolerant of colder waters. In general, sea turtles spend most of their time at sea, with female turtles returning to land to nest.

Sea snakes, also known as coral reef snakes, form a subfamily of venomous snakes closely related to the cobra and other terrestrial venomous snakes of Australia (Heatwole, 1999). Most species of sea snakes are adapted to a fully aquatic life, with few records on land (Udyawer et al., 2013). Only the yellow-bellied sea snake is thought to occur within the HCTT Study Area. Sea snakes have a passive drifting ecology and occur almost exclusively in open ocean areas outside of breeding locations. Their sightings, however, are typically reported nearshore and coastal areas because of the difficulty in sighting these sea snakes in open waters.

Habitat and distribution for sea turtles and sea snakes vary depending on species and life stages and are discussed further in the species profiles and summarized in the following sections, with more detail in Appendix C.

3.8.2.2 Endangered Species Act-Listed Species

There are five species of sea turtles listed as endangered or threatened under the ESA known to occur in the Study Area. Summaries of each species' listing status, presence, occurrence, and distribution in the Study Area are provided in Table 3.8-1. Critical habitat for the leatherback sea turtle and proposed critical habitat for green sea turtles in the Study Area is shown in Figure 3.8-1, Figure 3.8-2, Figure 3.8-3, Figure 3.8-4, and Figure 3.8-5. Detailed species descriptions, including status and management, habitat and geographic range, population trends, predator and prey interactions, and species-specific threats are provided in Appendix C.

Table 3.8-1: Current Regulatory Status and Presence of Endangered Species Act-Listed Reptiles in the Study Area

Species Name and Regulatory Status				Presence in Study Area		
Common Name	**Scientific Name**	**Distinct Population Segment**	**Endangered Species Act Status**	**Nearshore and Coastal Waters Hawaiian Islands**	**Open Ocean**	**Nearshore and Coastal Waters of California**
Family Cheloniidae (hard-shelled sea turtles)						
Green Sea Turtle	*Chelonia mydas*	Central North Pacific distinct population segment	Threatened[1,2]	Yes[5]	Yes	No
		East Pacific distinct population segment		No		Yes
Hawksbill Sea Turtle	*Eretmochelys imbricata*		Endangered[2]	Yes[5]	Yes	No
Loggerhead Sea Turtle	*Caretta caretta*	North Pacific distinct population segment	Endangered[3]	No	Yes	No
Olive Ridley Sea Turtle	*Lepidochelys olivacea*		Threatened, Endangered[4]	Yes[6]	Yes	No
Family Dermochelyidae (leatherback sea turtle)						
Leatherback Sea Turtle	*Dermochelys coriacea*		Endangered	Yes	Yes	No

[1] On April 6, 2016, the National Marine Fisheries Service and U.S. Fish and Wildlife Service listed the Central West Pacific, Central South Pacific, and Mediterranean distinct population segments as endangered, while listing the other eight distinct population segments (Central North Pacific, East Indian-West Pacific, East Pacific, North Atlantic, North Indian, South Atlantic, Southwest Indian, and Southwest Pacific) as threatened. The HCTT Study Area shares portions of the geographic extents identified for the Central North Pacific and East Pacific distinct population segments.
[2] Research suggests that green and hawksbill sea turtles may be present in the Study Area in all life stages (Hanna, 2021; National Park Service, 2023; Sloan et al., 2022; Teresa, 2021).
[3] The only distinct population segment of loggerheads that occurs in the Study Area—the North Pacific Ocean distinct population segment—is listed as Endangered.
[4] National Marine Fisheries Service and U.S. Fish and Wildlife Service only consider the breeding populations of Mexico's Pacific coast as Endangered. Other populations found in east India, Indo-Western Pacific, and Atlantic are listed as Threatened.
[5,6] Indicates nesting activity within the Study Area portion. Only green sea turtles and hawksbill sea turtles are known to nest regularly in the Study Area. Rare instances of olive ridley nesting occur at Kaneohe Bay (at Marine Corps Base Hawaii).

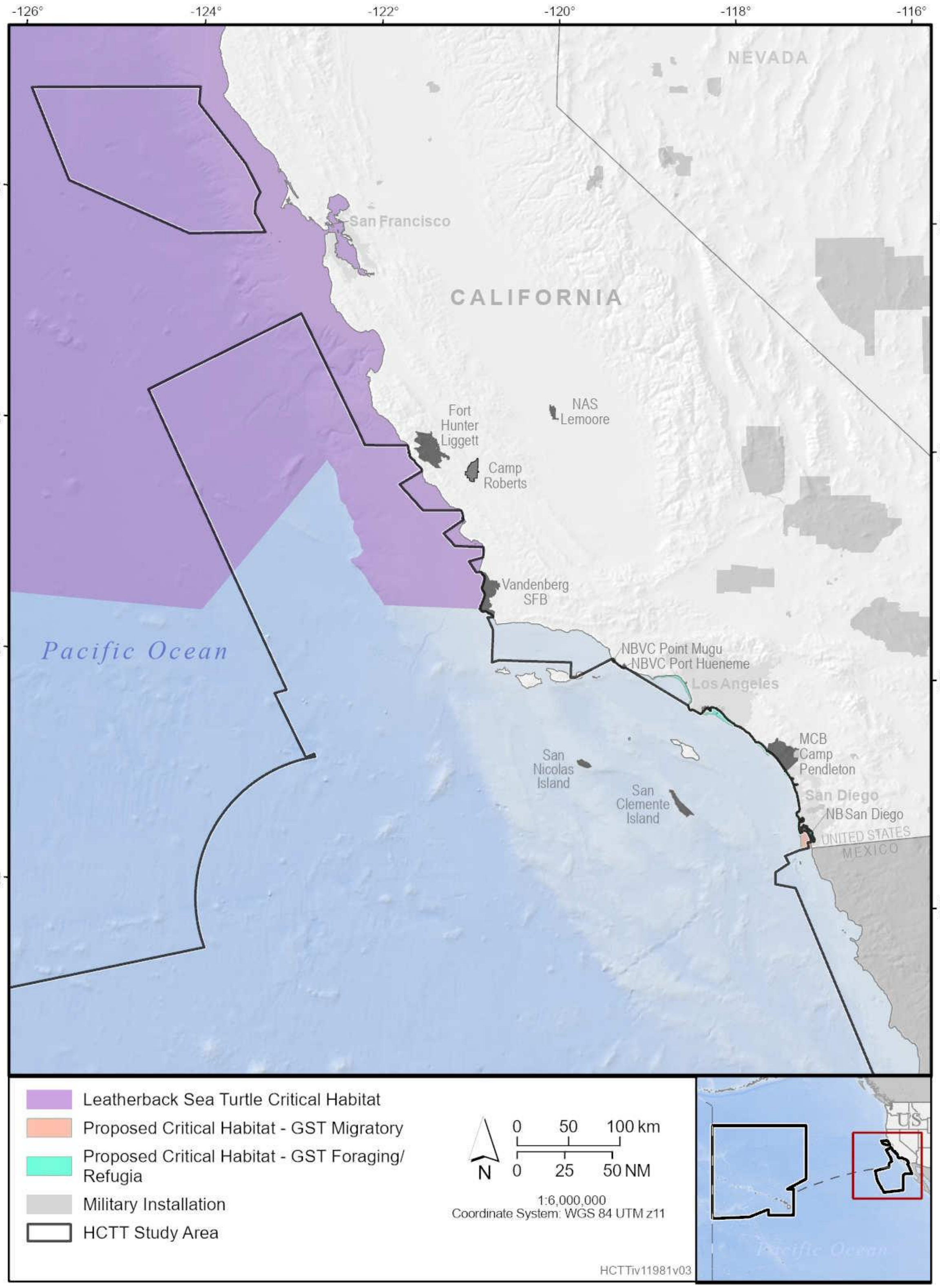


Figure 3.8-1: Leatherback Sea Turtle Critical Habitat and Proposed Green Sea Turtle Critical Habitat in the HCTT Study Area

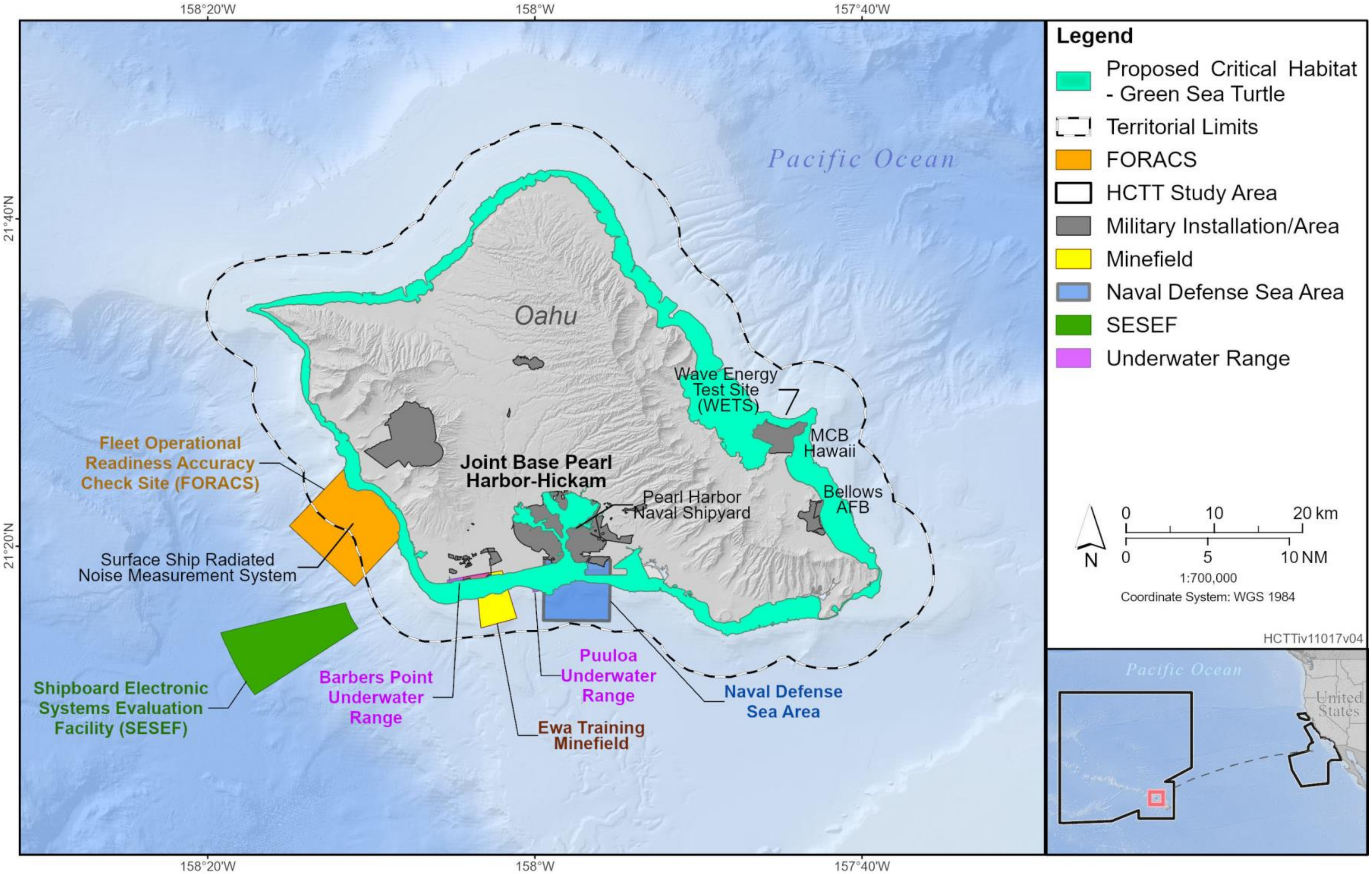


Figure 3.8-2: Proposed Critical Habitat for the Green Sea Turtle Surrounding Oahu

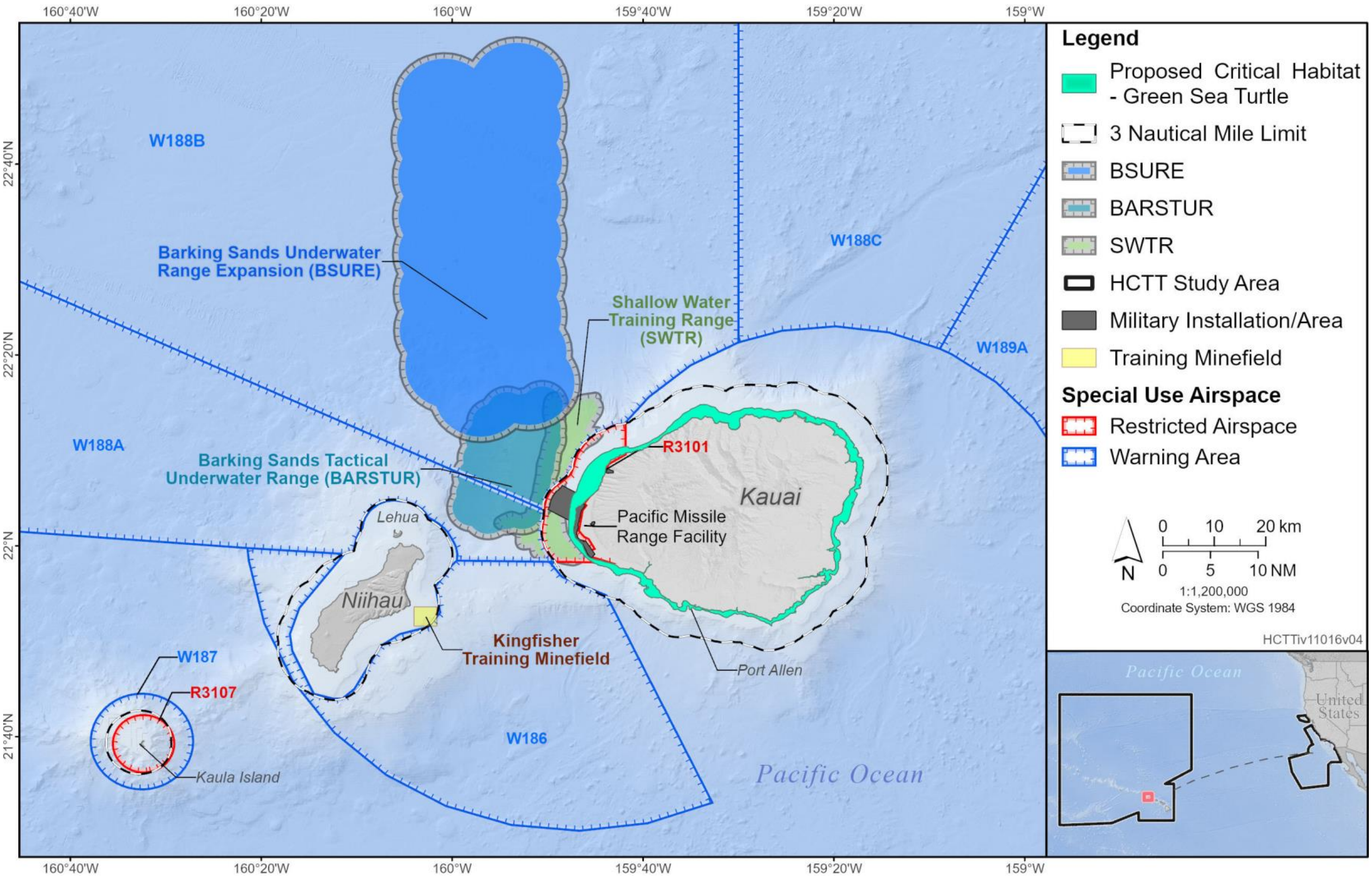


Figure 3.8-3: Proposed Critical Habitat for the Green Sea Turtle Surrounding Kauai

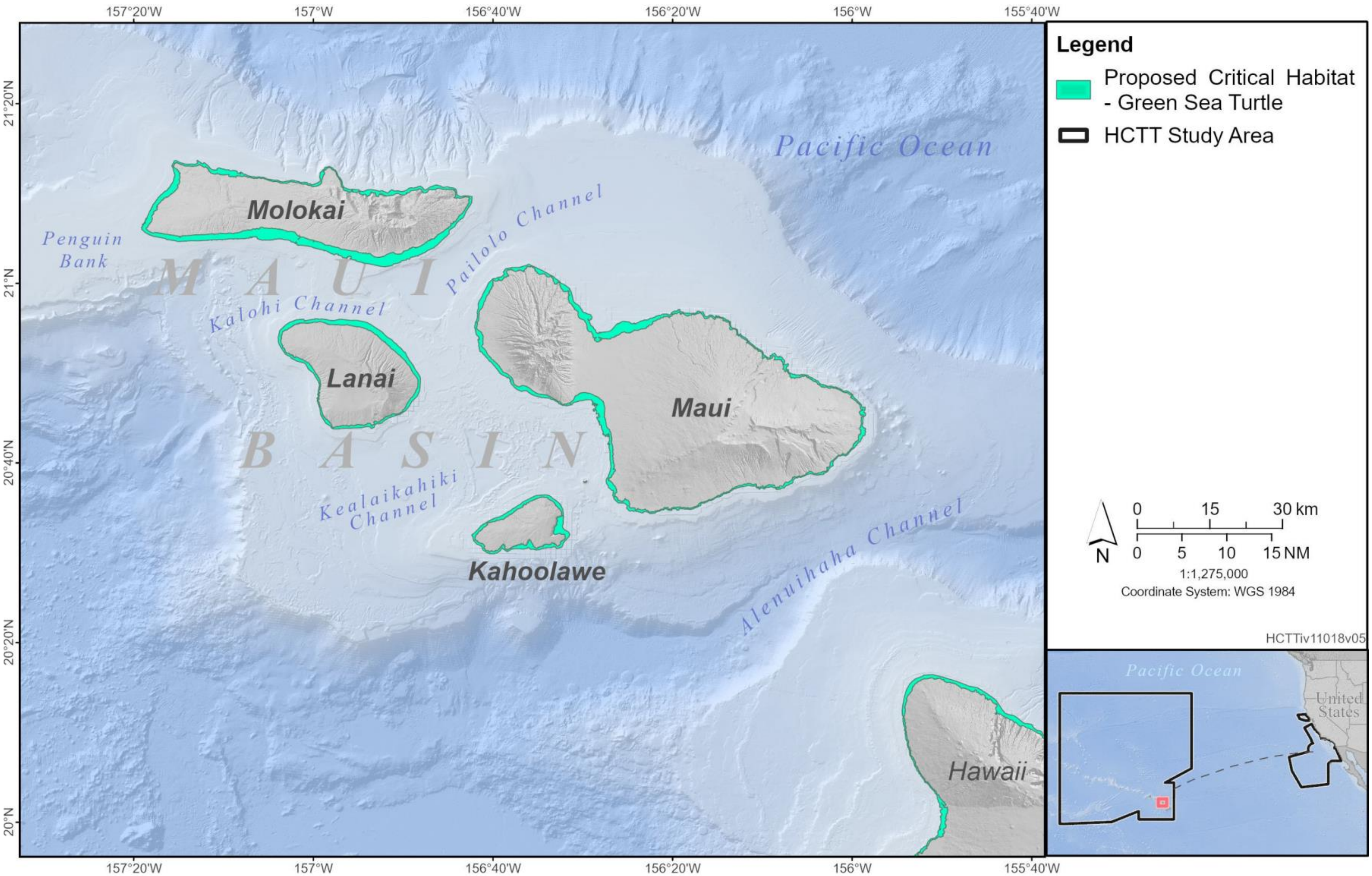
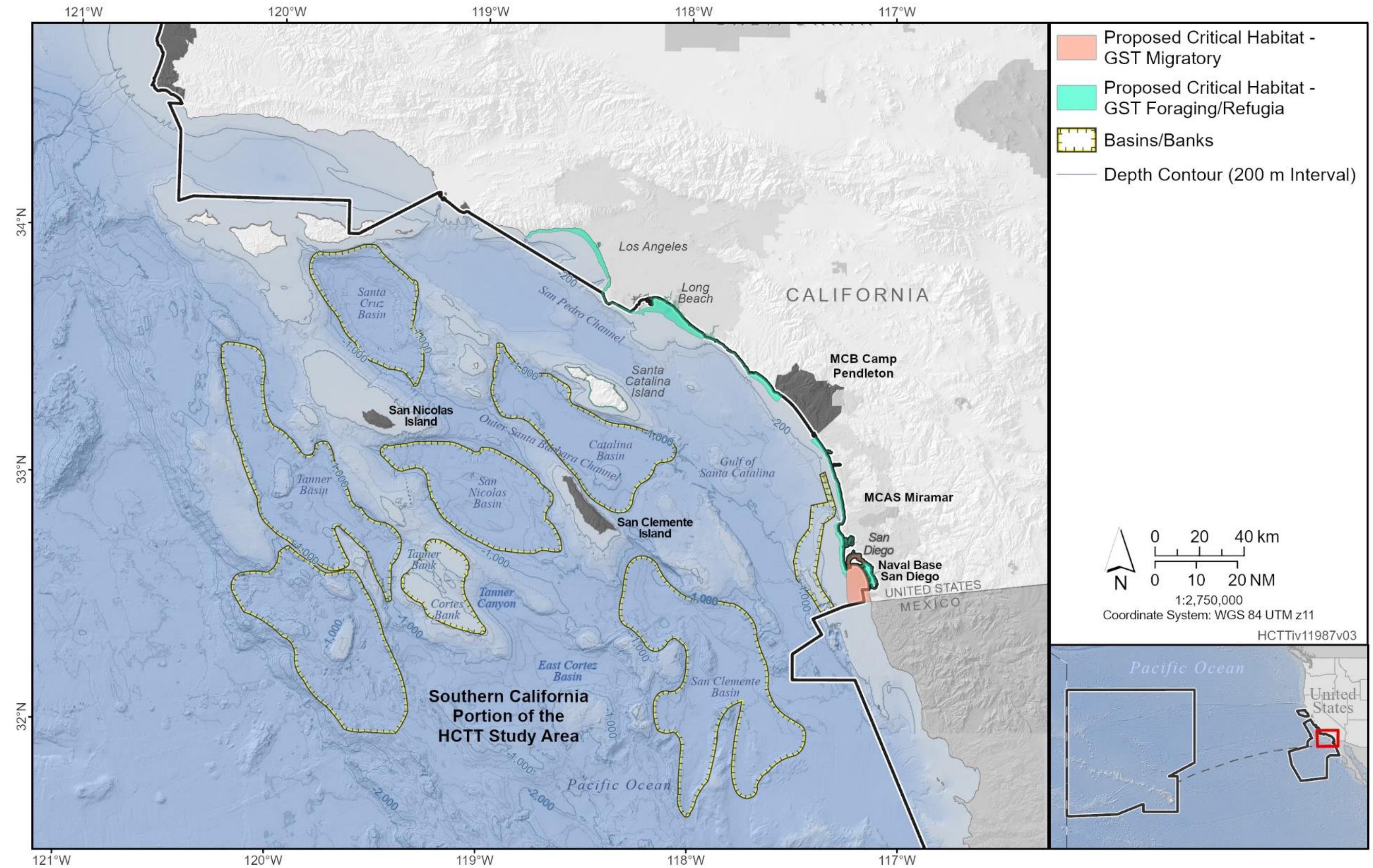


Figure 3.8-4: Proposed Critical Habitat for the Green Sea Turtle Surrounding Maui



Note: GST = Green sea turtle

Figure 3.8-5: Proposed Critical Habitat for the Green Sea Turtle in the California Portion of the HCTT Study Area

3.8.2.3 Species Not Listed under the Endangered Species Act

The only marine reptile species in the Study Area not listed under the ESA is the yellow-bellied sea snake. This species is described in more detail in Appendix C.

3.8.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, baseline conditions of the existing environment for reptiles would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section evaluates how, and to what degree, the activities and stressors described in Chapter 2 and stressors described in Section 3.0.3.3 could potentially affect reptiles known to occur within the Study Area.

The stressors vary in intensity, frequency, duration, and location within the Study Area. General characteristics of all stressors and reptiles' general susceptibilities to stressors are discussed in Section 3.0.3.3, and reptiles' general susceptibilities to stressors are discussed in Section F.1 in Appendix F. Discussion on species ecology and biology is also found within Appendix C. The stressors and substressors analyzed for reptiles include the following:

- **acoustic** (sonar and other transducers, air guns, pile driving, vessel noise, aircraft noise, and weapon noise)
- **explosive** (explosions in-air, explosions in-water)
- **energy** (in-water electromagnetic devices, high-energy lasers, high-power microwave devices)
- **physical disturbance and strikes** (vessels and in-water devices, MEM, seafloor devices)
- **entanglement** (wires and cables, decelerators/parachutes)
- **ingestion** (MEM – munitions, MEM other than munitions)

As noted in Section 3.0.2, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in 40 CFR 1501.3(d). Acoustic, explosive, physical disturbance and strike, and ingestion stressors could have a reasonably foreseeable adverse effect, thus requiring a significance determination. Stressors with no reasonably foreseeable adverse effects remain included in this Draft EIS/OEIS to document and support the analysis leading to this conclusion.

A stressor is considered to have a significant effect on the human environment based on an examination of the context of the action and the intensity of the effect. In the present instance, the effects of the stressors analyzed would be considered significant if the effects have short-term or long-term changes well outside the natural range of variability of species' populations, their habitats, or the natural processes sustaining them; alter population structure, genetic diversity, or other demographic factors; or cause mortality beyond a small number of individuals, resulting in a decrease in population levels. Reptile populations or habitats would be degraded over the long term or permanently such that they would no longer possess sustainable population requirements. Under the ESA, this would result in a jeopardy opinion.

The analysis considers the standard operating procedures and mitigation measures that would be implemented under Alternative 1 and Alternative 2 of the Proposed Action. The standard operating procedures and mitigation that are specific to reptiles are listed in Table 3.8-2.

Table 3.8-2: Standard Operating Procedures and Mitigation for Sea Turtles

Applicable Stressor	Requirements Summary and Protection Focus	Section Reference
Acoustic and Explosive	The Navy will conduct visual observations for in-water events that create underwater sound (e.g., sonar, pile driving, explosives).	Section 5.6.1[1]
	The Action Proponents will not detonate any in-water explosives within a horizontal distance of 350 yd from shallow-water coral reefs and precious coral beds.	Section 5.7.1[2]
	The Navy will not detonate any in-water explosives within a horizontal distance from artificial reefs, biogenic hard bottom, submerged aquatic vegetation, and shipwrecks, except in designated locations where these resources will be avoided to the maximum extent practical.	Section 5.7.2[2]
Physical Disturbance and strike	The Navy will not do the following: 1. Set vessel anchors within an anchor swing circle radius that overlaps shallow-water coral reefs (except in designated anchorages) 2. Place other seafloor devices too close to shallow-water coral reefs 3. Deploy non-explosive ordnance against surface targets too close to shallow-water coral reefs	Section 5.7.1[2]
	The Navy will operate surface vessels in waters deep enough to avoid bottom scouring or prop dredging, with at least a 1-foot clearance between the deepest draft of the vessel (with the motor down) and the seafloor at mean low water. The mitigation will ensure that surface vessels and their propellers do not come into contact with shallow-water coral reefs, artificial reefs, biogenic hard bottom, submerged aquatic vegetation, and shipwrecks.	Section 5.7.2[2]

[1] The mitigation was developed to protect possible indicators of marine mammal and sea turtle presence.
[2] The mitigation was developed to protect specific habitats, which also protects sea turtles that are associated with those habitats.

3.8.3.1 Acoustic Stressors

This section summarizes the potential effects of acoustic stressors used during military readiness activities within the Study Area. The acoustic substressors included for analysis include (1) sonar and other transducers, (2) air guns, (3) pile driving, (4) vessel noise, (5) aircraft noise, and (6) weapons firing.

Table 3.8-3 contains brief information summaries that are relevant to the analyses of effects for each acoustic substressor on reptiles (specifically sea turtles, as data on sea snakes is not available). Details on the updated information in general, as well as effects specific to each substressor, are provided in Appendix D.

The detailed assessment of these acoustic stressors under this proposed action is in Appendix E. Changes in the predicted acoustic effects are due to the following:

- Updates to criteria used to determine if acoustic stressors may cause auditory effects and behavioral responses. Changes to the auditory effects criteria include the weighted non-impulsive sound exposure level thresholds decreased by 22 decibels referenced to 1 micropascal squared seconds (dB re 1 $\mu Pa^2 s$).
- Revisions to the modeling of explosive effects in the Navy Acoustic Effects Model. See the technical report *Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing* (U.S. Department of the Navy, 2024a).
- Updates to data on sea turtle presence, including estimated density of each species or stock (number of animals per unit area), group size, and depth distribution. For additional details, see the technical reports *U.S. Navy Marine Species Density Database Phase IV for the Hawaii-California Training and Testing Study Area* (U.S. Department of the Navy, 2024b), and *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii- California Study Areas* (Oliveira et al., 2024).
- Changes in the locations, numbers, and types of modeled military readiness activities as described in Chapter 2, and associated quantities (hours and counts) of acoustic stressors shown in Section 3.0.3.3.1.
- As discussed in Section 3.8.3, the Action Proponents will implement activity-based mitigation under Alternative 1 and Alternative 2 to reduce potential effects from acoustic stressors on sea turtles. However, the Action Proponents do not reduce the number of model-predicted effects, due to using activity-based mitigation. The Action Proponents will also implement geographic mitigation to reduce potential acoustic effects within important sea turtle habitats, as identified in Table 3.8-3.
- There will be no reduction of model-predicted effects due to animal avoidance of a sound source, unlike in prior analyses.

Table 3.8-3: Acoustic Stressors Information Summary

Substressor	Information Summary
Sonar and other transducers	Sonar and other transducers may result in hearing loss, masking, physiological stress, or behavioral reactions. Behavioral responses can depend on the characteristics of the signal, behavioral state of the animal, sensitivity and previous experience of an individual, and other contextual factors including distance of the source, movement of the source, physical presence of vessels, time of year, and geographic location. • Sea turtles are likely only susceptible to hearing loss when exposed to high levels of sound within their limited hearing range (most sensitive from 100 to 400 Hertz [Hz] and limited over 1 kilohertz [kHz]). This includes low-frequency sonar and other transducers that produce noise below 2 kHz. • Due to the lack of data on non-auditory injuries resulting from sonar and other transducers, the estimated risk is low due to low-frequency sonar, and non-existent from mid-frequency sonar. • Sonar and other transducers would have limited potential for masking. • Information on acoustically induced stress responses in sea turtles is limited, and any physiological response or behavioral response is likely associated with a stress response. • Information on behavioral responses to sonar and other transducers is limited, and behavioral responses could consist of temporary avoidance, increased swim speed, or no observable response.

Table 3.8-3: Acoustic Stressors Information Summary (continued)

Substressor	Information Summary
Vessel Noise	Vessel disturbance may result in masking, physiological stress, or behavioral reactions. Vessel sound exposure is rarely decoupled from the physical presence of a surface vessel. In some more industrialized or populated areas, non-military vessel noise is a chronic and frequent stressor. • Continuous vessel noise with low-frequency components of an appreciable received level (e.g., proximate vessel noise) within the limited hearing range for sea turtles (most sensitive from 100 to 400 Hz and limited over 1 kHz) is most likely to result in masking. • Information on acoustically induced stress responses in sea turtles is limited, and any physiological response or behavioral response is likely associated with a stress response. • Information on behavioral responses to vessel noise is limited and can include amplification of existing behaviors, increased vigilance, or no observable response.
Aircraft Noise	Aircraft disturbance may result in physiological stress or behavioral reactions. Aircraft sound exposure is rarely decoupled from the physical presence of an aircraft. The brief and intermittent nature of aircraft would result in a very limited probability of any masking effects. • Information on acoustically induced stress responses in sea turtles is limited, and any physiological response or behavioral response is likely associated with a stress response. • Sea turtle behavioral reactions have not been studied like marine mammals. Given that they have less sensitive hearing than marine mammals, sea turtles could exhibit behavioral reactions to aircraft noise that are likely to be brief and minor.
Impulsive noise (includes air guns, pile driving, and weapons firing)	Impulsive noise may result in hearing loss, masking, physiological stress, or behavioral reaction. The intermittent nature of most impulsive sounds would result in very limited probability of any masking effects. Due to the rapid rise time and higher instantaneous peak pressure of impulsive noise, nearby noise is more likely to cause startle or avoidance responses. • Sea turtles are likely only susceptible to hearing loss when exposed to high levels of sound within their limited hearing range (most sensitive around 100 to 400 Hz and limited over 1 kHz). This includes low-frequency components from air guns, pile driving, and weapons noise. • Information on acoustically induced stress responses in sea turtles is limited, and any physiological response or behavioral response is likely associated with a stress response. • Information on behavioral responses to repetitive impulsive noise over long durations (e.g., air guns) is limited and can include temporary avoidance, increased swim speed, changes in depth, and no observable response. Similar responses are expected for other sources that produce repetitive and long duration impulsive noise (e.g., pile driving).

3.8.3.1.1 Effects from Sonar and Other Transducers

Table 3.8-3 contains a summary of information used to analyze the potential effects of sonars and other transducers (hereafter inclusively referred to as sonars) on reptiles. Other transducers include items such as acoustic projectors and countermeasure devices.

Sonars have the potential to affect reptiles by causing auditory injuries, TTSs, masking, non-injurious physiological responses (such as stress), or behavioral reactions. As discussed in Appendix E, reptile hearing is most sensitive from 100 to 400 Hz and limited over 1 kHz. Therefore, only sonars below 2 kHz, including low-frequency sonar, are analyzed for their effects on reptiles. As discussed in Appendix D, sea turtles and sea snakes have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of effects on sea snakes are assessed to be comparable to those for sea turtles.

3.8.3.1.1.1 Effects from Sonar and Other Transducers Under Alternative 1

Training and Testing. Low-frequency sonars are operated less often than mid- or high-frequency sources throughout the Study Area. Activities using sonar would generally occur within Navy range complexes, on Navy testing ranges, around inshore locations, and at specified ports and piers identified in Chapter 2. Activities using sonar range from single-source, limited duration events to multi-day events with multiple sound sources on different platforms. The types of sonars and the way they are used differ between primary mission areas. This in turn influences the potential for effects on exposed reptiles.

The number of effects on each turtle species due to exposure to sonar during training and testing under Alternative 1 is shown in Table 3.8-4 for a maximum year of activities and in Table 3.8-5, including seasons and regions in which effects are most likely to occur; which activities are most likely to cause effects; and analysis of effects on designated critical habitat for ESA-listed species, where applicable. Appendix E also shows total effects on each species due to training or testing activities under this alternative and explains how effects are summed to estimate maximum annual and seven-year total effects.

Sonar-induced acoustic resonance and bubble formation phenomena are very unlikely to occur under realistic conditions, as discussed in Appendix D. Non-auditory injury and mortality from sonar are unlikely under realistic exposure conditions. Any effect on hearing could reduce the distance over which a reptile detects environmental cues, such as the sound of waves, or the presence of a vessel or predator. A reptile could respond to sounds detected within its limited hearing range if it is close enough to the source. Use of sonar would typically be transient and temporary, and there is no evidence to suggest that any behavioral response would persist after a sound exposure. In addition, a stress response could accompany any behavioral response. Although masking of biologically relevant sounds by the limited number of sonars operated in reptile hearing range is possible, this may only occur in certain circumstances. Reptiles most likely use sound to detect nearby broadband, continuous environmental signals, such as the sounds of waves crashing on the beach. Reptiles may rely on senses other than hearing, such as vision or magnetic orientation, and could potentially reduce any effects of masking caused by sonar use. The use characteristics of most low-frequency sonars, including limited band width, beam directionality, relatively low source levels, low duty cycle, and limited duration of use, would both greatly limit the potential for a reptile to detect these sources and limit the potential for masking of broadband, continuous environmental sounds.

Based on the updated background and analysis for training and testing under Alternative 1, effects from sonars on reptiles would likely be limited to temporary or short-term effects, including stress, startle, and behavioral responses, and TTS; while long-term effects would include auditory injuries.

Modernization and Sustainment of Ranges. Sonars would not be used during range modernization and sustainment activities.

Conclusion. Activities that include the use of sonars under Alternative 1 would result in less than significant effects. Estimated behavioral and TTS effects from sonar are expected to be short term and would not result in substantial changes to behavior, growth, survival, annual reproductive success, lifetime reproductive success, or species recruitment, for an individual and would not result in population-level effects. Low levels of estimated AINJ from sonar may have deleterious effects on the fitness of an individual turtle but are not expected to affect the fitness of enough individuals to cause population-level effects.

3.8.3.1.1.2 Effects from Sonar and Other Transducers Under Alternative 2

Under Alternative 2, the use of sonar in the hearing range for reptiles (i.e., low-frequency and broadband sonar) would increase during both training and testing activities. Effects from sonars under Alternative 2 (Table 3.8-4 and Table 3.8-5) are the same as those under Alternative 1, and therefore the conclusions for significance are the same for both alternatives.

Table 3.8-4: Effects Due to a Maximum Year of Sonar Training and Testing Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
ESA-Listed							
Green sea turtle	East Pacific DPS	29	552	7	30	552	7
	Central North Pacific DPS	15	45	0	15	45	0
Hawksbill sea turtle	Primary	1	6	0	1	6	0
Leatherback sea turtle	Primary	39	334	2	39	334	3
Loggerhead sea turtle	California	56	517	3	57	520	3
Olive ridley sea turtle	Primary	27	194	1	27	194	1

BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury. Zero (0) indicates a rounded value less than 0.5. Stocks are not shown if no effects are estimated. version.20241108

Table 3.8-5: Effects Due to 7 Years of Sonar Training and Testing Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
ESA-Listed							
Green sea turtle	East Pacific DPS	202	3,419	44	205	3,853	49
	Central North Pacific DPS	96	278	0	96	312	0
Hawksbill sea turtle	Primary	3	35	0	3	39	0
Leatherback sea turtle	Primary	190	2,069	14	191	2,335	15
Loggerhead sea turtle	California	326	3,205	18	335	3,621	20
Olive ridley sea turtle	Primary	134	1,202	7	134	1,355	7

BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury. Zero (0) indicates a rounded value less than 0.5. Stocks are not shown if no effects are estimated. version.20241108

3.8.3.1.2 Effects from Air Guns

Table 3.8-3 contains summaries of information used to analyze the potential effects of air guns on reptiles. The broadband impulses from air guns are within the hearing range of all reptiles. Potential effects from air guns could include auditory injuries, TTS, behavioral reactions, physiological response, and masking. The ranges to auditory effects and behavioral responses for air guns are in Appendix E. As discussed in Appendix D, sea turtles and sea snakes have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of effects on sea snakes are assessed to be comparable to those for sea turtles.

3.8.3.1.2.1 Effects from Air Guns Under Alternative 1

Training and Testing. Air guns would not be used during training activities. During testing activities, small air guns would be fired over a limited period within a single day. Air gun use would occur nearshore in the SOCAL Range Complex and greater than 3 NM from shore in the Hawaii, NOCAL, and SOCAL Range Complexes.

The number of effects on each species due to exposure to air guns during testing under Alternative 1 are shown in Table 3.8-6 for a maximum year of activities and in Table 3.8-7 for seven years of activities. Appendix E provides additional detail on modeled effects on each species, including seasons and regions in which effects are most likely to occur; which activities are most likely to cause effects; and analysis of effects on designated critical habitat for ESA-listed species, where applicable. Appendix E also shows total effects on each species due to testing activities under this alternative and explains how effects are summed to estimate maximum annual and seven-year total effects.

Potential effects from exposures to air guns include hearing loss and AINJ within a short distance, behavioral reactions, and physiological response. Due to the low duration of an individual air gun shot (approximately 0.1 second) and the low duty cycle of sequential shots, the potential for masking from air guns would be low. The use of air guns in offshore waters would not interfere with the detection of environmental cues in nearshore environments, such as the sound of waves crashing on the beach. Table 3.8-6 provides sea turtle effects from the quantitative analysis using the number of air gun shots for a maximum year of testing activities under Alternative 1 and Alternative 2.

Based on the updated background and analysis for testing under Alternative 1, effects from air guns on reptiles would be limited to temporary or short-term effects, including TTS.

Modernization and Sustainment of Ranges. Air guns would not be used during range modernization and sustainment activities.

Conclusions. Activities that include the use of air guns under Alternative 1 would result in less than significant effects. Estimated TTS effects from air guns are expected to be short term and would not result in substantial changes to behavior, growth, survival, annual reproductive success, lifetime reproductive success, or species recruitment, for an individual and would not result in population-level effects.

3.8.3.1.2.2 Effects from Air Guns Under Alternative 2

Air guns would not be used during training activities. The quantities of air gun activity (i.e., counts) under Alternative 2 are slightly higher than those under Alternative 1. Effects from air guns under Alternative 2 (Table 3.8-6 and Table 3.8-7) are the same as those under Alternative 1, and therefore the conclusions for significance are the same for testing activities.

Table 3.8-6: Effects Due to a Maximum Year of Air Gun Testing Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
ESA-Listed							
Green sea turtle	East Pacific DPS	-	1	-	-	1	-
	Central North Pacific DPS	-	1	-	-	1	-

BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury. A dash (-) indicates a (true zero). Stocks are not shown if no effects are estimated. version.20241108

Table 3.8-7: Effects Due to Seven Years of Air Gun Testing Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1			Alternative 2		
		BEH	TTS	AINJ	BEH	TTS	AINJ
ESA-Listed							
Green sea turtle	East Pacific DPS	-	2	-	-	2	-
	Central North Pacific DPS	-	1	-	-	1	-

BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury. A dash (-) indicates a (true zero). Stocks are not shown if no effects are estimated. version.20241108

3.8.3.1.3 Effects from Pile Driving

Table 3.8-3 contains a summary of information used to analyze the potential effects of pile-driving noise on reptiles. The impact and vibratory pile-driving hammers generate impulsive and continuous non-impulsive broadband sounds, respectively. As discussed in Appendix D, sea turtles and sea snakes have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of effects on sea snakes are assessed to be comparable to those for sea turtles.

3.8.3.1.3.1 Effects from Pile Driving

Training and Testing. Impact and vibratory pile driving would not occur during testing activities. Pile driving would occur as part of Port Damage Repair activities in Port Hueneme, California. Impact and vibratory pile driving during Port Damage Repair training activities can occur over a period of 14 days during each training event, and up to 12 times per year. Pile-driving activities would occur intermittently in very limited areas and would be of temporary duration. The activity location is in a highly urbanized, all quay wall port. Reptiles would not be affected by pile driving activities in Port Hueneme, California, due to a lack of geographic overlap.

Modernization and Sustainment of Ranges. Pile driving would not be used during range modernization and sustainment activities.

Conclusions. Activities that include pile driving would not have reasonably foreseeable adverse effects since reptiles do not overlap with pile driving activities in Port Hueneme, California.

3.8.3.1.4 Effects from Vessel Noise

Table 3.8-3 contains a summary of information used to analyze the potential effects of vessel noise on reptiles. The broadband, non-impulsive, and continuous noise from vessels is within the hearing range of all reptiles. As discussed in Appendix D, sea turtles and sea snakes have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of effects on sea snakes are assessed to be comparable to those for sea turtles. Additional information on the assessment of this acoustic stressor under the Proposed Action is in Appendix E.

3.8.3.1.4.1 Effects from Vessel Noise Under Alternative 1

Training and Testing. Based on the updated background and analysis for training and testing under Alternative 1, vessel noise effects on reptiles could include brief behavioral reactions and short periods of masking while in the proximity of a vessel.

Range Sustainment and Modernization. Vessel noise would be produced during SOAR Modernization, SWTR Installation, Sustainment of Undersea Ranges, Deployment of Seafloor Cables and Instrumentation, Installation and Maintenance of Mine Warfare and Other Training Areas, and Installation and Maintenance of Underwater Platforms. Vessel noise may result in masking, physiological stress, or behavioral reactions. During installation activities, vessels would move slowly (0–3 knots) which would limit ship-radiated noise from propeller cavitation and water flow across the hull.

Conclusions. Activities that include the use of vessel noise under Alternative 1 would result in less than significant effects. Exposure to vessel noise could result in short-term behavioral reactions, physiological response, masking, or no response. Effects from vessel noise would be temporary and localized, and such responses would not be expected to compromise the general health or condition of individual reptiles. Therefore, long-term consequences for populations are not expected.

3.8.3.1.4.2 Effects from Vessel Noise Under Alternative 2

The number of activities including vessels or in-water devices increases only slightly over that of Alternative 1. Effects from vessel noise under Alternative 2 are not meaningfully different from Alternative 1. Therefore, activities that include vessel noise under Alternative 2 would result in less than significant effects.

3.8.3.1.5 Effects from Aircraft Noise

Table 3.8-3 contains summaries of information used to analyze the potential effects of aircraft noise on reptiles. Aircrafts produce broadband, non-impulsive, continuous noise during operation and transit that is within the hearing range of all reptiles. As discussed in Appendix D, sea turtles and sea snakes have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of effects on sea snakes are assessed to be comparable to those for sea turtles. Additional information on the assessment of this acoustic stressor under the Proposed Action is in Appendix E.

3.8.3.1.5.1 Effects from Aircraft Noise Under Alternative 1

Training and Testing. Based on the updated background and analysis for training and testing under Alternative 1, aircraft noise effects on reptiles would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual reptiles found within localized areas. Reptiles at or near the surface when an aircraft flies overhead at low altitude may startle, divert their attention to the aircraft, or avoid the immediate area by swimming away or diving.

Range Sustainment and Modernization. Aircraft noise would not be produced during range modernization and sustainment activities.

Conclusions. Activities that include aircraft noise under Alternative 1 would result in less than significant effects. The amount of sound entering the ocean from aircraft would be very limited in duration, sound level, and affected area. If reptiles were to respond to aircraft noise, only short-term behavioral or physiological response would be expected. Therefore, effects on individuals would be unlikely, and long-term consequences for populations are not expected.

3.8.3.1.5.2 Effects from Aircraft Noise Under Alternative 2

The number of activities including aircraft under Alternative 2 would increase only slightly over Alternative 1. Effects from aircraft noise under Alternative 2 are not meaningfully different from Alternative 1. Therefore, activities that include aircraft noise under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.8.3.1.6 Effects from Weapons Noise

Table 3.8-3 contains summaries of information used to analyze the potential effects of weapons noise on reptiles. Firing of guns, vibrations from the hull of ships, items that impact the water’s surface, and items launched from underwater may produce weapons noise that are within the hearing range of all reptiles. As discussed in Appendix D, sea turtles and sea snakes have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of effects on sea snakes are assessed to be comparable to those for sea turtles. Additional information on the assessment of this acoustic stressor under the Proposed Action is in Appendix E.

3.8.3.1.6.1 Effects from Weapons Noise Under Alternative 1

Training and Testing. Based on the updated background and analysis for training and testing under Alternative 1, the effect of weapons noise on reptiles would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual reptiles found within localized areas. Because firing of medium- and large-caliber gunnery would occur greater than 12 NM from shore, effects on coastal species are unlikely.

Range Sustainment and Modernization. Weapons noise would not be produced during range modernization and sustainment activities.

Conclusions. Activities that include weapons noise under Alternative 1 would result in less than significant effects. Due to the short-term and transient nature of weapons noise, reptiles would likely exhibit short-term (lasting minutes) behavioral reactions that are unlikely to lead to long-term consequences for individuals or species.

3.8.3.1.6.2 Effects from Weapons Noise Under Alternative 2

The number of items generating weapons firing noise (e.g., non-explosive and explosive practice munitions) would increase only slightly over Alternative 1. Effects from weapons noise under Alternative 2 are not meaningfully different from Alternative 1. Therefore, activities that include weapons noise under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.8.3.2 Explosive Stressors

This section summarizes the potential effects of explosives used during military readiness activities within the Study Area. Table 3.8-8 summarizes information relevant to the analyses of effects for explosives. New applicable and emergent science regarding explosive effects is presented in Appendix D. The detailed assessment of explosive stressors under this proposed action is in Appendix E. Changes in the predicted explosive effects are due to the following:

- Updates to criteria used to determine if an exposure to explosive energy may cause auditory effects, non-auditory injury or mortality, and behavioral responses. Changes to the auditory effects criteria include the weighted impulsive sound exposure level thresholds decreased by 20 dB re 1 $\mu Pa^2 s$, and the impulsive sound pressure level thresholds decreased by 2 dB re 1 µPa.
- Revisions to the modeling of explosive effects in the Navy Acoustic Effects Model. See the technical report, Quantifying Acoustic Impacts on Marine Mammals and Sea Turtles: Methods and Analytical Approach for Phase IV Training and Testing (U.S. Department of the Navy, 2024a).
- Updates to data on marine mammal and sea turtle presence, including estimated density of each species or stock (number of animals per unit area), group size, and depth distribution. For additional details, see the technical report *Dive Distribution and Group Size Parameters for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii-Southern California Training and Testing Study Areas* (Oliveira et al., 2024).
- Changes in the locations, numbers, and types of modeled military readiness activities as described in Chapter 2 and associated quantities of explosives (counts) shown in Section 3.0.3.3.2.
- No reduction of model-predicted mortalities due to activity-based mitigation, unlike in prior analyses. As discussed in Section 3.8.3, the Action Proponents will implement activity-based mitigation under Alternative 1 and Alternative 2 to reduce potential effects from explosives on sea turtles. The Action Proponents will also implement geographic mitigation to reduce potential explosive effects within important sea turtle habitats, as identified in Table 3.8-2.

Mitigation areas for seafloor resources, as described in Section 3.5, may also provide some level of protection from explosive effects for sea turtles that feed among, shelter, or otherwise inhabit these habitats.

- No reduction of model-predicted effects due to animal avoidance of a sound source, unlike in prior analyses.

Table 3.8-8: Explosive Stressors Information Summary

Substressor	Information Summary
Explosives in air	In-air detonations at or near the water surface could transmit sound and energy into the water and affect sea turtles. However, detonations within a few tens of meters of the surface are analyzed as if detonating completely underwater, and the background information described in Appendix E would also apply. Detonations that occur at higher altitudes would not propagate enough sound and energy into the water to result in effects on sea turtles and therefore are not analyzed in this section.
Explosives in water	Explosives may result in mortality and non-auditory injury. Direct injury due to explosives depends on the charge size, the geometry of the exposure (e.g., distance and depth), and the size of the animal. The intermittent nature of most impulsive sounds would result in very limited probability of any masking effects. Due to the rapid rise time and higher instantaneous peak pressure of impulsive noise, nearby noise is likely to cause startle or avoidance responses. There are limited studies of reptile responses to sounds from impulsive sound sources, and all data come from sea turtles exposed to seismic air guns, as summarized in Table 3.8-3.

3.8.3.2.1 Effects from Explosives

Explosions produce loud, impulsive, broadband sounds with sharp pressure peaks that can be injurious. Potential effects from explosive energy and sound include non-auditory injury (including mortality), auditory effects (AINJ and TTS), behavioral reactions, physiological response, and masking. Ranges to effects for mortality, non-auditory injury, and behavioral responses are shown in Appendix E. Explosive noise is very brief and intermittent, and detonations usually occur over a limited area for a brief period rather than being widespread. The potential for masking is limited. Reptiles may behaviorally respond, but responses to single detonations or small numbers of clusters may be limited to startle responses. As discussed in Appendix D, sea turtles and sea snakes have similar hearing capabilities, mechanisms, and likely usage. Therefore, the types of effects on sea snakes are assessed to be comparable to those for sea turtles.

3.8.3.2.1.1 Effects from Explosives Under Alternative 1

Training and Testing. Most explosive activities would occur in the SOCAL Range Complex, Hawaii Range Complex, and PMSR, although activities with explosives would also occur in other areas as described in Appendix A. Activities involving in-water explosives from medium- and large-caliber naval gunfire, missiles, bombs, or other munitions are conducted more than 12 NM from shore. This includes Small Ship Shock Trials that could occur in the SOCAL Range Complex. SINKEX are conducted greater than 50 NM from shore. Certain activities with explosives may be conducted closer to shore at locations identified in Appendix A.

The number of effects on each species due to exposure to explosives during training and testing under Alternative 1 is shown in Therefore, activities that include the use of explosives under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

Table 3.8-9 for a maximum year of activities and in Table 3.8-10 for seven years of activities. Appendix E provides additional detail on modeled effects on each species, including seasons and regions in which effects are most likely to occur; which activities are most likely to cause effects; and analysis of effects on designated critical habitat for ESA-listed species, where applicable. Appendix E also shows total effects on each species due to training or testing activities under this alternative and explains how effects are summed to estimate maximum annual and seven-year total effects.

A reptile's behavioral response to a single detonation or explosive cluster is expected to be limited to a short-term startle response or other behavioral responses, as the duration of noise from these events is very brief. Limited research and observations from air gun studies in Appendix D suggest that if sea turtles are exposed to repetitive impulsive sounds (analogous to impulsive sounds from explosives) in close proximity, they may react by increasing swim speed, avoiding the source, or changing their position in the water column. There is no evidence to suggest that any behavioral response would persist beyond the sound exposure. In addition, a stress response could accompany any behavioral response. Because the duration of most explosive events is brief, the potential for masking is low. Effects including TTS, auditory injury, and non-auditory injury could reduce the fitness of an individual animal, causing a reduction in foraging success, reproduction, or increased susceptibility to predators. This reduction in fitness would be temporary for recoverable effects, such as TTS. Full recovery from a TTS is expected to take a few minutes to a few days, depending on the severity of the initial shift.

Based on the updated background and analysis for training and testing under Alternative 1, effects from explosives on reptiles would be limited to temporary or short-term effects including behavioral and stress-startle responses and TTS, and long-term effects including auditory injury, non-auditory injury, and mortality.

Range Sustainment and Modernization. Explosives would not be used during range sustainment and modernization activities.

Conclusions. Activities that include the use of explosives under Alternative 1 would result in less than significant effects. Estimated behavioral and TTS effects from explosives are expected to be short term and would not result in substantial changes to behavior, growth, survival, annual reproductive success, lifetime reproductive success, or species recruitment for an individual and would not result in population-level effects. Low levels of estimated AINJ, injuries, and mortalities from explosives may have deleterious effects on the fitness of an individual turtle but are not expected to affect the fitness of enough individuals to cause population level effects.

3.8.3.2.1.2 Effects from Explosives Under Alternative 2

The quantities of explosive activity (i.e., counts) under Alternative 2 would increase only slightly over Alternative 1. Effects from explosives under Alternative 2 (Table 3.8-9 and Table 3.8-10) for reptiles are not meaningfully different from Alternative 1. Therefore, activities that include the use of explosives under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

Table 3.8-9: Effects Due to a Maximum Year of Explosive Training and Testing Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
ESA-Listed											
Green sea turtle	East Pacific DPS	11	15	2	1	0	11	15	2	1	0
	Central North Pacific DPS	2,052	1,120	45	3	1	2,052	1,120	45	3	1
Hawksbill sea turtle	Primary	18	12	1	-	-	18	13	1	-	-
Leatherback sea turtle	Primary	6	8	3	0	-	6	8	3	0	-
Loggerhead sea turtle	California	68	143	6	2	0	68	143	6	2	0
Olive ridley sea turtle	Primary	4	9	3	0	-	4	9	3	0	-

BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury, INJ = Non-Auditory Injury, MORT = Mortality. A dash (-) indicates a (true zero) and zero (0) indicates a rounded value less than 0.5. Stocks are not shown if no effects are estimated. version.20241108

Table 3.8-10: Effects Due to Seven Years of Explosive Training and Testing Activity Under Alternative 1 and Alternative 2

Species	Stock or Population	Alternative 1					Alternative 2				
		BEH	TTS	AINJ	INJ	MORT	BEH	TTS	AINJ	INJ	MORT
ESA-Listed											
Green sea turtle	East Pacific DPS	73	84	10	1	0	73	84	10	1	0
	Central North Pacific DPS	14,283	7,656	303	11	5	14,283	7,708	303	11	5
Hawksbill sea turtle	Primary	122	74	2	-	-	122	75	2	-	-
Leatherback sea turtle	Primary	30	27	4	0	-	31	27	4	0	-
Loggerhead sea turtle	California	443	703	31	7	0	444	705	31	7	0
Olive ridley sea turtle	Primary	16	50	5	0	-	16	50	5	0	-

BEH = Significant Behavioral Response, TTS = Temporary Threshold Shift, AINJ = Auditory Injury, INJ = Non-Auditory Injury, MORT = Mortality. A dash (-) indicates a (true zero) and zero (0) indicates a rounded value less than 0.5. Stocks are not shown if no effects are estimated. version.20241108

3.8.3.3 Energy Stressors

This section analyzes the potential effects of energy stressors used during military readiness activities within the Study Area. Detailed background information is provided in Appendix F. Table 3.8-11 summarizes the potential adverse effects of energy stressors used during military readiness activities within the Study Area, which includes an analysis of the potential adverse effects of (1) in-water electromagnetic devices, (2) high-energy lasers, and (3) high-power microwave devices. For information on the types of training and testing activities that create an in-water electromagnetic field, refer to Appendix B; and for information on locations and the number of activities proposed for each alternative, see Table 3.0-11.

Conclusion. There are no reasonably foreseeable adverse effects from energy stressors on sea turtles or sea snakes, and therefore further analysis is not warranted.

Table 3.8-11: Energy Stressors Information Summary

Substressor	Background Information Summary
In-water electromagnetic devices	Adverse effects on sea turtles or sea snakes from the use of in-water electromagnetic devices are not expected for the following reasons: (1) The in-water devices designed to produce an electromagnetic field are towed by a vessel or unmanned mine countermeasure systems; (2) the electromagnetic field is produced to simulate a vessel's magnetic field; in an actual mine-clearing operation, the intent is that the electromagnetic field would trigger an enemy mine designed to sense a vessel's magnetic field; (3) adverse effects from the use of in-water electromagnetic devices are not anticipated, because the electromagnetic field is the simulation of a ship's magnetic field, having no greater effect than that of a passing ship, a common occurrence in the marine environment; and (4) there is no evidence to suggest the magnetic field from a passing vessel would adversely affect reptiles.
High-energy lasers	High-energy lasers would have no effect on sea turtles or sea snakes for the following reasons: (1) precision targeting high-energy lasers are fired over relatively short ranges; (2) reptiles in open waters spend the majority of time under the water, limiting opportunities to be exposed to the laser beam; (3) reptiles are unlikely to remain stationary and may avoid activities at the target area prior to and during the military readiness activity; (4) the very small diameter of the laser beam limits the probability of exposure; and (5) the laser is designed not to miss the intended target and would automatically shut down if target-lock is lost, preventing the laser from striking anything but the target.
High-power microwave devices	High-power microwave devices are used in a similar manner and with a similar purpose as high-energy lasers, and some of the same reasoning explaining why adverse effects are unlikely applies to the analysis of effects from high-power microwave devices. Specifically, reasons 1 through 4 for high-energy laser are also applicable for high-power microwave devices. High-power microwave devices do not have an automated shutdown capability if target-lock is lost and would need to be turned off by the operator. While it is possible to miss the target, if only briefly, the probability analysis in Appendix I shows that the likelihood is extremely low and is considered discountable.

3.8.3.4 Physical Disturbance and Strike Stressors

The evaluation of the effects from physical disturbance and strike stressors on reptiles focuses on proposed activities that affect sea turtles or sea snakes by an object that is moving through the water (e.g., vessels and in-water devices), dropped into the water (e.g., MEM), deployed on the seafloor (e.g., mine shapes, anchors, wires as part of range modernization actions), or propelled through the water column (e.g., explosive fragments).

Table 3.8-12 contains brief summaries of information relevant to the analyses of effects for each physical disturbance and strike substressor (e.g., MEM). Detailed information on physical disturbance effect categories, as well as effects specific to each substressor, is provided in Appendix F.

Table 3.8-12: Physical Disturbance and Strike Stressors Information Summary

Substressor	Background Information Summary
Vessels and in-water devices	Vessels: • Within the Study Area, commercial traffic is heaviest in the nearshore waters, near major ports and in the shipping lanes along the entire U.S West Coast and port facilities in the Hawaiian Islands, particularly the southern coast of Oahu. • Strikes of reptiles could cause permanent injury or death from bleeding or other trauma, paralysis and subsequent drowning, infection, or inability to feed. The likelihood of recovery from a strike is influenced by the level of injury and the reptiles' age, reproductive state, and general condition. • With the exception of hatchlings and pre-recruitment juveniles, sea turtles spend a majority of their time submerged, though green turtles were observed to stay within the top 3 meters of water despite deeper water being available (Hazel et al., 2009; Hazel et al., 2007). • Basking on the water's surface is common for all turtle species within the Study Area as a strategy to thermoregulate and rest and is most common during inter-nesting periods. The reduced and idle activity associated with basking at the water's surface puts sea turtles at increased risk of vessel strikes. • Foraging behavior for some reptile species would limit their time at the surface. For example, olive ridley and loggerhead turtles can spend extended periods foraging at depth, even in open-ocean areas (DiMatteo et al., 2022; Sasso & Witzell, 2006; Seney, 2016; Servis et al., 2015). • Sea snakes do not generally occur close to shore within the Study Area, and therefore, risk for vessel strike would be low. On the open ocean, sea snakes would not likely be able to avoid a large vessel, but the chances for an interaction should be considered low because of the low density of snakes and the low density of Navy ships. In-water devices: • In-water devices are generally smaller (several inches to 111 feet) than most Navy vessels. • Devices that could pose a collision risk to reptiles are those operated at high speeds and are unmanned. • The Navy reviewed torpedo design features and a large number of previous anti-submarine warfare torpedo exercises to assess the potential of torpedo strikes on marine mammals, and its conclusions are also relevant to reptiles. The acoustic homing programs of Navy torpedoes are sophisticated and would not confuse the acoustic signature of a marine mammal with a submarine/target. It is reasonable to assume that acoustic signatures of sea turtles would also not be confused with a submarine or target. • Review of torpedo records indicates there has never been an effect on a sea turtle or other reptile. In thousands of exercises in which torpedoes were fired or in-water devices used, there have been no recorded or reported instances of a marine species strike from a torpedo or any other in-water device.

Table 3.8-12: Physical Disturbance and Strike Stressors Information Summary (continued)

Substressor	Background Information Summary
Vessels and in-water devices (continued)	• Since some in-water devices are identical to support craft (typically less than 15 m in length), reptiles could respond to the physical presence of the device similar to how they respond to the physical presence of a vessel. Physical disturbance from the use of in-water devices is not expected to result in more than a momentary behavioral response. These responses would likely include avoidance behaviors (e.g., swimming away or diving) and cessation of normal activities (e.g., foraging). • Most in-water devices, such as unmanned underwater vehicles, move slowly or are closely monitored by observers. However, detecting presence of reptiles is more difficult than marine wildlife (i.e., marine mammals). • Towed devices are unlikely to strike a sea turtle or sea snake because of the observers on the towing platform and other standard safety measures employed when towing in-water devices.
Military expended materials	Reptiles could be struck by military expended materials at the surface and on the seafloor as items settle on the bottom, and could also be disturbed by materials sinking through the water column, but the number of individuals affected would be low in the context of population size: • For sea turtles, although disturbance or strike from an item as it falls through the water column is possible, it is not likely because the objects generally sink through the water slowly and can be avoided by most sea turtles. Materials will slow in their velocity as they approach the bottom of the water and will likely be avoided by any juvenile or adult sea turtles (e.g., olive ridley, green, loggerhead, or hawksbill turtles) that happen to be in the vicinity foraging in benthic habitats. • Direct strike potential is greatest at or near the surface for reptiles. However, reptiles may respond to other types of stressors (e.g., vessel noise or visual disturbance) and flee the vicinity of the near shore activity, thereby reducing the potential for physical disturbance and strike. • Most missiles and projectiles are fired at and hit their targets, so only a very small portion hit the water with their maximum velocity and force. • Expended aerial targets and aerial target fragments hit the water's surface with relatively high velocity and force, although they fall rather than being fired. Disturbance or strike resulting in injury as expended materials sink through the water column is possible but not likely because most objects sink slowly and can be avoided. • Propelled fragments produced by an exploding bomb are large and decelerate rapidly, posing little risk to reptiles. • Sediment disturbance and turbidity caused by materials settling on the seafloor would be temporary and affect a small area.
Seafloor devices	Strikes and disturbance of reptiles by seafloor devices are possible but not likely: • Benthic-foraging sea turtles (e.g., olive ridley, green, loggerhead, or hawksbill turtles), encountering a seafloor device but would likely avoid it. • Sea floor devices move slowly, if at all, in benthic habitats and could be avoided by most reptiles. Therefore, these items do not pose a significant strike risk to sea turtles or sea snakes.
Pile Driving	Pile driving occurs during training activities and would have no effect on reptiles because pile driving activities do not occur in the Hawaii portion of the Study Area or in areas of the California portion of the Study Area where green sea turtles are expected to occur.

3.8.3.4.1 Effects from Vessels and In-Water Devices

Section 3.0.3.3.4.1 provides estimates of relative vessel and in-water device use and location throughout the HCTT Study Area. Table 3.0-14 provides a list of representative vessels, along with vessel lengths and speeds used in military readiness activities that present strike risks for sea turtles and sea snakes. Table 3.0-14 provides a list of representative in-water devices, along with device types, sizes, and speeds used in military readiness activities. The concentration of vessel and in-water device use and the manner in which the military trains and tests would remain consistent with the levels and types of activity undertaken in the HSTT and PMSR Study Areas over the last decade. The addition of PMSR and the Northern California Range Complex to the Study Area does not result in increased numbers of activities. Consequently, the military does not foresee any appreciable changes in the levels or frequency where vessels have been used over the last decade. Therefore, the level which physical disturbance and strikes are expected to occur is likely to remain consistent with the previous decade.

3.8.3.4.1.1 Effects from Vessels and In-Water Devices Under Alternative 1

Training and Testing. Section 3.0.3.3.4.1 discusses the type of activities and number of events that present a potential strike hazard on marine reptiles. For a discussion of the types of activities that include vessels and in-water devices, refer to Appendix B, and for information on locations and the number of activities proposed for each alternative, see Table 3.0-17. The potential for vessel strikes to reptiles are not associated with any specific military readiness activity but rather a limited, sporadic, and accidental result of Navy and USCG ship movement within the Study Area. Vessel movement can be widely dispersed throughout the HCTT Study Area but is more concentrated near naval ports, piers, and range areas. Navy training vessel traffic would especially be concentrated near Pearl Harbor and San Diego Bay. Smaller support craft usage would also be more concentrated in the coastal areas near naval installations, ports, and ranges.

Although the likelihood is low, a harmful interaction with a vessel or in-water device cannot be discounted, and sea turtle strikes in high vessel traffic areas (e.g., Pearl Harbor) have been reported. Potential effects of exposure to vessels may result in substantial changes in an individual's behavior, growth, survival, annual reproductive success, lifetime reproductive success (fitness), or species recruitment. Any strike at high speed is likely to result in significant injury. Potential effects of exposure to vessels are not expected to result in population-level effects for all sea turtle species. Under Alternative 1 training activities, the Action Proponents will continue to implement activity-based mitigation to avoid or reduce the potential for vessel and in-water device strike of sea turtles (see Section 5.6.2). Within a mitigation zone of a vessel or in-water device, trained observers will relay sea turtle locations to the operators, who are required to change course when practical. A mitigation zone size is not specified for sea turtles to allow flexibility based on vessel type and mission requirements (e.g., small boats operating in a narrow harbor). Sea snakes in the Study Area are not anticipated to occur within high vessel traffic areas, as the yellow-bellied sea snake is associated with pelagic habitats, and only in low abundances. Strikes of sea snakes are considered unlikely to occur.

Modernization and Sustainment of Ranges. Vessels and in-water devices associated with SOAR Modernization; SWTR Installation; Sustainment of Undersea Ranges; Hawaii and California undersea cable projects; and Installation and Maintenance of Underwater Platforms, Mine Warfare, and Other Training Areas would move very slowly during installation activities (0–3 knots) and would not pose a collision threat to sea turtles expected to be present in the vicinity. No in-water devices would be used during modernization and sustainment of ranges activities.

Conclusion. Activities that include the use of vessels and in-water devices under Alternative 1 would result in less than significant effects. These activities are not expected to result in detectable changes to reptile habitat, reproduction, growth, or survival; and are not expected to result in population-level effects or affect the distribution or abundance of reptiles because (1) decades of vessel and in-water device use in similar areas has not indicated a high likelihood of military vessel or in-water device strike of reptiles and (2) the Navy and USCG will continue to implement activity-based mitigation to avoid or reduce the potential for vessel and in-water device strike of sea turtles.

3.8.3.4.1.2 Effects from Vessels and In-Water Devices Under Alternative 2

As shown in Table 3.0-17, the number of vessels and in-water devices used in the Study Area increases under Alternative 2. Training accounts for nearly 9 times the number of events with vessel and in-water device movements than testing, and, under Alternative 2 training events would increase by 11 percent in the California Study Area and 9 percent in the Hawaii Study Area. Therefore, the potential for effects from the use of vessels and in-water devices under Alternative 2 is measurably greater than under Alternative 1, but would still result in less than significant effects.

3.8.3.4.2 Effects from Military Expended Materials

Section 3.0.3.3.4.2 summarizes the background information used to analyze the potential effects of MEM on reptiles. Detailed background information is provided in Appendix I. For sea turtles and sea snakes in the water column, the discussion of military expended material strikes focuses on the potential of a strike at the surface of the water.

3.8.3.4.2.1 Effects from Military Expended Materials Under Alternative 1

Training and Testing. MEM that may cause physical disturbance or strike on marine reptiles include (1) all sizes of non-explosive practice munitions (Table 3.0-18); (2) fragments from high-explosive munitions (Table 3.0-19); (3) expendable targets (Table 3.0-20); and (4) expended materials other than munitions, such as sonobuoys or torpedo accessories (Table 3.0-21). See Appendix I for more information on the type and quantities of MEM proposed to be used.

Modernization and Sustainment of Ranges. No MEM would be expended during modernization and sustainment of ranges activities. Some anchors may not be recovered and become MEM, but those are covered in the analysis of seafloor devices.

Conclusion. Activities that include the use of MEM under Alternative 1 would result in less than significant effects. Based on the updated background and the statistical analysis conducted in Appendix I, MEM effects on sea turtles and sea snakes would be rare and limited to temporary or short-term behavioral and stress-startle responses to individual sea turtles or sea snakes found within localized areas.

3.8.3.4.2.2 Effects from Military Expended Materials Under Alternative 2

The locations where military materials are expended would be the same as Alternative 1, and the quantity of materials expended would increase, but not significantly (see Section 3.0.3.3.4.2 and Appendix I). Therefore, activities that include the use of MEM under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.8.3.4.3 Effects from Seafloor Devices

The number and location of activities including seafloor devices is presented in Section 3.0.3.3.4.3. Additional information on stressors by military readiness activities is provided in Appendix B. Seafloor devices include items that are placed on, dropped on, or moved along the seafloor, such as mine shapes, anchor blocks, anchors, bottom-placed instruments, seafloor cables and hydrophones (associated with range sustainment and modernization), bottom-crawling unmanned underwater vehicles, and bottom-placed targets that are not expended. Range sustainment and modernization will also use seafloor devices. As discussed in the MEM strike section, objects falling through the water column would slow in velocity as they sink toward the bottom and could be avoided by most, if not all, sea turtles.

Training and Testing. Table 3.0-22 shows the number and location of events that use seafloor devices. As indicated in Section 3.0.3.3.4.3, activities that use seafloor devices occur throughout the Study Area. Based on the analysis in this section for military readiness activities, there is a reasonable level of certainty that no sea turtles would be struck by seafloor devices. The likelihood of a sea turtle encountering seafloor devices in benthic foraging habitats is considered low because these items are either stationary or move very slowly along the bottom. Seafloor devices are not likely to interfere with sea turtles resident to, or engaging in migratory, reproductive, and feeding behaviors within the range complexes of the HCTT Study Area. Further, seafloor devices would only affect sea turtle species that are foraging in benthic habitats (e.g., olive ridley, loggerhead, and green sea turtles). Sea turtles in coastal habitats may be present near the bottom when foraging or resting. Sea turtles encountering seafloor devices would likely avoid them because of their slow movement and visibility. Given the slow movement of seafloor devices, the effort expended by sea turtles to avoid them will be minimal, temporary, and not have fitness consequences.

Modernization and Sustainment of Ranges. New range modernization and sustainment activities include installation of undersea cables integrated with hydrophones and underwater telephones to sustain the capabilities of the SOAR. Deployment of cables along the seafloor would occur in three locations: (1) south and west of SCI in the California Study Area, (2) to the northeast of Oahu, and (3) to the west of Kauai in the Hawaii Study Area. In all three locations the installations would occur completely within the water; no land interface would be involved. Installation and maintenance of underwater platforms, mine warfare training areas, and installation of other training areas involve seafloor disturbance where those activities would take place. Each installation would occur on soft, typically sandy bottom, avoiding rocky substrates. As described above under Training and Testing, the likelihood of any sea turtle species encountering cables is considered low because these items are stationary on the seafloor once installed.

Conclusion. Activities that include the use of seafloor devices would not have reasonably foreseeable adverse effects and are not expected to result in detectable changes to reptile habitat, reproduction, growth, or survival, and are not expected to result in population-level effects or affect the distribution or abundance of reptiles because (1) the likelihood of a sea turtle encountering seafloor devices in benthic foraging habitats is considered low because these items are either stationary or move very slowly along the bottom, and (2) decades of seafloor device use in similar areas has not indicated a high likelihood of seafloor device strike of reptiles.

3.8.3.5 Entanglement Stressors

This section analyzes the potential entanglement effects of the various types of expended materials used during military readiness activities within the Study Area. Section 3.0.3.3.5 summarizes the background information for items expended during military readiness activities that present entanglement risks. Sea snakes are not analyzed for potential entanglement stressors because of their physiology and lack of appendages necessary for an entanglement interaction. Although the main threat to sea snakes globally is fisheries bycatch, this is primarily associated with prawn fisheries (using drag nets). Risk factors for entanglement of sea turtles include animal size (and life stage), sensory capabilities, and foraging methods. Most entanglements discussed in the literature are attributable to sea turtle entrapments with fishing gear or other non-military materials that float or are suspended at the surface.

Table 3.8-13 contains brief summaries of information relevant to analysis of potential effects on sea turtles from entanglement stressors. Detailed background information supporting the entanglement stressor analysis is provided in Appendix F.

Table 3.8-13: Entanglement Stressors Information Summary

Substressor	Information Summary
Wires and cables	Wires and cables are unlikely to adversely affect reptiles for the following reasons: • The chance that an individual animal would encounter expended cables or wires is low based on (1) the fact that the wires and cables will sink to the seafloor upon release, (2) the depth of waters where these items would be expended are likely beyond the depths where benthic foraging sea turtles would forage, and (3) expended wires and cables would be sparsely distributed throughout the Study Area. • It is very unlikely that an animal would become entangled even if it encountered a cable or wire while it was sinking or upon settling to the seafloor. • A sea turtle or sea snake would have to swim through loops and become twisted within the cable or wire; given the properties of the expended wires (low breaking strength, sinking rates, and resistance to coiling or looping), this would be an unlikely occurrence. • Wires and cables resting on unconsolidated soft sediments (e.g., sand or silt) are likely to become partially or completely buried over time by shifting sediments, further reducing the likelihood that a sea turtle would encounter an expended wire or cable.
Decelerators/ parachutes	Entanglement of a sea turtle or sea snake in a decelerator/parachute assembly at the surface, within the water column, or at the seafloor would be unlikely for the following reasons: • Most decelerators/parachutes are small, and their distribution in the Study Area would be sparse. • A decelerator/parachute would have to land directly on an animal, or an animal would have to swim into a floating decelerator/parachute to become entangled within the cords or fabric while the decelerator/parachute is floating at the surface or sinking through the water column. • Most small and medium decelerators/parachutes would be expended in deep ocean areas and sink to the bottom relatively quickly, reducing the likelihood of encounter by sea turtles.

Table 3.8-13: Entanglement Stressors Information Summary (continued)

Substressor	Information Summary
Decelerators/ parachutes (continued)	• The main potential for entanglement is with large and extra-large decelerators/parachutes. While these larger parachutes would eventually sink and flatten on the seafloor, there is the potential that these decelerators/parachutes could remain suspended in the water column before sinking or billow at the seafloor for a longer period of time before flattening. The longer parachute lines pose an entanglement risk as well. Nevertheless, larger decelerators/parachutes would ultimately sink and become inaccessible in deeper waters to sea turtles and sea snakes, and the likelihood of encounter at the surface and in the water column is low. • Once on the seafloor, decelerators/parachutes on unconsolidated soft sediments (e.g., sand or silt) are likely to become partially or completely buried over time by shifting sediments, further reducing the likelihood that a sea turtle would encounter an expended decelerator/parachute.
Cables Installed during Range Sustainment and Modernization Activities	Cables installed on the seafloor as part of this activity are highly unlikely to result in entanglement of a reptile for the following reasons: • The cables installed at underwater ranges are thick (approximately 3 inches in diameter), armored for durability and abrasion resistance, and inflexible, making them highly unlikely to loop or coil during installation. • Most reptiles do not forage on the seafloor and would not encounter the cables after installation. • The cable-laying process occurs once, not annually, and typically lasts for approximately 40 days for range installation, and about 1 week for the installation of fiber-optic cables. • The fiber-optic cables installed at Kaneohe Bay, west of Kauai, and off San Clemente Island are narrower (about 1 inch in diameter) but also relatively inflexible and resistant to looping in the water column. • The cables would be installed from a slowly moving (1–5 knots) cable-laying vessel.

Training and Testing. Based on the updated background and analysis for training, effects on sea turtles potentially resulting from wires and cables and decelerators/parachutes may range from short-term or long-term disturbance to an individual turtle. A scenario of a short-term effect would be if a sea turtle became entangled to the extent where the sea turtle could free itself after a short period of time. A longer-term effect if the entanglement caused injury or sufficiently long entanglement to inhibit foraging or migration. Sea turtles, as evidenced in fisheries bycatch, could be injured or drown.

Modernization and Sustainment of Ranges. Cables are deployed on the seafloor during SOAR Modernization, SWTR Installation, Sustainment of Undersea Ranges, Deployment of Seafloor Cables and Instrumentation, Installation and Maintenance of Mine Warfare and Other Training Areas, and Installation and Maintenance of Underwater Platforms. Entanglement of sea turtles is not likely because of the rigidity of the cable that is designed to lay extended on the sea floor vice coil easily. Anchor and cable lines would be taut, posing no risk of entanglement or interaction with sea turtles that may be swimming in the area. Once installed on the seabed, the new cable and communications instruments would be equivalent to other hard structures on the seabed, again posing no risk of adverse effect on sea turtles. No decelerators/parachutes would be expended during modernization and sustainment of ranges activities.

Conclusion. Activities that include the use of wires and cables and decelerators/parachutes would not have reasonably foreseeable adverse effects and are not expected to result in detectable changes to reptile habitat, reproduction, growth, or survival. They are also not expected to result in population-level effects or affect the distribution or abundance of reptiles because (1) the likelihood of a sea turtle encountering any of these items in benthic foraging habitats is considered low because of the sparse use of these throughout the vast Study Area; (2) where cables would be expected to be concentrated through range modernization actions, these cables would be installed slowly, in a controlled way (not expended), and rest on the seafloor; (3) the characteristics of the wires and cables used are not consistent with entanglement threats; and (4) all of the items either sink or degrade quickly and are only temporarily in the water column.

3.8.3.6 Ingestion Stressors

This section analyzes the potential effects of the various types of ingestion stressors used during military readiness activities within the Study Area. This analysis includes the potential effects from the following types of MEM: non-explosive practice munitions (small- and medium-caliber); fragments from high-explosives; fragments from targets, chaff, flare casings (including plastic end caps and pistons); and decelerators/parachutes. Table 3.8-14 contains a brief summary of background information that is relevant to analysis of effects from ingestion stressors. Detailed background information supporting the entanglement stressor analysis is provided in Appendix F.

Table 3.8-14: Ingestion Stressors Background Information Summary

Substressor	Background Information Summary
Military expended materials – munitions	Many different types of explosive and non-explosive practice munitions are expended at sea during military readiness activities. Types of non-explosive practice munitions generally include projectiles, missiles, and bombs. Of these, only small- or medium-caliber projectiles would be small enough for a reptile to ingest in offshore and nearshore waters: • Small- and medium-caliber projectiles include all sizes up to and including 2.25 inches (57 millimeters) in diameter. These are solid metal munitions; therefore, even if a reptile did try to bite a larger munition, the munition would not break apart and be ingestible. • Solid metal materials from high-explosive munitions would quickly move through the water column and settle to the seafloor; therefore, ingestion is not expected by most species. • Ingestion of non-explosive practice munitions is not expected to occur in the water column because the munitions sink quickly. • Fragments are primarily encountered by species that forage on the bottom. Other munitions and munitions fragments such as large-caliber projectiles or intact training and testing bombs are too large for loggerhead, green, Kemp's ridley, and hawksbill turtles to consume and are made of metal so they cannot be broken up by sea turtles. • Schuyler et al. (2014) noted that less than 10% of sea turtles (out of a sample size of 454 turtles) that ingested a wide range of debris suffered mortality, and 4% of turtles necropsied were killed by plastics ingestion (out of a sample size of 1,106 necropsied turtles). Because juvenile and adult green, loggerhead, Kemp's ridley, and hawksbill turtles feed along the seafloor, they are more likely to encounter munitions of ingestible size that settle on the bottom than leatherbacks that primarily feed at the surface and in the water column.

Table 3.8-14: Ingestion Stressors Background Information Summary (continued)

Substressor	Background Information Summary
Military expended materials other than munitions	Several different types of materials other than munitions are expended during military readiness activities in the Study Area that have the potential to be ingested by reptiles. These include target-related materials, chaff, flares, decelerators/parachutes, AMNS neutralizer, grenades, and torpedo accessories: • Sea turtles would be exposed to potential ingestion risk of target-related materials where these items are expended in offshore and nearshore waters. Sea snakes prey on fish at or near the surface and would be unlikely to mistake debris for normal prey items. • Although chaff fibers are too small for sea turtles to confuse with prey and forage, there is some potential for chaff to be incidentally ingested along with other prey items, particularly if the chaff attaches to other floating marine debris. If ingested, chaff is not expected to affect sea turtles due to the low concentration that would be ingested and the small size of the fibers. • Bottom-feeding sea turtles, such as green, hawksbill, olive ridley, and loggerhead turtles, would be at increased risk of ingesting chaff end caps and pistons as these items could be deposited in potential benthic feeding areas before these items would be encrusted or buried. • An extensive literature review and controlled experiments conducted by the United States Air Force demonstrated that self-protection flare use poses little risk to the environment or animals (U.S. Department of the Air Force, 1997). For sea turtles, these types of flares are large enough to not be considered an ingestion hazard. Nonetheless, sea turtles within the vicinity of flares could be exposed to light generated by the flares. It is unlikely that sea turtles would be exposed to any chemicals that produce either flames or smoke since these components are consumed in their entirety during the burning process. Animals are unlikely to approach or get close enough to the flame to be exposed to any chemical components. • Ingestion of a small decelerator/parachute by a sea turtle at the surface or within the water column would be unlikely, since the decelerator/parachute would not be available for very long before it sinks. Once on the seafloor, if bottom currents are present, the canopy may temporarily billow and be available for potential ingestion by sea turtles within bottom-feeding habits. Bottom-feeding sea turtles (e.g., green, hawksbill, olive ridley, and loggerhead turtles) tend to forage in nearshore and coastal areas rather than offshore, where the majority of these decelerators/parachutes are used. Since these materials would most likely be expended in offshore waters too deep for benthic foraging, it would be unlikely for bottom foraging sea turtles to interact with these materials once they sink; however, leatherbacks that feed offshore and in the water column could mistake a floating parachute for prey (e.g., jellyfish).

Notes: AMNS = Airborne Mine Neutralization System

3.8.3.6.1 Effects from Military Expended Materials Under Alternative 1

Types of MEM generally include projectiles, missiles, bombs, target-related materials, chaff (including fibers, end caps, and pistons), and decelerators/parachutes. Section 3.0.3.3.6 summarizes the background information used to analyze the potential ingestion effects of MEM on reptiles. Detailed background information is provided in Appendix F.

Training and Testing. As indicated in Section 3.0.3.3.6, these materials would occur throughout the Study Area where reptiles that occur in these areas would have the potential to be exposed. Many of these items may be small enough for some sea turtles or sea snakes to ingest, although that is considered unlikely since most of these materials would quickly drop through the water column, settle on the seafloor, or rapidly decay, and not present an ingestion hazard. Some Styrofoam, plastic endcaps, chaff, and other small items may float for some time before sinking.

Modernization and Sustainment of Ranges. No MEM would be expended during modernization and sustainment of ranges activities. Some anchors may not be recovered and become MEM, but these are too large to be an ingestion risk for sea turtles.

Conclusion. Activities that include the use of MEM under Alternative 1 would result in less than significant effects and are not expected to result in detectable changes to reptile habitat, reproduction, growth, survival; and are not expected to result in population-level effects or affect the distribution or abundance of reptiles because (1) an individual sea turtle would encounter a generally low amount of MEM based on the patchy distribution of both the MEM and sea turtle feeding habits; (2) a sea turtle would not likely ingest every item it encountered; (3) a sea turtle may attempt to ingest MEM and then reject it when it realizes it is not a food item; (4) these MEM would remain for a limited period of time in the water column and (5) it is unlikely that a sea turtle might encounter and swallow these items on the seafloor, particularly given that many of these items would be expended over deep, offshore waters; and (6) sea snakes would have to mistake an item as prey, and would only be exposed in pelagic habitats.

3.8.3.6.2 Effects from Military Expended Materials Under Alternative 2

The locations where military materials are expended would be the same as Alternative 1, and the quantity of materials expended would increase, but not significantly (see Section 3.0.3.3.4.2 and Appendix I). Therefore, activities that include the use of MEM under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.8.3.7 Secondary Stressors

The terms “indirect” and “secondary” do not imply reduced severity of environmental consequences but instead describe how a sea turtle or sea snake may be exposed to the stressor. Potential indirect adverse effects on marine reptiles would be through effects on their habitat (used for sheltering, feeding, or breeding) or prey. Stressors from military readiness activities that could pose indirect effects on reptiles via habitat or prey include (1) explosives, (2) explosives byproducts and unexploded munitions, (3) metals, (4) chemicals, and (5) transmission of disease and parasites (see Table 3.8-15).

Effects on abiotic habitat, specifically sediments and water, are analyzed in Section 3.2. Indirect effects from explosive materials, byproducts, and unexploded munitions on sea turtles or sea snakes from chemical constituents in sediments are possible only if a reptile were to ingest the substantial amount of sediment. Appendix C describes foraging habitats and behaviors for marine reptiles in the Study Area. For an adverse effect on prey to result in an indirect adverse effect on a reptile species, the population or a regional subpopulation of the prey would need to be significantly adversely affected. The analysis presented in Section 3.4 on invertebrates and Section 3.6 on fishes concluded that there would be less than significant to no direct adverse effects on those species. Therefore, there would be no potential for indirect adverse effects on sea turtles or sea snakes.

There are no reasonably foreseeable adverse effects from secondary stressors on sea turtles or sea snakes; therefore, further analysis is not warranted. Background information on secondary stressors is provided in Appendix F.

Table 3.8-15: Secondary Stressor Information Summary

Indirect Links	Substressors	Information Summary
Habitat	Explosives	• Explosions on or near the bottom in areas of soft substrate would not cause an overall reduction in the surface area or volume of sediment available to benthic invertebrates prey sources for sea turtles. Sea snakes feed near the surface of the water and would not experience indirect effects associated with benthic habitats. • Activities that inadvertently result in explosions on or near hard bottom habitat or reefs could break hard structures and reduce the amount of colonizing surface available to encrusting organisms (e.g., corals, sponges). Refer to Section 3.5 for a more comprehensive summary of direct effects on habitat.
	Explosive byproducts and unexploded munitions	Explosive byproducts and unconsumed explosives may potentially affect habitat, but the effects would likely be undetectable in the context of effects on reptile populations because of extremely low concentrations and dilution of these materials in the Study Area: • High-order explosions consume most of the explosive material, and byproducts would therefore not degrade sediment or water quality or result in indirect stressors to reptiles. • Low-order detonations and unexploded munitions may result in the presence of explosive material in sediments or the water column. However, toxicity and other effects are generally associated with exposure to higher concentrations than those expected to occur due to military readiness activities. • Munitions constituents and degradation products in sediments would likely be detectable only within a few feet, and the range of toxic sediment conditions could be less (inches). Due to low solubility and dilution, reptiles would be exposed to chemical byproducts in the water column only in the immediate vicinity of degrading explosives (inches or less).
	Chemicals	• Potentially harmful chemicals introduced into the marine environment consist mostly of propellants and combustion products, other fuels, polychlorinated biphenyls in target vessels, other chemicals associated with munitions, and simulants. • Ammonium perchlorate (a rocket and missile propellant) is the most common chemical used. Other representative chemicals with potential to affect reptiles through effects on their prey include propellant combustion products such as hydrogen cyanide and ammonia. • Perchlorate from failed expendable items is therefore unlikely to compromise water quality to that point that it would act as a secondary stressor to sea turtles.

Table 3.8-15: Secondary Stressor Information Summary (continued)

Indirect Links	Substressors	Information Summary
Habitats (continued)	Chemicals (continued)	• Most propellants are consumed during normal operations, and the failure rate of munitions using propellants and other combustible materials is low. • Most byproducts occur naturally in seawater and are readily degraded by biotic and abiotic processes. All chemicals are quickly diluted by water movement. • Target vessels are selected from a list of Navy-approved vessels that have been cleaned in accordance with U.S. Environmental Protection Agency guidelines. This procedure minimizes the amount of polychlorinated biphenyls entering the marine environment. • Overall, concentrations of chemicals in sediment and water are not likely to cause injury or mortality to reptiles.
	Metals	• Metals are introduced into seawater and sediments as a result of military readiness activities involving vessel hulks, targets, munitions, and other military expended materials. • Secondary effects may occur when marine invertebrates are exposed to concentrations above background levels by contact with the metal, contact with trace amounts in the sediment or water, and ingestion of contaminated sediments. This in turn creates trophic transfer when reptiles consume the contaminated prey source. • Because metals tend to precipitate out of seawater and often concentrate in sediments, potential adverse indirect effects are much more likely via sediment than water. However, studies have found the concentrations of metals in the sediments within military ranges or munitions disposal sites, where deposition of metals is very high, to be localized and rarely above biological effects levels. • Effects on sea turtle prey (e.g., invertebrates) would likely be limited to exposure in the sediment within a few inches of the object. Concentrations of metals in sea water are unlikely to be high enough to cause injury or mortality to reptiles.
Prey availability	All stressors	The potential for primary stressors to affect reptile prey populations is directly related to their effects on biological resources (e.g., habitats, invertebrates, aquatic vegetation).

3.8.3.8 Combined Effects of All Stressors

This section evaluates the potential for combined effects of all stressors from the Proposed Action. The analysis and conclusions for the potential effects from each of the individual stressors are discussed in the sections above. Stressors associated with proposed military readiness activities do not typically occur in isolation but rather occur in some combination. For example, mine neutralization activities include elements of acoustic, physical disturbance and strike, entanglement, ingestion, and secondary stressors that are all coincident in space and time. An analysis of the combined effects of all stressors considers the potential consequences of additive and synergistic stressors from the Proposed Action, as described below.

There are generally two ways that a reptile could be exposed to multiple additive stressors. The first would be exposure to multiple sources of stress from a single event or activity (e.g., a mine warfare event may include the use of a sound source and a vessel). The potential for a combination of these effects from a single activity would depend on the range to effects of each of the stressors and the response or lack of response to that stressor. Secondly, a reptile could be exposed to multiple military readiness activities over the course of its life; however, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individuals would be exposed to stressors from multiple activities within a short timeframe. However, animals with a home range intersecting an area of concentrated activity have elevated exposure risks relative to animals that simply transit the area through a migratory corridor.

Multiple stressors may also have synergistic effects. For example, individuals that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical strike and disturbance stressors due to a decreased ability to detect and avoid threats. Individuals that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to malnourishment and disorientation, leading to an increase in likelihood of entanglement and strike stressors. These interactions are speculative, and without data on the combination of multiple stressors, the synergistic effects from the combination of stressors are difficult to predict in any meaningful way.

The following analysis makes the reasonable assumption that the majority of exposures to individual stressors are non-lethal, and instead focuses on consequences potentially affecting fitness (e.g., physiology, behavior, reproductive potential).

Based on the general description of effects, the combined effects of all stressors is consistent with a less than significant determination because (1) a sea turtle or sea snake could be exposed to multiple military readiness activities over the course of its life; however, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individual sea turtle or sea snake would be exposed to stressors from multiple activities within a short timeframe; and (2) mitigation measures to reduce potential effects on sea turtles and their designated critical habitat would be implemented. Existing conditions would not change considerably under Alternative 1; therefore, no detectable effects on reptile populations would occur with implementation of Alternative 1.

3.8.4 Endangered Species Act Determinations

Pursuant to the ESA, military readiness activities may affect ESA-listed sea turtles as summarized in Table 3.8-16, and military readiness activities may affect leatherback critical habitat. The Navy is consulting with NMFS as required by section 7(a)(2) of the ESA.

Table 3.8-16: Sea Turtle Endangered Species Determinations for Military Readiness Activities Under Alternative 1 (Preferred Alternative)

Species	Overall Determination	Acoustic Stressors						Explosive Stressors	Energy Stressors		Physical Disturbance and Strike Stressors				Entanglement Stressors		Ingestion Stressors	Indirect Effects
		Sonar & Other Transducers	Air Guns	Pile Driving	Vessel Noise	Aircraft Noise	Weapons Noise	Explosions	In-Water Electromagnetic Devices	High Energy Lasers and Microwaves	Vessels & In-Water Devices	Military Expended Material	Seafloor Devices	Pile Driving	Wires & Cables	Decelerators/Parachutes	Military Expended Materials	
ESA-Listed Species																		
Green Sea Turtle[1]	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	MA
Green Sea Turtle[2]	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	MA
Hawksbill Sea Turtle	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	MA
Olive Ridley Sea Turtle	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	MA
Loggerhead Sea Turtle	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	MA
Leatherback Sea Turtle	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	MA
Proposed Critical Habitat																		
Green Sea Turtle	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	MA
Designated Critical Habitat																		
Leatherback Sea Turtle	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	MA

[1] Central North Pacific distinct population segment

[2] East Pacific distinct population segment

Notes: NE = no effect; MA = may affect. The preliminary effects determinations are consistent with previous consultations for military readiness activities in the Study Area.

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3.9 Birds

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Stressors to birds that could result from the Proposed Action within the Study Area were considered, and the following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Acoustic: Birds in flight, on the water's surface, or under water while diving for prey items have the potential to be exposed to sound generated by military readiness activities. Unless very close to an intense sound source, responses by birds to acoustic stressors would likely be limited to short-term behavioral responses. Some birds may be temporarily displaced, and there may be temporary increases in stress levels. Although individual birds may be impacted, population-level effects would not occur. As such, acoustic stressors would have no reasonably foreseeable adverse effects on birds.
- Explosive: Birds could be exposed to in-air explosions. Sounds generated by most small underwater explosions are unlikely to disturb birds above the water surface. However, if a detonation is sufficiently large or is near the water surface, birds above the water surface could be injured or killed. Detonations in air could injure or kill birds while either in flight or at the water surface; however, detonations in air during anti-air warfare training and testing would typically occur at much higher altitudes where seabirds and migrating birds are less likely to be present. Detonations can result in fish kills, which may attract birds. If this occurred during training or testing where multiple detonations take place, bird mortalities or injuries are possible. An explosive detonation would likely cause a startle reaction, as the exposure would be brief, and any reactions are expected to be short term. Although a few individuals may experience long-term effects and potential mortality, population-level effects would not occur. As such, explosives would have less than significant effects on birds.
- Energy: The impact of energy stressors on birds is expected to be negligible based on (1) the limited geographic area in which they are used, (2) the rare chance that an individual bird would be exposed to these devices while in use, and (3) the tendency of birds to temporarily avoid areas of activity when and where the devices are in use. The effects of energy stressors would be limited to individual cases where a bird might become temporarily disoriented or be injured. Although a small number of individuals may be impacted, no population-level effects would occur. As such, energy stressors would have no reasonably foreseeable adverse effects on birds.
- Physical Disturbance and Strike: There is a potential for individual birds to be injured or killed by physical disturbance and strikes during training and testing. However, there would not be long-term species or population-level effects due to the vast area over which training and testing activities occur, and the small size of birds and their ability to flee disturbance. As such physical disturbance and strike stressors would have less than significant effects on birds.

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BIRDS SYNOPSIS

- Ingestion: It is possible that persistent expended materials could be accidentally ingested by birds while foraging for natural prey items, though the probability of this event is low as (1) foraging depths of diving birds is generally restricted to the surface of the water or shallow depths, (2) the material is unlikely to be mistaken for prey, and (3) most of the material remains at or near the sea surface for a short length of time. No population-level effect to any bird species would occur. As such, ingestion stressors would have less than significant effects on birds.

3.9.1 Introduction

The following sections provide an overview of birds in the Study Area and the potential effects of the proposed military readiness activities on these resources. Appendix C provides more detailed descriptions of species within the Study Area.

3.9.2 Affected Environment

The affected environment provides the context for evaluating the effects of the proposed military readiness activities on birds. The Study Area is larger than what was described in the 2018 HSTT and 2022 PMSR EIS/OEISs. Despite this change, the affected environment for birds is not meaningfully different. See Appendix C for detailed information on the affected environment of birds.

3.9.2.1 General Background

As described in the 2018 HSTT and 2022 PMSR EIS/OEISs, most of the bird species that occur within the Study Area are waterbirds—birds that live in marine, estuarine, and freshwater habitats. Waterbirds include seabirds, wading birds, shorebirds, and waterfowl. In this analysis, because of where training and testing activities would occur and the types of activities, the focus of this chapter is on seabirds. The remainder of the species that may be encountered in the Study Area are landbirds that are coastal resident species that live on land but forage in the adjacent coastal waters.

3.9.2.1.1 Group Size

A variety of group sizes and diversity may be encountered throughout the Study Area, ranging from solitary migration of an individual bird to large concentrations of birds in single-species and mixed-species flocks. Depending on season, location, and time of day, the number of birds observed (group size) varies and will likely fluctuate from year to year. During spring and fall periods, diurnal and nocturnal migrants would likely occur in large groups as they migrate over open water. Many waterbirds migrate in very small groups or pairs and can be found in large groups at stopover areas and wintering grounds (Assali et al., 2020; Elphick, 2007).

3.9.2.1.2 Habitat Use

The Hawaiian Islands are important habitat for seabirds in the North Pacific Subtropical Gyre. The shoreline, estuarine, and open ocean environments support a diverse and large population of seabird species by providing important nesting and feeding habitats. The Hawaiian Islands are in the warm North Pacific water mass (U.S. Fish and Wildlife Service, 2005). Recent research estimates that 15 million seabirds inhabit the Hawaiian Islands; 22 species of seabirds regularly nest in the Hawaiian Islands, and many more pass through during migration to and from their breeding grounds elsewhere in the Pacific (Pratt et al., 2023). In addition to the seabirds that breed in the Study Area, millions of seabirds from more than 100 different species migrate to or through the Study Area. Surveys around the Hawaiian Islands found 40 different species of seabirds; half were local breeders, and the remainder were migrant species (U.S. Fish and Wildlife Service, 2005).

An estimated 5.5 to 6 million seabirds representing more than 100 species are thought to occur off California based on at-sea surveys within the Study Area (U.S. Fish and Wildlife Service, 2005). More than 300 bird species have been documented in and around San Diego Bay. The majority of these bay birds, representing 30 families, are migratory and may only stop to rest and feed, while others spend the winter or breed. Several are terrestrial birds of special concern or influence that are found about the Bay but may not directly depend upon it. Accordingly, terrestrial bird species are not analyzed in this document because they are not expected to be impacted by military readiness activities described in this EIS/OEIS.

3.9.2.1.3 Movement and Behavior

Many of the seabird species found in the Study Area dive, skim, or grasp prey at the water's surface or within the upper portion (1–2 m) of the water column (Cook et al., 2011; Jiménez et al., 2012; Sibley, 2014). However, numerous seabirds, including various species of diving ducks, cormorants, and alcids (the family that includes murres, murrelets, auks, auklets, shearwaters, and puffins), including the threatened Newell's shearwater, are known to feed at depths greater than 50 m (Raine et al., 2020). Some seabirds are aerial plunge divers, diving from above the surface and making generally shallow dives into the water column after prey (e.g., terns, gannets). Others are considered surface divers, plunging directly from the surface underwater after prey (e.g., puffins, loons). Most diving species tend to catch the majority of their prey near the surface of the water column or on the bottom in shallow water (e.g., clams, mussels, and other invertebrates) (Cook et al., 2011), although some pursue prey to considerable depths as noted previously. Dive durations are correlated with depth and range from a few seconds in shallow divers to several minutes in alcids (Ponganis, 2015).

3.9.2.1.4 Hearing and Vocalization

Marine birds generally have the greatest hearing sensitivity between 1 and 4 kHz in air and underwater. Additional information on hearing and vocalization for birds is provided in Appendix C. The majority of the published literature on bird hearing focuses on terrestrial birds and their ability to hear in air. A review of 32 terrestrial and marine species indicates that birds generally have greatest hearing sensitivity between 1 and 4 kHz (Beason, 2004; Dooling, 2002). Very few can hear below 20 Hz, most have an upper frequency hearing limit of 10 kHz, and none exhibit hearing at frequencies higher than 15 kHz (Dooling, 2002; Dooling & Popper, 2000). Larsen et al. (2020) determined that the average sound pressure with the most sensitivity was found at 1 kHz, both in air (53 dB re 20 µPa) and underwater (58 dB re 20 µPa), but with higher sensitivities under water. Information on hearing and vocalization for birds is provided in Appendix C.

3.9.2.1.5 General Threats

Seabirds are some of the most threatened marine animals in the world, with 29 percent of species at risk of extinction (Spatz et al., 2014). Threats to bird populations in the Study Area include human-caused stressors (such as incidental mortality) from interactions with commercial and recreational fishing gear; predation and competition by introduced species; disturbance and degradation of nesting areas by humans and domesticated animals; noise pollution from construction and other human activities; nocturnal collisions with power lines and artificial lights; collisions with aircraft; and pollution, such as that from oil spills and plastic debris (Anderson et al., 2007; Burkett et al., 2003; California Department of Fish and Game, 2010; Carter & Kuletz, 1995; Clavero et al., 2009; International Union for Conservation of Nature and Natural Resources, 2010; North American Bird Conservation Initiative, 2022; North American Bird Conservation Initiative & U.S. Committee, 2010; Onley & Scofield, 2007; Phillips et al., 2023; Piatt & Naslund, 1995; Richards et al., 2021; U.S. Fish and Wildlife Service, 2005, 2008, 2010; Waugh et al., 2012; Weimerskirch, 2004). A relatively new threat of wind energy development is of concern in both coastal Hawaii and California (Allison et al., 2019; Ross IV, 2022). Disease, volcanic eruptions, storms, and harmful algal blooms are also natural threats to birds (Anderson et al., 2007; Jeglinski et al., 2024; Jessup et al., 2009; North American Bird Conservation Initiative, 2022; North American Bird Conservation Initiative & U.S. Committee, 2010; U.S. Fish and Wildlife Service, 2005).

Young et al. (2012) and Phillips et al. (2023) summarized the hypothesized effects of climate change on seabirds in the Pacific Climate, which include possible changes in wind patterns (affecting frontal zones and coastal upwelling important for prey items), oceanic warming and increasing thermal stratification, higher sea levels and storm surge events causing inundation of breeding locations, changes in ocean chemistry (creation of low oxygen zones or areas with high acidity), and increased heat stress for breeding birds at terrestrial colony sites.

More detailed species-specific threats are included in Appendix C.

3.9.2.2 Endangered Species Act-Listed Species

Six species of birds listed as Threatened or Endangered under the ESA occur in the Study Area. The status, presence, and nesting occurrence of ESA-listed species are listed in Table 3.9-1. Critical habitat has not been designated for any of these species within the Study Area.

Table 3.9-1: Current Regulatory Status and Presence of Endangered Species Act-Listed Birds in the Study Area

Species Name and Regulatory Status				Species Occurrence in the Study Area		
Common Name	**Scientific Name**	**Distinct Population Segment/Stock**	**Endangered Species Act Status/Critical Habitat**	**Inshore and Coastal Waters Hawaiian Islands**	**Open Ocean**	**Inshore and Coastal Waters of California**
California least tern	*Sternula antillarum browni*	-	Endangered	No	No	**Yes**
Hawaiian petrel	*Pterodroma sandwichensis*	-	Endangered	**Yes**	**Yes**	No
Band-rumped storm-petrel	*Hydrobates castro*	Hawaii distinct population segment	Endangered	**Yes**	**Yes**	No
Short-tailed albatross	*Phoebastria albatrus*	-	Endangered	No	**Yes**	No
Marbled murrelet	*Brachyramphus marmoratus*	-	Threatened	No	No	**Yes**
Newell's shearwater	*Puffinus newelli*	-	Threatened	**Yes**	**Yes**	No

3.9.2.3 Species Not Listed under the Endangered Species Act

Section 3.9.2.3.1 describes species that are protected and of conservation concern under the Migratory Bird Treaty Act (MBTA) and Bald and Golden Eagle Protection Act. Additional information on each taxonomic group is provided in Appendix C. Major bird groups present in the Study Area are shown in Table 3.9-2.

Table 3.9-2: Major Groups of Birds in the Study Area

Major Bird Groups[1]		Species Occurrence in the Study Area [2]		
Common Name (Taxonomic Group)	**Description**	**Inshore and Coastal Waters Hawaiian Islands**	**Open Ocean**	**Inshore and Coastal Waters of California**
Geese, swans, dabbling and diving ducks (Order Anseriformes)	Diverse group of birds that inhabit shallow waters, coastal areas, and deeper waters. Feed at the surface by dabbling or by diving in deeper water. Often occur in large flocks.	Yes	Yes	Yes
Loons (Order Gaviiformes)	Superficially duck-like, fish-eating birds that capture prey by diving and underwater pursuit.	No	Yes	Yes
Grebes (Order Podicipediformes)	Small diving birds, superficially duck like. May occur in small groups.	No	Yes	Yes
Albatrosses, fulmars, petrels, shearwaters, and storm-petrels (Order Procellariiformes)	Group of largely pelagic seabirds. Fly nearly continuously when at sea. Soar low over the water surface to find prey. Some species dive below the surface.	Yes	Yes	Yes
Boobies, gannets, cormorants, anhingas, and frigatebirds (Order Suliformes)	Diverse group of large, fish-eating seabirds with four toes joined by webbing. Often occur in large flocks near high concentrations of bait fish.	Yes	Yes	Yes
Pelicans, herons, egrets, Ibis, and spoonbills (Order Pelecaniformes)	Large wading birds with dagger-like, down-curved, or spoon-shaped bills used to capture prey in water or mud.	Yes	No	Yes
Osprey, bald eagles, peregrine falcons (Orders Accipitriformes, and Falconiformes)	Large raptors that inhabit habitats with open water, including coastal areas. Feed on fish, waterfowl, or other mammals. Migrate and forage over open water.	Yes	No	Yes
Shorebirds, phalaropes, gulls, noddies, terns, skua, jaegers, and alcids (Order Charadriiformes)	Diverse group of small to medium sized shorebirds, seabirds and allies inhabiting coastal, nearshore, and open ocean waters.	Yes	Yes	Yes

[1]American Ornithologists' Union (1998), Sibley (2014), for major bird taxonomic groups.
[2]Presence in the Study Area includes open ocean areas (North Pacific Subtropical Gyre and North Pacific Transition Zone) and coastal waters of two Large Marine Ecosystems (California Current and Insular Pacific-Hawaiian).

3.9.2.3.1 Migratory Birds

Migratory birds are those that undertake periodic seasonal movement from one region to another, typically coinciding with available food supplies or breeding seasons. A variety of bird species would be encountered in the Study Area, including those listed under the MBTA, which protects nearly all migratory species of birds, eggs, and nests and establishes federal responsibilities for protecting these species.

For the analysis of effects, species protected under the MBTA are not analyzed individually but are grouped based on taxonomic or behavioral similarities based on the stressor that is being analyzed. Determinations of potential effects on species protected under the MBTA are presented in Section 3.9.5.

Birds of Conservation Concern are species, subspecies, and populations of migratory birds that the USFWS determined to be the highest priority for conservation actions to prevent the need to list birds under the ESA. The USFWS updated the list of Birds of Conservation Concern in 2021 after the preparation of the 2018 HSTT EIS/OEIS. Table 3.9-3 lists the species with potential to occur in the Study Area.

Table 3.9-3: Birds of Conservation Concern that Occur Within the Study Area

Order/Family	Common Name	Scientific Name
Order Procellariiformes		
Family Diomedeidae		
	Laysan albatross	*Phoebastria immutabilis*
	Black-footed albatross	*Phoebastria nigripes*
Family Procellariidae		
	Pink-footed shearwater	*Puffinus creatopus*
	Christmas shearwater	*Puffinus nativitatis*
	Black-vented shearwater	*Puffinus opisthomelas*
Family Hydrobatidae		
	Ashy storm-petrel	*Oceanodroma homochroa*
	Band-rumped storm-petrel[1]	*Hydrobates castro*
	Tristram's storm-petrel	*Oceanodroma tristrami*
Order Falconiformes		
Family Falconidae		
	Peregrine falcon	*Falco peregrinus*
Order Charadriiformes		
Family Lardiae		
Subfamily Sterninae	Blue noddy	*Procelsterna cerulean*
	Gull-billed tern	*Sterna nilotica*
Subfamily Rynchopinae	Black skimmer	*Rynchops niger*
Family Ardeidae		
	Guadalupe murrelet	*Synthliboramphus hypoleucus*
	Scripps's murrelet	*Synthliboramphus scrippsi*
	Cassin's auklet	*Ptychoramphus aleuticus*

[1] The band-rumped storm petrel are distributed in both the Atlantic and Pacific oceans. The Hawaii DPS is listed under the ESA.

3.9.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, baseline conditions of the existing environment for birds would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section describes and evaluates how and to what degree the activities described in Chapter 2, Appendix A, and Section 3.0.3.3 could potentially impact birds known to occur within the Study Area. The proposed military readiness activities and the locations where they would take place in the Study Area are presented in a series of tables in Chapter 2 for both Alternatives 1 and 2 and described in greater detail in Appendix A.

A review of changes in regulatory status and scientific information since 2018 that could alter the results of the stressor-based analysis presented in the 2018 HSTT and 2022 PMSR EIS/OEISs was conducted. The same stressor-based analysis was used in the analysis of adverse effects from the Proposed Action, and for most stressors, the adverse effects were generally similar to the previous analyses. The most substantive differences between the results of the previous analyses and the results from the analysis of the Proposed Action were from acoustic and explosives stressors.

The analysis considers standard operating procedures and mitigation measures that would be implemented under Alternative 1 and Alternative 2 of the Proposed Action. The standard operating procedures and mitigation measures that are specific to birds are listed in Table 3.9-4.

Table 3.9-4: Chapter 5 Section Reference to Relevant Mitigation Measures

Applicable Stressor	Requirements Summary and Protection Focus	Section Reference
General SOP	Designed to aid lookouts and other personnel with observation, environmental compliance, and reporting responsibilities.	Section 5.3
Explosives	Conduct visual observations for events for all NEW during ship shock trials. Observe during the event and after each individual detonation	Section 5.6
	Conduct visual observations for events involving explosive mine countermeasure and neutralization activities. Use of lookouts, with mitigation zones of 600 yd. for activities using 0.1–5 lb. NEW and 2,100 yd. for 6–650 lb. NEW.	Section 5.6
	Conduct visual observations for events involving explosive mine countermeasure with Navy divers. Use of lookouts, with mitigation zones for activities using 1–20 lb. NEW and 1,000 yd. for 21–60 lb. NEW, and additional ship shock trials.	Section 5.6

Notes: lb. = pound(s), yd. = yard(s), NEW = Net Explosive Weight

The stressors vary in intensity, frequency, duration, and location within the Study Area. General characteristics of all stressors and living resources' general susceptibilities to stressors are discussed in Section 3.0.3.3. The stressors and substressors analyzed for birds include the following:

- **acoustic** (sonar and other transducers, pile driving, vessel noise, aircraft noise, weapons noise, and air guns)
- **explosive** (explosions in-water, explosions in air)

- **energy** (in-air electromagnetic devices, in-water electromagnetic devices, high-energy lasers, high-power microwave devices)
- **physical disturbance and strike** (vessels and in-water devices, aircraft and aerial targets, MEM, seafloor devices, pile driving)
- **ingestion** (MEM)

As noted in Section 3.0.2, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in 40 CFR 1501.3(d). Explosive, physical disturbance and strike, and ingestion stressors could have a reasonably foreseeable adverse effect; thus requiring a significance determination.

A stressor is considered to have a significant effect on the human environment based on an examination of the context of the action and the intensity of the effect. In the present instance, the effects of the stressors analyzed would be considered significant if the effects would be short term or long term and well outside the natural range of variability of species' populations, habitats, or the natural processes sustaining them. This could include extensive (i.e., affecting a large proportion of the local population), life-threatening, or debilitating injury and mortality and substantial disruption of time-sensitive behaviors such as breeding. Displacement of birds from preferred breeding or feeding areas, nursery grounds, or migratory routes would occur within project areas, their immediate surroundings, and beyond. Behavioral disruptions and displacement would result in the loss of breeding and egg-bearing adults and chicks due to increased competition or energy expenditure at scales large enough to affect overall bird population numbers or demographic structure. Impacts would also be considered major if they threatened the continued existence of any bird species. Full recovery of bird populations would not be expected to occur in a reasonable time. Habitat would be degraded over the long term or permanently such that it would no longer be able to support dependent populations of birds.

3.9.3.1 Acoustic Stressors

This section summarizes the potential effects of acoustic stressors used during military readiness activities within the Study Area. Table 3.9-5 contains a brief summary of background information that is relevant to the analyses of effects for each acoustic substressor. More detailed information and analysis on acoustic stressors, as well as effects specific to each substressor, is provided in Appendix D.

Table 3.9-5: Acoustic Stressors Information Summary

Substressor	*Background Information Summary*
Sonar and other transducers	• Pursuit-diving bird species may be exposed to sonar and other transducers while foraging underwater; however, diving occurs only for minutes at a time. • Injury of the lungs from sonar and other transducers is unlikely in birds. • Hearing loss would only occur if a bird were close to a sound source of sufficient intensity and duration. It is unlikely that a diving bird would experience underwater exposure to sonar or other transducers that would impact hearing.
Air guns	• Sound from air guns lack the strong shock wave and rapid pressure increases of explosions that can cause primary blast injury or barotraumas. Generated impulses would have short durations, typically a few hundred milliseconds. • The exposure to these sounds by birds, other than pursuit-diving species, would be negligible because they spend a very short time underwater.

Table 3.9-5: Acoustic Stressors Information Summary (continued)

Substressor	*Background Information Summary*
	• Pursuit divers may experience underwater sound exposure. However, exposure is unlikely because of the short duration of an air gun pulse; relatively low source (exposure would require a bird to be very close to the source at the moment of discharge); and generally, air guns are used at depths greater than where birds forage.
Weapons noise	• Sounds produced by weapons are potential stressors to birds. • Sound generated by a muzzle blast is intense but very brief. A bird very close to a large weapons blast could be injured or experience hearing loss or threshold shift due to acoustic trauma. • Sound generated by a projectile travelling at speeds greater than the speed of sound can produce a low amplitude bow shock wave in a narrow area around its flight path.
Weapons noise (continued)	• Inert objects hitting the water surface would generate a splash, and the noise may disturb nearby birds. • Bird responses to weapons firing and projectile travel noise may include short-term behavioral or physiological responses such as alert responses, startle responses, or temporary increases in heart rate. • Studies of effects of weapons noise on raptors show that these birds show little reaction (e.g., head turn) and do not alter behavior in the presence of noise from weapons testing (Brown et al., 1999; Schueck et al., 2001; Stalmaster & Kaiser, 1997). • Once surface weapons firing activities begin, birds would likely disperse away from the area around the ship and the path of projectiles.
Pile driving	• Impact pile driving produces repetitive, impulsive, broadband sound with most of the energy in lower frequencies. Vibratory pile removal produces nearly continuous sound at a lower source level. Sounds are emitted both in the air and in the water in nearshore areas where some birds forage. • Most individuals would avoid the locations during pile driving and removal activities. • Behavioral responses and displacement from the area are expected to be temporary for the duration of the pile driving and extraction activities.
Vessel noise	• Birds respond to vessels in various ways. Some follow vessels while others avoid vessels. • Vessel noise could elicit short-term behavioral or physiological responses but is not likely to disrupt migrating, breeding, feeding, and sheltering, or result in serious injury to any birds. • Harmful bird/vessel interactions are commonly associated with commercial fishing vessels because birds are attracted to concentrated food sources. Such concentrations are not present around military vessels.
Aircraft noise	• Birds could be exposed to noise associated with subsonic and supersonic fixed-wing aircraft and rotary-wing aircraft overflights. • Exposure to fixed-wing aircraft noise would be brief and infrequent, and repeated exposure of individuals in a short period of time (hours or days) is unlikely. • Common behavioral responses to aircraft noise include no response or stationary alert behavior, startle response, flight, and increased vocalization. • There is also the potential for noise to mask calls. • In some instances of frequent exposure or exposure to intense noise, behavioral responses could affect breeding, foraging, habitat use, and energy budgets.

3.9.3.1.1 Effects from Sonar and Other Transducers

Table 3.9-5 contains a summary of the background information used to analyze the potential effects of sonar and other transducers on birds. For a listing of the types of activities that use sonar and other transducers, refer to Appendix B. For information on locations and the number of activities proposed for each alternative, see Table 3.0-1.

Sonar and other transducers would not be regularly used in nearshore areas that could be used by foraging shorebirds, expect during pierside maintenance activities or navigation in areas around ports. The Pacific current runs through the portion of the HCTT Study Area along the western U.S. coast, and is an area of increased productivity that attracts formatting birds. Therefore, birds that forage in open ocean areas would have a greater chance of underwater sound exposure than birds that forage in coastal areas.

Training and Testing. Pursuit-diving birds could be exposed to low-, mid-, and high-frequency sonar and sound produced by sonar and other transducers during training and testing activities. The greatest potential for measurable effects would be near the sources of low-frequency and high-intensity sonar. For military readiness activities, this would occur mostly in the offshore marine environment. Sonar and other transducers would not be regularly used in nearshore areas that could be used by foraging shorebirds, except during maintenance and for navigation in areas around ports. Therefore, birds that forage in open-ocean areas would have a greater chance of underwater sound exposure than birds that forage in coastal areas. Exposure resulting in adverse effects are unlikely because of the bird would have to be underwater at the time of use of sonar and transducers in very close (within a few meters) proximity to the source.

The possibility of an ESA-listed bird species being exposed to sonar and other transducers depends on whether it submerges during foraging and whether it forages in areas where these sound sources may be used. Hawaiian petrels, band-rumped storm petrels, and short-tailed albatrosses do not submerge while foraging; therefore, it is unlikely they would be exposed to underwater sound from sonar and other active acoustic sources. Least terns, marbled murrelet, and Newell's shearwater may briefly submerge while foraging, either during plunge-diving (terns) or pursuit diving (murrelet and shearwater), so there is a chance that these species could be exposed to underwater sound from sonar and other transducers. However, their plunge dives are brief, so any chance of exposure would be inconsequential. Most other sonar use occurs farther offshore, however, so the chance for an exposure would be low.

Modernization and Sustainment of Ranges. Sonar and other transducers would not be used during modernization and sustainment of ranges activities.

Conclusion. Activities that use sonar and other transducers would not have reasonably foreseeable adverse effects on birds for reasons previously stated in the 2018 HSTT and 2022 PMSR EIS/OEISs. These reasons include (1) the close proximity that a diving bird would have to be to an emitting source to have an adverse effect; (2) if a bird was exposed to sound generated by sonar and other transducers, it would likely be sufficiently low (because of the distance from the sound source) to not alter normal feeding activities; and (3) the duration of exposure would likely be sufficiently brief as to have no discernable effect on normal activities.

3.9.3.1.2 Effects from Air Guns

Air guns can introduce brief impulsive, broadband sounds into the marine environment. Section 3.0.3.3.1.1 provides additional details on the use and acoustic characteristics of the small underwater air guns used during training and testing activities.

Training and Testing. The exposure of birds to air gun noise during military readiness activities other than pursuit diving species, would be negligible because they spend only a very short time underwater (plunge-diving or surface-dipping) or forage only at the water surface. Pursuit divers may remain underwater for minutes, increasing the chance of underwater sound exposure. However, the short duration of an air gun pulse and its relatively low source level means that a bird would have to be very close to a small air gun used in training and testing activities at the moment of discharge to be exposed. In addition, air guns may be fired at greater depths than birds conduct their foraging dives. Because of these reasons, the likelihood of a diving bird experiencing an underwater exposure to an air gun that could result in an impact on hearing is negligible.

There is no evidence that diving birds rely on underwater acoustic communication for foraging; rather, they may depend more on vision/visual cues (see Section 3.9.2.1.4). Because the signal from an air gun is very brief, the masking of important acoustic signals underwater by an air gun is unlikely.

The possibility of an ESA-listed seabird species being exposed to sounds from an air gun depends on whether it submerges during foraging and whether it forages in areas where this sound source may be used. Hawaiian petrels and short-tailed albatrosses do not submerge while foraging; therefore, it is unlikely they would be exposed to underwater sound from air guns. Least terns, marbled murrelets, and Newell’s shearwater may briefly submerge while foraging, either during plunge-diving (terns) or pursuit diving (murrelet and shearwater). The remote possibility of exposure to a brief air gun signal exists, but only for pursuit divers that may be underwater long enough to be exposed. As discussed previously, effects on individual birds, if any, are expected to be minor and limited. No long-term consequences to individuals are expected. Accordingly, there would be no consequences to any bird populations, and air guns would not have a significant adverse effect on populations of migratory bird species.

Modernization and Sustainment of Ranges. Air guns would not be used during modernization and sustainment of ranges activities.

Conclusion. Air gun activities would not have reasonably foreseeable adverse effects on birds for reasons previously stated in the 2018 HSTT and 2022 PMSR EIS/OEISs. These reasons include (1) the close proximity that a diving bird would have to be to air guns to have a measurable behavioral change, (2) the very close proximity (within a few meters) a diving bird would have to be air guns for injury, (3) the short duration and infrequent scheduling of an air gun event, and (4) the likely resumption of normal activities after air gun use ends.

3.9.3.1.3 Effects from Pile Driving

Refer to Table 3.9-5 for a summary of the background information used to analyze the potential effects of pile driving on birds. Detailed background information is provided in Appendix D.

Training and Testing. Pile driving would occur in Port Hueneme harbor in the Southern California portion of the Study Area. Although some individual birds could be exposed to noise from pile driving, the activities would occur intermittently (one event occurring intermittently over approximately 30 days per year) in very limited areas and would be of short duration (maximum of 90 minutes per 24-hour period). The activity would occur in highly disturbed estuarine habitats that are generally similar to that which was analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs.

Of the bird species under the ESA, Hawaiian petrels, short-tailed albatrosses, band-rumped storm petrels (Hawaii Distinct Population Segment), and Newell's shearwater do not occur in Port Hueneme Harbor. Marbled murrelet and least terns would be expected to occur within the areas subject to pile driving. There are limited available data on non-auditory injury to birds from intense non-explosive sound sources. The 2022 PMSR EIS/OEIS cited a study for recommended auditory thresholds for murrelets. The study recommended the auditory injury threshold (point at which injury to the ear hair cells would occur) for underwater noise levels at 202 decibels referenced to 1 micropascal squared per second (dB re 1 μPa^2-sec) cumulative SEL and the non-auditory injury threshold (from barotrauma) at 208 dB re 1 μPa^2-sec SEL for marbled murrelets (Science Applications International Corporation, 2011). Birds in the vicinity of pile driving activities are expected to avoid the area, and exposures would result in less than significant effects.

Modernization and Sustainment of Ranges. Pile driving would not occur during modernization and sustainment of ranges activities.

Conclusion. Pile driving activities would not have a reasonably foreseeable adverse effects on birds for reasons previously stated in the 2018 HSTT and 2022 PMSR EIS/OEISs. These reasons include (1) the close proximity that a diving bird would have to be to active pile driving to have a measurable behavioral change, (2) the very close proximity (within a few meters) a diving bird would have to be pile driving for injury, (3) the short duration and infrequent scheduling of an impact, and (4) the likely resumption of normal activities after the cessation of pile driving.

3.9.3.1.4 Effects from Vessel Noise

Military readiness activities proposed in the Study Area involve maneuvers by various types of surface ships, boats, submarines, and unmanned vehicles (collectively referred to as vessels) (see Section 3.0.3.3.1.4). Birds could be exposed to both in-air and underwater noise from vessels throughout the Study Area, but few exposures would occur based on the infrequency of operations and the low density of vessels within the Study Area at any given time. Potential for exposure to vessel noise due to military readiness activities would be greatest near Navy ports.

Birds respond to vessels in various ways. Some birds are commonly attracted to and follow vessels, including certain species of gulls, storm-petrels, and albatrosses (Hamilton, 1958; Hyrenbach, 2001, 2006), while other species such as frigatebirds, sooty terns, and a variety of diving birds seem to avoid vessels (Borberg et al., 2005; Hyrenbach, 2006; Schwemmer et al., 2011). Vessel noise could elicit short-term behavioral or physiological responses but is not likely to disrupt major behavior patterns, such as migrating, breeding, feeding, and sheltering, or to result in serious injury to any birds. Harmful bird/vessel interactions are commonly associated with commercial fishing vessels because birds are attracted to concentrated food sources around these vessels (Dietrich & Melvin, 2004; Melvin & Parrish, 2001). The concentrated food sources (catch and bycatch) that attract birds to commercial fishing vessels are not present around Navy vessels.

Although loud sudden noises can startle and flush birds, vessels are not expected to result in major acoustic disturbance of birds in the Study Area. The continuous noise from Navy vessels has the potential to cause masking for birds, both in air and underwater. Due to the transient nature of Navy vessels, this masking is expected to be temporary. Birds near ports may experience increased masking and become habituated to this noise or attempt to compensate for the masking. Noises from Navy vessels are similar to or less than those of the general maritime environment. Birds may respond to the physical presence of a vessel, regardless of the associated noise (see Section 3.9.3.4.1).

Training and Testing. Table 3.0-12 lists each vessel type and their characteristics for different activity types proposed under Alternative 1. Table 3.0-14 lists the number of annual events using vessels and seven-year event numbers for training and testing activities. The location and hours of Navy vessel usage for training and testing activities are dependent upon the locations of Navy ports, piers, and established at-sea training and testing areas. These areas (including the previously analyzed HSTT Study Area and new areas added to the HCTT Study Area) have not appreciably changed in decades and are not expected to change in the foreseeable future.

Modernization and Sustainment of Ranges. The Navy proposes to deploy undersea fiber optic cables and connected instrumentation to existing undersea infrastructure along the seafloor in the California Study area (south and west of SCI), and in the Hawaii Study Area (northeast of Oahu and west of Kauai). Vessels supporting modernization and sustainment activities would move very slowly during installation activities (0 to 3 knots) but otherwise would have similar noise effects as described for training and testing activities.

Conclusion. Vessel noise generated by military readiness activities would not have reasonably foreseeable adverse effects on birds for reasons previously stated in the 2018 HSTT and 2022 PMSR EIS/OEISs. Vessel noise produced during military readiness activities may briefly impact some individuals, but exposures would be brief, localized, and intermittent and would not be expected to impact populations or to impact survival, growth, or reproduction. Birds in the open ocean, foraging or migrating, could be exposed to vessel noise as the vessel passes and may respond by avoiding areas of temporarily concentrated vessel noise. If a bird responds to vessel noise, only short-term behavioral responses such as startle, head turning, or avoidance would be expected. There is little likelihood of repeated exposures because of the transient nature of vessels and regular movement of birds. Because effects on individual birds are expected to be minor and limited, no long-term consequences to individuals or populations are expected.

3.9.3.1.5 Effects from Aircraft Noise

Military readiness activities proposed in the Study Area involve various types of aircraft, including fixed-wing, and rotary-wing aircraft (see Section 3.0.3.3.1.5). Aircraft noise would be generated throughout the Study Area, contributing both airborne and underwater sound to the ocean environment. Most of the aircraft noise would be generated at air stations, which are outside the Study Area. Takeoffs and landings occur at established airfields as well as on vessels across the Study Area. Takeoffs and landings from Navy vessels produce in-water noise at a given location for a brief period as the aircraft climbs to cruising altitude. Some bird species, particularly waders and shorebirds, could have greater exposure to aircraft noise because of the proximity of habitats (e.g., wetlands, estuaries) to airfields. Seabirds in pelagic habitats would likely experience fewer exposures because of the brief overflight time and the high altitude of the aircraft relative to the lower altitudes maintained by foraging seabirds.

A bird offshore could be exposed to transient noise from aircraft passing overhead and may respond by avoiding areas where aircraft operations are temporarily concentrated. Aircraft activity would be dispersed, and exposures would be infrequent and brief. This is true of fixed- or rotary-winged aircraft, though helicopters could hover for longer periods and helicopter activities would also occur closer to the coast and inshore, and at times at lower altitudes than fixed wing aircraft, increasing the potential to expose birds to aircraft noise.

Training and Testing. Table 3.0-5 provides source levels for some typical aircraft used during training and testing activities under Alternative 1 and depicts comparable airborne source levels for the F-35A, EA-18G, and F/A-18C/D aircraft during takeoff. Exposures to aircraft noise, particularly those of longer duration, could result in behavioral responses and physiological stress. However, it is likely that birds present when aircraft noise exposure begins would leave the area to avoid further exposure to aircraft noise, human presence, and other training and testing-associated stressors. Any reactions are expected to be short term and minor. Repeated exposures of individuals would be unlikely, and no long-term consequences to individuals or populations are expected.

Sonic booms would also be generated during training and testing activities. Supersonic aircraft flights are not intentionally generated below 30,000 ft. unless over water and more than 30 nautical miles from inhabited coastal areas or islands. Deviation from these guidelines may be approved for tactical missions that require supersonic flight, phases of formal training requiring supersonic speeds, research and test flights that require supersonic speeds, and for flight demonstration purposes when authorized by the Chief of Naval Operations (U.S. Department of the Navy, 2016). Outside of these authorized tactical missions, sonic booms would not likely disturb seabirds in these pelagic environments.

Modernization and Sustainment of Ranges. Aircraft would not be used during modernization and sustainment of ranges activities.

Conclusion. Activities that use aircraft would not have a reasonably foreseeable adverse effect on birds for reasons previously stated in the 2018 HSTT and 2022 PMSR EIS/OEISs. These reasons include: (1) birds in nearshore environments (where the most aircraft noise exposures would occur) would likely be disturbed, however, any observable behavioral change would be temporary with normal activities quickly resuming after the aircraft has left the area; (2) the brief overflight time and the high altitude of the aircraft relative to the lower altitudes maintained by foraging seabirds; and (3) sonic booms would be generated at elevations sufficiently high enough where the noise generated by the sonic boom would be short in duration (a few seconds) and not likely discernable from ambient sounds in the pelagic environment.

3.9.3.1.6 Effects from Weapons Noise

Proposed military readiness activities involve various weapons platforms, as described in Appendix A (see Section 3.0.3.3.1.5). Other devices intentionally produce noise to serve as a non-lethal deterrent. Not all weapons utilize explosives, either by design or because they are non-explosive practice munitions. Noise produced by explosives, both in air and water, are discussed in Section 3.0.3.3.2, with potential effects on birds discussed in Section 3.9.3.2.

Training and Testing. Table 3.0-7 provides examples of in-water and airborne weapons platforms proposed for use under Alternative 1, listing the noise source and the anticipated sound level. Most sounds would be brief, lasting from less than a second for a blast or inert impact to a few seconds for other launch and object travel sounds. Most incidents of impulsive sounds produced by weapons firing, launch, or inert object effects would be single events, with the exception of gunfire activities.

Use of weapons during training would typically occur in the range complexes, with fewer activities in the transit corridor. Most activities involving large-caliber naval gunfire or the launching of targets, missiles, bombs, or other munitions are conducted more than 3 NM from shore.

Birds that migrate or forage in open-ocean areas could be exposed to large-caliber weapons noise. All species could be exposed to small- and medium-caliber weapons noise that may occur closer to shore.

Because weapons firing occurs at varying locations over a short time period and bird presence changes seasonally and on a short-term basis, individual birds would not be expected to be repeatedly exposed to weapons firing, launch, or projectile noise. Any effects on migratory or breeding birds related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short in duration and infrequent.

Modernization and Sustainment of Ranges. Weapons would not be used during modernization and sustainment of ranges activities.

Conclusion. Activities that include weapons noise would not have reasonably foreseeable adverse effects on birds for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs. Because effects on individual birds, if any, are expected to be minor and limited, no long-term consequences to individuals are expected.

3.9.3.2 Explosive Stressors

Table 3.9-6 contains brief summaries of background information that is relevant to the analyses of effects for each explosive substressor. Detailed information on acoustic impact categories in general, as well as effects specific to each substressor, is provided in Appendix D.

While each of these substressors could affect birds, the following analysis focuses on those substressors that would occur in areas covered under previous NEPA analyses (2018 HSTT and 2022 PMSR EIS/OEISs), as well as new areas proposed in the HCTT Study Area.

Table 3.9-6: Explosives Stressors Background Information Summary

Substressor	Background Information Summary
Explosions in Air	• Detonations in air during anti-air warfare training would typically occur at much higher altitudes (greater than 3,000 feet [914 meters] above sea level) where seabirds and migrating birds are not likely to be present. • Explosives detonated at or just above the water surface, such as those used in anti-surface warfare, would create blast waves that would propagate through both the water and air. • Detonations in air could also result in mortality or injury to birds. • If prey species (e.g., fishes) are killed or injured as a result of detonations, some birds may be attracted to forage in the area and be exposed to subsequent detonations. • A fleeing response to an initial explosion may reduce bird exposure to any additional explosions that occur within a short time. • Detonations either in air or underwater have the potential to cause a permanent or temporary hearing loss or auditory threshold shift, which could affect the ability of a bird to communicate or detect biologically relevant sounds. • An explosive detonation would likely cause a startle reaction, as the exposure would be brief, and any reactions are expected to be short term. Startle effects range from altering behavior (e.g., stop feeding or preening), minor behavioral changes (e.g., head turning), or a flight response. The range of effects could depend on the charge size, distance from the charge, and the animal's behavior at the time of the exposure. Any effects related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short term and infrequent. • Because most events would consist of a limited number of detonations, exposures would not occur over long durations; and since events occur at varying locations, it is expected there would be an opportunity to recover from an incurred energetic cost, and individual birds would not be repeatedly exposed to explosive detonations.

Substressor	Background Information Summary
Explosions in Water	• The majority of underwater explosions typically in offshore locations and in depths greater than 100 feet (30 meters). • Sound and energy generated by most small underwater explosions are unlikely to disturb birds above the water surface. If a detonation is sufficiently large or is near the water surface, however, pressure would be released at the air-water interface. Birds above this pressure release could be injured or killed. • If prey species, such as fish, are killed or injured as a result of detonations, some birds may be attracted to forage in the area and be exposed to subsequent detonations. The Navy maintains mitigation measures to stop activities when large numbers of birds aggregate in area where multiple successive explosions would occur.

3.9.3.2.1 Effects from Explosions in Air

3.9.3.2.1.1 Effects from Explosions in Air under Alternative 1

Training and Testing. Because most events involving in-air explosions would consist of a limited number of detonations, exposures would not occur over long durations; and since events occur at varying locations, it is expected there would be an opportunity to recover from an incurred energetic cost, and individual birds would not be repeatedly exposed to explosive detonations.

The Navy will implement mitigation for seabirds during applicable explosive mine warfare activities throughout the Study Area (see Table 3.9-4). The mitigation will help avoid or reduce potential effects on concentrations of seabirds and birds that have the ability to forage underwater.

Modernization and Sustainment of Ranges. Explosives would not be used during modernization and sustainment of ranges activities.

Conclusion. Activities that include the use of in-air explosives under Alternative 1 would result in less than significant effects because although a few individuals may experience long-term effects and potential mortality, population-level effects are not expected.

3.9.3.2.1.2 Effects from Explosions in Air under Alternative 1 and Alternative 2

The only difference between Alternatives 1 and 2 in explosives use is that the number of explosives used would be slightly greater under Alternative 2 (Table 3.0-9). Even though the number of explosives used in Alternative 2 would be greater than Alternative 1, potential effects on birds are not expected to be meaningfully different. Therefore, activities that include in-air explosions under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.9.3.2.2 Effects from Explosions in Water

Detonations underwater have the potential to cause a permanent threshold shift or temporary threshold shift, which could affect the ability of a bird to communicate with conspecifics or detect biologically relevant sounds. An explosive detonation would likely cause a startle reaction, as the exposure would be brief and any reactions are expected to be short term. Startle effects range from altering behavior (e.g., stop feeding or preening), minor behavioral changes (e.g., head turning), or a flight response. The range of effects could depend on the charge size, distance from the charge, and the animal's behavior at the time of the exposure. Explosives detonated in water are binned by NEW. The bins of explosives that are proposed for use in the Study Area are shown in Table 3.0-5. Any effects related to startle reactions, displacement from a preferred area, or reduced foraging success in offshore waters would likely be short-term and infrequent.

Nearshore waters are the primary foraging habitat for many seabird species. Any small detonations close to shore could have a short-term adverse impact on nesting and nearshore foraging species. Larger detonations would typically occur near areas with the potential for relatively high concentrations of seabirds (e.g., upwelling areas associated with the Pacific Current, productive live/hard bottom habitats, and large algal mats); therefore, any effects on seabirds are likely to be greater in these areas.

3.9.3.2.2.1 Effects from Explosions in Water under Alternative 1

Training and Testing. The use of in-water explosives would increase from the 2018 HSTT EIS/OEIS for training activities and would decrease slightly for testing. There is an overall reduction in the use of most of the largest explosive bins (bin E8 [> 60–100 lb. NEW] and above) for training and a decrease in two of the largest explosive bins (bin E10 [> 250–500 lb. NEW] and E11 [> 500–650 lb. NEW]) under testing activities. There would be notable increases in the smaller explosive bins (E7 [> 20–60 lb. NEW] and below) under training and testing activities, except for bin E1 (0.1–0.25 lb. NEW) which would decrease under testing activities. Small ship shock trials (bin E16 [> 7,250–14,500 lb. NEW]) not previously analyzed are currently proposed under testing activities.

Sound and energy generated by most small underwater explosions are unlikely to disturb birds above the water surface. If a detonation is sufficiently large or is near the water surface, however, pressure would be released at the air-water interface. Birds above this pressure release could be injured or killed.

If prey species, such as fish, are killed or injured as a result of detonations, some birds may continue to forage close to the area, or may be attracted to the area, and be exposed to subsequent detonations in the same area within a single event, such as gunnery exercises, which involves firing multiple high-explosive 5-in. rounds at a target area; bombing exercises, which could involve multiple bomb drops separated by several minutes; or underwater detonations, such as multiple explosive munitions neutralization charges. However, a fleeing response to an initial explosion may reduce seabird exposure to any additional explosions that occur within a short timeframe. Along the coast of SCI and throughout the SSTC, however, groups of pelicans and grebes are noted around under water detonations and are monitored to avoid effects from subsequent underwater detonations.

Because most events involving underwater explosions would consist of a limited number of detonations, exposures would not occur over long durations; and since most at-sea events occur at varying locations, it is expected there would be an opportunity to recover from an incurred energetic cost, and individual birds would not be repeatedly exposed to explosive detonations. Some areas are used more regularly for mine warfare activities and other activities that use lower yield explosives under water. Although a few individuals may experience long-term effects and potential mortality, population-level effects are not expected, and explosives would not have a significant adverse effect on populations of migratory bird species. The Action Proponents conduct extensive activity-based mitigation that includes visual observations for ship shock trials in accordance with event-specific mitigation and monitoring plans (see Chapter 5). Adherence to these plans increases the likelihood that Lookouts would sight groups of birds on the surface within the ship shock trial mitigation zone. For other explosive activities, the Action Proponents would also implement mitigation to relocate, delay, or cease detonations when marine animals are sighted within or entering a mitigation zone to avoid or reduce potential explosive effects. The mitigation measures will help avoid or reduce potential effects on concentrations of seabirds and birds that have the ability to forage underwater.

Modernization and Sustainment of Ranges. Explosives would not be used during modernization and sustainment of ranges activities.

Conclusion. Activities that include explosions in water under Alternative 1 would result in less than significant effects since the effects on birds would not have a measurable effect on breeding, feeding, and sheltering of birds.

3.9.3.2.2.2 Effects from Explosions in Water under Alternative 2

The only difference between Alternatives 1 and 2 in explosives use is that the number of explosives used would be slightly greater under Alternative 2 (Table 3.0-9). Even though the number of explosives used in Alternative 2 would be greater than Alternative 1, potential effects on birds are not expected to be meaningfully different. Therefore, activities that include in-air explosions under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.9.3.3 Energy Stressors

Table 3.9-7 contains brief summaries of background information that is relevant to the analyses of effects for each energy substressor. Detailed information on energy stressors in general, as well as effects specific to each substressor, is provided in Appendix F.

Table 3.9-7: Energy Stressors Background Information Summary

Substressor	Background Information Summary
In-air electromagnetic devices	• Several different types of in-air electromagnetic devices are used during military readiness activities, including an array of communications transmitters, radars, and electronic countermeasures transmitters. In-air electromagnetic effects can be categorized as thermal (i.e., capable of causing damage by heating tissue) or non-thermal. • Thermal effects are most likely to occur when near high-power systems. Should such effects occur, they would likely cause birds to temporarily avoid the area receiving the electromagnetic radiation until the stressor ceases (Manville, 2016). • Currently, questions exist about far-field, non-thermal effects from low power, in-air electromagnetic devices. Manville (2016) performed a literature review of this topic. Although findings are not always consistent, several peer-reviewed studies have shown non-thermal effects can include (1) affecting behavior by preventing birds from using their magnetic compass, which may in turn affect migration; (2) fragmenting the DNA of reproductive cells, decreasing the reproductive capacity of living organisms; (3) increasing the permeability of the blood-brain barrier; (4) causing other behavioral effects; (5) causing other molecular, cellular, and metabolic changes; and (6) increasing cancer risk. • Cucurachi et al. (2013) also performed a literature review of 113 studies and reported that (1) few field studies were performed (the majority were conducted in a laboratory setting); (2) 65% of the studies reported ecological effects both at high as well as low dosages (i.e., those that are compatible with real field situations, at least on land); (3) no clear dose-effect relationship could be discerned, but studies finding an effect applied higher durations of exposure and focused more on mobile phone frequency ranges; and (4) a lack of standardization and a limited number of observations reduced the possibility of generalizing results from an organism to an ecosystem level. • Any temporary disorientation experienced by birds from electromagnetic changes caused by in-air electromagnetic devices may be considered a short-term impact and would not hinder bird navigation abilities due to their use of other orientation cues such as the sun and moon, visual cues, wind direction, infrasound, and scent.

Table 3.9-7: Energy Stressors Background Information Summary (continued)

Substressor	Background Information Summary
	• Given the wide area where military readiness activities at sea could occur and the relatively low-level and dispersed use of these systems at sea, it is unlikely that birds would be affected by these activities, and population-level effects are not expected. • Similarly, the potential to affect ESA-listed birds is low based on the low numbers of individuals and the transient and brief nature of the use of these devices. No effects are anticipated.
In-water electromagnetic devices	• Towed in-water electromagnetic devices effects could impact diving bird species or species on the surface in the immediate area where the device is deployed. There is no information available on how birds react to electromagnetic fields underwater.
High-energy lasers	• Effects would occur if individuals were struck directly with a laser beam, which could result in injury or mortality due to the thermal effects of radiation exposure. • Birds could be exposed to a laser only if they fly through the beam, a very unlikely occurrence because of the limited use of high-energy lasers and small area and time that the beam would be present. • The laser is designed not to miss the intended target and automatically shuts down if the target-lock is lost, preventing the laser from striking anything but the target.
High-power microwave weapons	• High-power microwave devices are used in a similar manner and with a similar purpose as high-energy lasers, and some for the same reasoning explaining why adverse effects are unlikely applies to the analysis of effects from high-power microwave devices. High-power microwave devices lack the automated shutdown capability if target-lock is lost and would be turned off by the operator; however, a bird exposure is unlikely. For an exposure to occur, the beam would have to miss the target and hit a bird in the beam's path before the operator could turn off the device.

Notes: DNA = deoxyribonucleic acid; ESA = Endangered Species Act

3.9.3.3.1 Effects from In-Air Electromagnetic Devices

Given (1) the information provided in Table 3.9-7; (2) the dispersed nature of Navy military readiness activities at sea; and (3) the relatively low-level and dispersed use of these systems at sea, the following conclusions are reached:

- The chance that in-air electromagnetic devices would cause thermal damage to an individual bird is extremely low;
- It is possible, although unlikely, that some individual birds would be exposed to levels of electromagnetic radiation that would cause discomfort, in which case they would likely avoid the immediate vicinity of training and testing;
- The strength of any avoidance response would decrease with increasing distance from the in-air electromagnetic device; and
- No long-term or population-level effects would occur.

Training and Testing. Training and testing activities involving in-air electromagnetic devices would occur throughout the Study Area. For the reasons described previously, however, no long-term or population-level effects on birds would occur.

The effects of in-air electromagnetic device use on birds are not expected to result in detectable changes to bird habitat, reproduction, growth, or survival, and are not expected to result in population-level effects or affect the distribution or abundance of birds.

Modernization and Sustainment of Ranges. In-air electromagnetic devices would not be used during modernization and sustainment of ranges activities.

Conclusion. In-air electromagnetic devices would not have reasonably foreseeable adverse effects on birds for reasons previously stated in the 2018 HSTT and 2022 PMSR EIS/OEISs. These reasons include (1) the close proximity that a diving bird would have to be to a device to have a measurable behavioral change, (2) the very close proximity (within a few meters) a flying bird would have to be for in-air electromagnetic devices to induce injury, (3) the likely startle response from stressors not associated with electromagnetic fields (i.e., visual disturbance of aircraft or aircraft noise), and (4) the likely resumption of normal activities after the cessation of device use.

3.9.3.3.2 Effects from In-Water Electromagnetic Devices

Table 3.9-7 contains a summary of background information used to analyze the potential effects of in-water electromagnetic devices on birds. Detailed information is provided in Appendix F.

Training and Testing. For a discussion of the types of activities that create an electromagnetic field under water, refer to Appendix B, and for information on locations and the number of activities proposed for Alternative 1, see Table 3.0-9. The in-water devices producing an electromagnetic field are towed or unmanned mine countermeasure systems. The electromagnetic field is produced to simulate a vessel's magnetic field. In an actual mine-clearing operation, the intent is that the electromagnetic field would trigger an enemy mine designed to sense a vessel's magnetic field.

The distribution of birds in these portions of the Study Area is patchy (Fauchald et al., 2002; Haney, 1986b; Nevitt & Veit, 1999; Savoca et al., 2016; Schneider & Duffy, 1985). Exposure of birds would be limited to those foraging at or below the surface (e.g., cormorants, loons, petrels, grebes) because that is where the devices are used. Birds that forage inshore could be exposed to these in-water electromagnetic stressors because their habitat overlaps with some of the activities that occur in the nearshore portions of the California Study Area. However, the in-water electromagnetic fields generated would be distributed over time and location near mine warfare ranges and harbors, and any influence on the surrounding environment would be temporary and localized. More importantly, the in-water electromagnetic devices used are typically towed by a helicopter, surface ship, or unmanned vehicle. It is likely that any birds in the vicinity of an approaching vehicle towing an in-water electromagnetic device would be dispersed by the noise and disturbance generated by the vehicles (Section 3.9.3.1.5) and therefore move away from the vehicle and device before any exposure could occur.

Modernization and Sustainment of Ranges. The Navy proposes to deploy undersea cables and connected instrumentation to existing undersea infrastructure along the seafloor in the California Study area (south and west of SCI), and the Hawaii Study Area (northeast of Oahu and west of Kauai). These cables all generate an EMF. The EMF produced by the cable is less than that of the natural background magnetic force of the earth at distances beyond 0.6 cm (0.25 in) from the cable. As electromagnetic energy dissipates exponentially by distance from the energy source, the magnetic field from the cable would be equal to 0.1 percent of the earth's at a distance of 6 m (20 ft.). The cables and nodes would be installed at the bottom of the ocean floor, in most cases at a minimum depth of 37 m (120 ft.). Given this depth, birds are unlikely to come into extended contact with cables or nodes and it is extremely unlikely that they would be affected by the magnetic field.

Conclusion. In water electromagnetic devices would not have reasonably foreseeable adverse effects on birds for reasons previously stated in the 2018 HSTT and 2022 PMSR EIS/OEISs. These reasons include (1) relatively low intensity of the magnetic fields generated (0.2 microtesla at 600 ft. from the source),

(2) very localized potential impact area, (3) temporary duration of the activities (hours), (4) occurrence only underwater, and (5) the likelihood that any birds in the vicinity of the approaching vehicles towing an in-water electromagnetic device would move away from the vehicle and device before any exposure could occur. No long-term or population-level effects are expected.

3.9.3.3.3 Effects from High-Energy Lasers and High-Power Microwaves

Refer to Table 3.9-7 for a summary of background information used to analyze the potential effects of high-energy lasers and high-power microwaves on birds. Detailed information is provided in Appendix F.

Training and Testing. High-energy laser and microwave weapons use is described in Section 3.0.3.3.3.3, with locations in the Hawaii and California Operating Areas identified in Chapter 2.

These types of weapons use precision targeting with high-fidelity optics and other sensors to ensure that a beam targets a specific object. The weapon is only engaged at that target, and if the tracking loses the target the weapon cycles off. These aspects of precision-targeted energy weapons provide for a negligible impact on birds in flight or on the water’s surface. Further, high-energy laser use and microwave weapons testing would occur far from shore and away from islands where higher concentrations of birds would be expected. Accordingly, exposure to high-energy lasers or microwave weapons use would be exceedingly rare because of the targeting procedures in place for these types of weapons and the location where these weapons would be used. High-energy lasers have automatic shut off capability when a target is lost, so there is very little opportunity for a bird in flight or on the surface to be targeted by a laser. High-power microwave devices do not have automatic shutoff capability; however, they are closely monitored to ensure the beam remains on target and turned off when not targeting an object.

No long-term or population-level effects are expected.

Modernization and Sustainment of Ranges. High-energy lasers and microwaves would not be used during modernization and sustainment of ranges activities.

Conclusion. Birds are not likely to be exposed to high energy lasers and adverse effects are not reasonably foreseeable based on the (1) relatively low number of activities, (2) very localized potential impact area of the laser beam, and (3) temporary duration of potential effects (seconds).

3.9.3.4 Physical Disturbance and Strike Stressors

The evaluation of the effects from physical disturbance and strike stressors on birds focuses on proposed activities that may cause birds to be injured or killed by an object that is moving through the water (e.g., vessels and in-water devices), moving through the air (e.g., aircraft and aerial targets), dropped into the water (e.g., MEM), deployed on the seafloor (e.g., mine shapes and anchors), or propelled through the water column (e.g., explosive fragments).

Table 3.9-8 contains brief summaries of background information that is relevant to the analyses of effects for each physical disturbance and strike substressor. Detailed information on physical disturbance and strike stressors in general, as well as effects specific to each substressor, is provided in Appendix F.

Table 3.9-8: Physical Disturbance and Strike Stressors Background Information Summary

Substressor	Background Information Summary
Vessels and in-water devices	• Vessel strike and collision with in-water devices has the potential to impact all taxonomic groups found within the Study Area and could cause injury, mortality, or behavioral responses. • There would be a higher likelihood of vessel and in-water device disturbance or strike in the coastal areas than in the open ocean because of the concentration of activities and higher numbers of birds closer to shore. • Direct collisions of birds with vessels and in-water devices are unlikely but may occur, especially at night when birds can become disoriented by or attracted to artificial light (Favero et al., 2011; Hamilton, 1958; Hyrenbach, 2001, 2006; Merkel & Johansen, 2011). • Vessel and in-water device activity could cause birds to temporarily move from an area.
Aircraft and aerial targets	• Bird strikes could occur during military readiness activities that use aircraft, particularly in nearshore areas, where birds are more concentrated in the Study Area. • Bird-aircraft strikes are a serious concern for the Navy because these incidents can result in injury to aircrews and damage equipment as well as injure or kill birds (Bies et al., 2006). • Bird strike potential is greatest in foraging or resting areas, in migration corridors at night, and at low altitudes during the periods around dawn and dusk. • While wildlife strikes can occur anywhere aircraft are operated, Navy data indicate that they occur most often within the airfield environment. • Unmanned drones could also strike birds; however, evidence from returned drones indicates the probability is low (Jha et al., 2019).
Military expended materials	• Exposure of birds to military expended materials during Navy military readiness activities could result in physical injury or behavioral disturbances to birds in air, at the surface, or underwater during foraging dives. • The widely dispersed area where materials would be coupled with the patchy distribution of seabirds suggests that the probability of these types of ordnance striking a seabird would be low. • Human activity associated with training could cause birds to flee a target area before the onset of firing, thus avoiding harm. • The potential likelihood of individual birds being struck by munitions is very low; thus, effects on bird populations would not be expected.

For birds, it is not expected seafloor devices are at all likely to cause physical disturbance or strike. Therefore, this analysis focuses on vessels, in-water devices, aircraft and aerial targets, and MEM (including non-explosive practice munitions). Additionally, the following analysis focuses on those substressors that would occur in new areas and those that would occur more often than what was analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs.

3.9.3.4.1 Effects from Vessels and In-Water Devices

Table 3.9-8 contains a summary of background information used to analyze the potential effects of vessels and in-water devices on birds. Detailed information is provided in Appendix F.

In general, there would be a higher likelihood of vessel and in-water device disturbance or strike in the coastal areas than in the open ocean portions of the Study Area because of the concentration of activities and higher numbers of birds closer to shore.

3.9.3.4.1.1 Effects from Vessels and In-Water Devices under Alternative 1

Training and Testing. Section 3.0.3.3.4.1 discusses the types of activities and number of events that present a potential strike hazard for birds. For a discussion on the types of activities that use in-water devices see Appendix B. Table 3.0-12 provides a list of representative vessels used in training and testing activities, along with vessel lengths and speeds used in training and testing activities that present a strike risk to birds flying over the water or resting on the surface. The potential for vessel strikes to birds is not associated with any specific training and testing activity but rather a limited, sporadic, and accidental result of Navy ship movement within the Study Area. Vessel movement can be widely dispersed throughout the HCTT Study Area but is more concentrated near naval ports, piers, and range areas. Navy training vessel traffic would be especially concentrated near Pearl Harbor and San Diego Bay. Smaller support craft usage would also be more concentrated in the coastal areas near naval installations, ports, and ranges.

Modernization and Sustainment of Ranges. The Navy proposes to deploy undersea fiber optic cables and connected instrumentation to existing undersea infrastructure along the seafloor in the California Study area (south and west of SCI), and the Hawaii Study Area (northeast of Oahu and west of Kauai). Vessels supporting modernization and sustainment of ranges activities would move very slowly during installation activities (0 to 3 knots) and would not pose a collision threat to birds.

Conclusion. Activities that include the use of vessels and in-water devices under Alternative 1 would result in less than significant effects due to (1) the ability of birds to maneuver and avoid vessels on the surface, (2) the low likelihood that a diving bird would be in the vicinity of in-water devices, and (3) the low speed of most in-water devices.

3.9.3.4.1.2 Effects from Vessels and In-Water Devices under Alternative 2

As shown in Table 3.0-17, the number of vessels and in-water devices used in the Study Area increases under Alternative 2. Training accounts for nearly 9 times the number of events with vessel and in-water device movements than testing, and, under Alternative 2 training events would increase by 11 percent in the California Study Area and 9 percent in the Hawaii Study Area. Therefore, the potential for effects from the use of vessels and in-water devices under Alternative 2 is measurably greater than under Alternative 1, but would still result in less than significant effects.

3.9.3.4.2 Effects from Aircraft and Aerial Targets

Refer to Table 3.9-8 for a summary of background information used to analyze the potential effects of aircraft and aerial targets on birds. Detailed information is provided in Appendix F.

Bird strikes could occur during military readiness activities that use aircraft, particularly in nearshore areas, where birds are more concentrated in the Study Area. Bird strike potential is greatest in foraging or resting areas, in migration corridors at night, and at low altitudes during the periods around dawn and dusk. While wildlife strikes can occur anywhere aircraft are operated, Navy data indicate that they occur most often within the airfield environment (Pfeiffer et al., 2018). Unmanned drones could also strike birds; however, evidence from returned drones indicates the probability is low (Jha et al., 2019). Detailed background information is provided in Appendix F.

Bird-aircraft strikes are a serious concern for the Navy because these incidents can result in injury to aircrews and damage equipment as well as injure or kill birds (Bies et al., 2006). Standard operating procedures applied during proposed activities would reduce manned aircraft strike hazards from large flocks of birds.

3.9.3.4.2.1 Effects from Aircraft and Aerial Targets under Alternative 1

Training and Testing. As a result of standard operating procedures for aircraft safety, strikes of large flocks of birds by manned aircraft would be expected to occur infrequently. Strikes to individual birds could occur as a result of aircraft and aerial target use in the Study Area under Alternative 1, which would result in injury or mortality. No population-level effects are expected. ESA-listed species could be impacted due to disturbance by aircraft activities or by strike while in flight. However, this is considered unlikely given the scarcity of individuals, and the dispersed and temporary nature of these activities.

Modernization and Sustainment of Ranges. Aircraft would not be used during modernization and sustainment of ranges activities.

Conclusion. Activities that include the use of aircraft and aerial targets under Alternative 1 would result in less than significant effects due to (1) bird exposure to strike potential would be relatively brief as an aircraft or aerial target quickly passes, and (2) although individual bird mortalities could occur, population-level impacts on birds would not likely result.

3.9.3.4.2.2 Effects from Aircraft and Aerial Targets under Alternative 2

The only difference between Alternatives 1 and 2 in aircraft and aerial target activities is that the number of activities would be slightly greater under Alternative 2. Even though the number of activities in Alternative 2 would be greater than Alternative 1, potential effects on birds are not expected to be meaningfully different. Therefore, activities that include aircraft and aerial targets under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.9.3.4.3 Effects from Military Expended Materials

Exposure of birds to MEM during Navy training and testing activities could result in physical injury or behavioral disturbances to birds in air, at the surface, or underwater during foraging dives. Although a quantitative analysis is not possible due to the absence of bird density information in the Study Area and the dispersed nature of training and testing activities, an assessment of the likelihood of exposure to MEM was conducted based on general bird distributions in the Study Area and their abilities to avoid expended materials.

The potential impact of MEM on birds in the Study Area is dependent on the probability that birds are present in areas where such materials are used as well as the ability of birds to detect and avoid foreign objects. The amount of materials expended over the vast area over which military readiness activities occur (see Chapter 2, combined with the ability of birds to flee disturbance, coupled with the often patchy distribution of seabirds (Fauchald et al., 2002; Haney, 1986a; Schneider & Duffy, 1985), would make direct strikes unlikely. Individual birds may be impacted, but strikes would have no impact on populations.

3.9.3.4.3.1 Effects from Military Expended Materials under Alternative 1

Training and Testing. Tables 3.0-19 to 3.0-22, 3.0-25, and 3.0-26 in Section 3.0.3.3.4.2 provide a breakdown of the number and general location of different activities that generate these materials under Alternative 1 and Alternative 2. MEM would occur throughout the Study Area, although relatively few items would be expended in transit between the Hawaii and California portions of the Study Area. Appendix I provides details on the types, numbers, and footprints of expended materials by location.

Based on the updated background and analysis for training and testing, MEM effects on birds would be limited to temporary (lasting up to several hours) behavioral and stress-startle responses to individual birds found within localized areas. Human activity such as vessel movement, aircraft overflights, and target placement could cause birds to flee a target area before the onset of firing, thus avoiding harm. If birds were in the target area, they would likely flee the area prior to the release of MEM or just after the initial rounds strike the target area (assuming seabirds were not struck by the initial rounds). Additionally, the force of MEM fragments dissipates quickly once the pieces hit the water, so direct strikes on seabirds foraging below the surface would not be likely. Generally, munitions would not be used in shallow/nearshore areas (some anti-mine warfare activities could occur in some shallow water areas). The potential likelihood of individual seabirds being struck or disturbed by munitions is very low; thus, effects on seabird populations would not be expected.

Modernization and Sustainment of Ranges. No MEM are expected during modernization and sustainment of ranges activities. Some anchors used to deploy training mines or instrumentation may not be recovered and become MEM, but those are covered in the analysis of seafloor devices.

Conclusion. Activities that include the use of MEM under Alternative 1 would result in less than significant effects due to (1) the vast area over which training and testing activities occur, (2) the ability of birds to flee disturbance, and (3) although individual bird mortalities could occur, population-level impacts on birds would not likely result.

3.9.3.4.3.2 Effects from Military Expended Materials under Alternative 2

MEM use would increase from Alternative 1 to Alternative 2, but not to an extent that would result in increased effects to birds. Therefore, activities that include the use of MEM under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.9.3.4.4 Effects from Seafloor Devices

As discussed in Section 3.0.3.3.4.3, seafloor devices are used during military readiness activities that are typically deployed onto the seafloor in shallow water and later recovered. Some seafloor devices may be deployed in deeper waters and some devices (e.g., anchors) are not always recovered. Because these devices are stationary or very slow moving, they do not pose a risk of physical disturbance or strike to birds, including ESA-listed species. Because of this, seafloor devices pose no threat of impact on birds and is not discussed further.

3.9.3.4.5 Effects from Pile Driving

Human activity such as vessel or boat movement, and equipment setting and movement, is expected to cause birds to flee the activity area before the onset of pile driving. If birds were in the activity area, they would likely flee the area prior to, or just after, the initial strike of the pile at the beginning of the ramp-up procedure. Pile driving is, therefore, not considered a physical disturbance or strike stressor for birds.

3.9.3.5 Ingestion Stressors

Table 3.9-9 contains brief summaries of background information that is relevant to the analyses of effects for each ingestion substressor. Detailed information on ingestion stressors in general, as well as effects specific to each substressor, is provided in Appendix F.

It is not expected that birds would ingest munitions or target fragments, as these would be too large to be mistaken for a source of food and would also be inaccessible as they are dense enough to sink rapidly and bury in the bottom. The types of expended materials that are potential ingestion stressors include fragments from chaff, plastic end caps from chaff cartridges, plastic compression pads, and end caps from pistons and flares. Accordingly, this analysis focuses on MEM, which could be ingested by birds. Additionally, the following analysis focuses on those substressors that would occur in new areas and those that would occur more often than what was analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs.

Table 3.9-9: Ingestion Stressors Background Information Summary

Substressor	Background Information Summary
Military expended materials	• Ingestion of military expended materials by birds could occur in any training or testing area at the surface or just below the surface portion of the water column. • Floating material of ingestible size could be eaten by birds that feed at or near the water surface, while materials that sink pose a potential risk to diving birds that feed just below the water's surface (Titmus & Hyrenbach, 2011). • Physiological effects on birds from ingestion include blocked digestive tracts; blockage of digestive enzymes; lowered hormone levels; delayed ovulation; reproductive failure; nutrient dilution; exposure to indirect effects from harmful chemicals found in and on the plastic material; and altered appetite satiation, which can lead to starvation (Azzarello & Van Vleet, 1987; Provencher et al., 2014). • While ingestion of marine debris has been linked to bird mortalities, sublethal effects are more common (Roman et al., 2016; Thiel et al., 2018; Wilcox et al., 2016).

3.9.3.5.1 Effects from Military Expended Materials

Table 3.9-9 contains a summary of background information used to analyze the potential effects of MEM on birds. Detailed information is provided in Appendix F. The types of activities that would produce potentially ingestible MEM are listed in Appendix B. The quantity of MEM associated with each training location is provided in Appendix I.

3.9.3.5.1.1 Effects from Military Expended Materials under Alternative 1

Training and Testing. As indicated in Section 3.0.3.3.6.3, the use of chaff, flares, and targets would occur and could generate MEM constituting ingestion stressors throughout the Study Area under Alternative 1. Although chaff fibers are too small for birds to confuse with prey, there is some potential for chaff to be incidentally ingested along with other prey items. If ingested, chaff is not expected to impact birds due to the low concentration that would be ingested and the small size of the fibers.

The plastic materials associated with flare compression pads or pistons sink in saltwater (U.S. Department of the Navy, 1999), which reduces the likelihood of ingestion by seabirds. Although the overall concentration of MEM would be low, and Navy standard practice is to collect and remove as much debris as possible when retrieving a degraded target, MEM would not be evenly distributed. Similarly, seabirds are not evenly distributed in the Study Area (Fauchald et al., 2002; Haney, 1986b; Schneider & Duffy, 1985). As noted previously, there is some potential for expended materials that float (e.g., some types of target fragments or chaff end caps or flare compression pads and pistons) to become concentrated along frontal zones, along with food resources that tend to attract foraging seabirds, resulting in the incidental ingestion of such materials, most likely as very small fragments.

MEM would constitute a minute portion of the floating debris that seabirds would be exposed to and may accidentally consume in such situations but could nevertheless contribute to harmful effects of manmade debris on some seabirds. The overall likelihood that individual birds would be negatively impacted by ingestion of MEM in the Study Area under Alternative 1 for training is considered low, but not discountable. Population-level effects would be very unlikely given the relatively small quantities expended over large areas that overlap with potential foraging locations. This conclusion applies to ESA-listed bird species as well.

Modernization and Sustainment of Ranges. No MEM of ingestible size would be expended during modernization and sustainment of ranges activities.

Conclusion. Activities that include the use of MEM under Alternative 1 would result in less than significant effects due to (1) the small size and low concentration of items like chaff fibers, (2) the sink rate of most MEM would minimize the time a bird would be near these items, and (3) most birds would not confuse MEM with prey items.

3.9.3.5.1.2 Effects from Military Expended Materials under Alternative 2

MEM use would increase from Alternative 1 to Alternative 2, but not to an extent that would result in increased effects to birds. Therefore, activities that include the use of MEM under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.9.3.6 Secondary Stressors

This section analyzes the potential effects on birds exposed to stressors indirectly through effects on habitat and prey availability. Detailed information on each secondary substressor is provided in Appendix F. Table 3.9-10 contains brief summaries of background information that is relevant to the analyses of effects for each substressor (e.g., explosives via habitat). Detailed background information supporting the secondary stressors analysis is provided in Appendix F.

Table 3.9-10: Secondary Stressors Background Information Summary

Indirect Links	Substressors	Background Information Summary
Habitat	Explosives	• The effects of stressors on physical habitat are described in Section 3.5. The impact of the Proposed Action alternatives on physical habitats, sediment, and water quality were considered negligible and therefore would not indirectly impact birds. • Any physical effects on habitats would be temporary and localized because military readiness activities would occur infrequently, be distributed across a vast area, and not routinely repeated in the same location.
Prey availability	All stressors	• The effects of stressors to prey availability for birds are described in Section 3.4 and Section 3.6. • The impact of the Proposed Action alternatives on fishes (prey items for seabirds) were considered negligible and therefore would not indirectly impact birds. • Any effects on bird prey resources would be temporary and localized. Furthermore, as discussed previously, these activities are expected to have minimal effects on prey habitats.

3.9.3.6.1 Impact of Secondary Stressors

3.9.3.6.1.1 Effects on Habitat

The effects of stressors on aquatic habitats and potential water and sediment quality degradation on aquatic life are described in Section 3.2. The impact of the Proposed Action alternatives on physical habitats, sediment, and water quality were considered negligible and therefore would not indirectly impact birds. Furthermore, any physical effects on habitats would be temporary and localized because military readiness activities would occur infrequently, be distributed across a vast area, and not routinely repeated in the same location. Military readiness activities would not be expected to indirectly impact birds through degradation of habitats used by birds and prey species.

3.9.3.6.1.2 Effects on Prey Availability

As noted in Section 3.4 and Section 3.5, implementation of the No Action Alternative, Alternative 1, or Alternative 2 would not adversely impact populations of invertebrate or fish prey resources (e.g., crustaceans, bivalves, worms, sand lance, herring) of birds and therefore would not indirectly impact birds. Any effects on bird prey resources would be temporary and localized. Furthermore, as discussed previously, these activities are expected to have minimal effects on prey for military readiness activities under both alternatives.

3.9.3.7 Combined Stressors

There are generally two ways that a bird could be exposed to multiple additive stressors. The first would be if a bird were exposed to multiple sources of stress from a single event or activity within a single training or testing event (e.g., a mine warfare event may include the use of a sound source and a vessel). The potential for a combination of these effects from a single activity would depend on the range of effects of each of the stressors and the response or lack of response to that stressor. Secondly, a bird could be exposed to multiple military readiness activities over the course of its life. Military readiness activities, however, are generally separated in space and time in such a way that it would be unlikely that any individual bird would be exposed to stressors from multiple activities within a short timeframe. The exception to this would be animals with a home range intersecting an area of concentrated activity, as they have elevated exposure risks relative to animals that simply transit the area through a migratory corridor.

Multiple stressors may also have synergistic effects. For example, birds that experience temporary hearing loss or injury from acoustic stressors could be more susceptible to physical disturbance and strike stressors due to a decreased ability to detect and avoid threats. Birds that experience behavioral and physiological consequences of ingestion stressors could be more susceptible to entanglement and physical strike stressors due to malnourishment and disorientation. These interactions are speculative, and without data on the combination of multiple stressors, the synergistic effects from the combination of stressors are difficult to predict in any meaningful way.

The following analysis makes the reasonable assumption that the majority of exposures to individual stressors are non-lethal, and instead focuses on consequences potentially impacting bird fitness (e.g., physiology, behavior, reproductive potential).

3.9.3.7.1 Combined Effects of All Stressors under Alternative 1

Most of the activities proposed under Alternative 1 generally involve the use of moving platforms (e.g., ships, torpedoes) that may produce one or more stressors; therefore, if birds were within the effects range of those activities, they may be introduced to multiple stressors at different times. The minimal effects of far-reaching stressors (e.g., sound pressures, particle motion) may also trigger some animals to leave the area ahead of a more damaging impact (e.g., physical disturbance or strike). Individual stressors that would otherwise have minimal to no impact may combine to have a measurable effect. Due to the wide dispersion of stressor sources, speed of the platforms, and general dynamic movement of many training and testing activities, it is unlikely that a highly mobile bird would occur in the potential effects range of multiple sources or sequential exercises. Effects would be more likely to occur on sessile and slow-moving species in areas where training and testing activities are concentrated and consistently located.

Although potential effects on birds from training and testing activities under Alternative 1 may include injury and mortality, in addition to other effects such as physiological stress, masking, and behavioral effects, the combined effects are not expected to lead to long-term consequences for bird populations. Based on the general description of effects, the number of birds impacted is expected to be small relative to overall population sizes and would not be expected to yield any lasting effects on the survival, growth, recruitment, or reproduction of any bird species. Therefore, the combined effects of stressors from Alternative 1 on birds would be less than significant.

3.9.3.7.2 Combined Effects of All Stressors under Alternative 2

Training and testing activities proposed under Alternative 2 would represent an increase over what is proposed for Alternative 1. However, the notable differences are not expected to substantially increase the potential for combined effects over what is analyzed for Alternative 1. The analysis presented in Section 3.9.3.8.1 would similarly apply to Alternative 2.

3.9.4 Endangered Species Act Determinations

Pursuant to the ESA, some military readiness activities may affect ESA-listed birds as summarized in Table 3.9-11. In accordance with Section 7(a)(2) of the ESA, the Navy will consult with the USFWS for stressors that may affect the band-rumped storm petrel, short-tailed albatross, Hawaiian petrel, Newell's shearwater, California least tern, and marbled murrelet.

3.9.5 Migratory Bird Treaty Act Determinations

The U.S. DoD, like other federal agencies, has regulatory, management, and stewardship responsibilities related to migratory birds. These requirements are driven by the MBTA, the "Military Readiness Rule" (50 CFR section 21.42, Authorization of take incidental to military readiness activities), and EO 13186. Under the military readiness rule, the Navy may take migratory birds incidental to military readiness activities described in this Draft EIS/OEIS provided that the Navy's actions do not result in a significant adverse effect on a population of birds protected under the MBTA. The Navy has determined that the Proposed Action would not result in a significant adverse effect on a population of a migratory bird species. If over the course of training and testing activities, the Navy determines that a population of migratory birds would be significantly impacted, the Navy would be required to confer and cooperate with the USFWS to develop and implement appropriate conservation measures to minimize or mitigate such significant adverse effects. Based on the analysis contained in this section, the Navy's proposed military readiness activities would not adversely impact any population of migratory bird species. This conclusion is supported by mitigation measures that limit potential effects, precision targeting, and locations where military readiness activities would occur.

Table 3.9-11: Resource ESA Effect Determinations for Military Readiness Activities under Alternative 1 (Preferred Alternative)

Species		Acoustic Stressors						Explosive Stressors	Energy Stressors			Physical Disturbance and Strike Stressors					Entanglement Stressors		Ingestion Stressors	
	Overall Determination	Sonar & Other Transducers	Air Guns	Pile Driving	Vessel Noise	Aircraft Noise	Weapons Noise	Explosions	In-Air Electromagnetic Devices	In-Water Electromagnetic Devices	High Energy Lasers and Microwaves	Vessels & In-Water Devices	Aircraft and Aerial Targets	Military Expended Material	Seafloor Devices	Pile Driving	Wires & Cables	Decelerators/Parachutes	Military Expended Materials	Indirect Effects
Band-rumped storm-petrel[1]	MA	NE	MA	NE	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	NE	NE	MA	MA	MA	MA
Short-tailed albatross[2]	MA	NE	NE	NE	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	NE	NE	MA	MA	MA	MA
Hawaiian petrel[1]	MA	NE	NE	NE	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	NE	NE	MA	MA	MA	MA
Newell's shearwater[1]	MA	MA	MA	NE	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	NE	NE	MA	MA	MA	MA
California least tern[3]	MA	NE	MA	MA	MA	MA	MA	MA	MA	MA	NE	MA	MA	MA	NE	NE	MA	MA	MA	MA
Marbled murrelet[3]	MA	NE	MA	MA	MA	MA	MA	NE	MA	MA	NE	MA	MA	MA	NE	NE	MA	MA	MA	MA

[1] Indicates only found in Hawaii portion of the Study Area
[2] Indicates found in open ocean waters of both the Hawaii and California portions of the Study Area
[3] Indicates only found in the California portion of the Study Area
Notes: NE = no effect; MA = may affect. The preliminary effects determinations are consistent with previous consultations for military readiness activities in the Study Area.

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Environmental Impact Statement/

Overseas Environmental Impact Statement

Hawaii-California Training and Testing

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3.10 Cultural Resources

CULTURAL RESOURCES SYNOPSIS

Stressors to cultural resources that could result from the Proposed Action were considered, and the following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Explosive: Explosive stressors resulting from underwater explosions creating shock waves and cratering of the seafloor would not result in any adverse effects on known submerged cultural resources because such activities only occur at the surface or, if underwater, in specific detonation areas where no known cultural resources are present. Additionally, the military routinely avoids known cultural resources. Therefore, effects on submerged cultural resources are expected to be less than significant.
- Physical Disturbance and Strike: Physical disturbance and strike stressors resulting from in-water devices, military expended materials, seafloor devices, and pile driving activities would not result significant effects on known or unknown submerged cultural resources for the following reasons:
  - Vessels and in-water devices are routinely operated in a way that avoids submerged cultural resources.
  - MEM would likely be small in size and would diffuse as they descended through the water column, making any potential effects on submerged cultural resources unlikely.
  - Seafloor devices are only deployed in specific areas where no known cultural resources are present. Additionally, the military routinely avoids known cultural resources.
  - Pile driving activities are only conducted in a portion of the Study Area where no known cultural resources are present.

Therefore, effects on submerged cultural resources are expected to be less than significant.

3.10.1 Introduction

The following section describes the cultural resources within the Study Area and evaluates the potential effects of the proposed at-sea military readiness activities on them. Submerged cultural resources are found throughout the Study Area. The approach for the assessment of submerged cultural resources includes defining the resource; presenting the regulatory requirements for the identification, evaluation, and treatment within established jurisdictional parameters; establishing the specific resources subtypes in the Study Area; identifying the data used to define the current conditions; and providing the method for effect analysis.

The approach to identifying cultural resources for this HCTT Draft EIS/OEIS involved identifying submerged cultural resources in the Study Area, which includes the expanded SOCAL Range Complex, the SSTC, the PMSR, the NOCAL Range Complex, the Hawaii Range Complex, and the temporary operating area. Land components are excluded from this EIS/OEIS, except for acoustic impacts on pinnipeds from ongoing land-based launch activities at SNI and PMRF, which are considered for MMPA authorization.

Cultural resources are the physical evidence or places of human activities that are considered important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. Cultural resources include archaeological resources, architectural resources, and traditional cultural properties related to pre-contact (prior to European contact) and post-contact periods. Historic properties, as defined by the National Historic Preservation Act (NHPA), are prehistoric or historic districts, sites, buildings, structures, or objects (including remains, records, and artifacts) that are listed on, or eligible to be listed on, the National Register of Historic Places (NRHP) as defined under 36 CFR section 60.4(a)–(d).

In general, effects are assessed by the potential effects on the resource, the sensitivity of the resource to the proposed activities, and the duration of the effects on the environment. These regulatory requirements and methods are consistent with those analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs.

3.10.2 Affected Environment

The affected environment provides the context for evaluating the effects of the proposed at-sea military readiness activities on cultural resources. The affected environment includes the HCTT Study Area within 12 NM from shore. Submerged cultural resources, cultural resources identified underwater, have been documented in offshore areas throughout the HCTT Study Area.

Submerged cultural resources include shipwrecks, sunken airplanes, and other submerged historical material as well as submerged precontact cultural material. Additional resources within the Study Area could include traditional cultural properties and practices, which are resources and practices associated with beliefs and cultural practices of a living culture, subculture, or community, as described in Section 3.10.2.5.

No specific procedures for the identification and protection of cultural resources in areas more than 12 NM from shore have been defined by the international community (Zander & Varmer, 1996). In accordance with NHPA (54 U.S.C. 307101(e) the effects on undertakings outside the United States that may directly and adversely affect a property on the World Heritage List must be taken into account. In this case, the World Heritage List was reviewed, and it was determined that no listings were present within the California Study Area beyond 12 NM to require further account of effects of the undertaking. Therefore, submerged resources beyond 12 NM will not be considered further.

3.10.2.1 Submerged Prehistoric Resources

3.10.2.1.1 Hawaii

Submerged prehistoric resources could be present in the waters surrounding the Hawaiian Islands. These resources primarily consist of submerged artifacts such as fishing hooks, lure weights, and canoe anchors, as well as old shoreline features, such as fishponds.

Hawaiian fishponds, or loko ia, exemplify the endemic traditional aquacultural practices of the Native Hawaiians and thus are culturally significant. Fishponds could be used in coastal, nearshore, or inland environments and were productive, low-maintenance systems that cultivated many different species of fresh water and saltwater plants and animals. Previous surveys determined that there were up to 488 fishponds throughout the Hawaiian archipelago, with some of the remaining structures dating back to the 15th century (Hawaii Department of Land and Natural Resources, 2013). Although many historical fishponds have been degraded and destroyed, recent decades have witnessed a resurgence in preservation for those that remain, particularly for sites that are under the purview of Konohiki (traditional resource managers), individuals, or families. In some cases, identifying details and location information for fishpond sites were not disclosed during Section 106 consultations due their sensitivity (54 U.S.C. section 307103) (Van Tilburg & Delgado, 2017). For this purposes of this EIS/OEIS, only coastal fishponds (loko kuapa and loko umeiki) were analyzed for potential effect from the Proposed Action; fishponds that were in nearshore or inland environments will not be analyzed in this document.

No effect from the Proposed Action is expected on these properties because they are in waters that are too shallow for most ships to safely navigate, and they are in coastal environments not used for training and testing.

3.10.2.1.2 California

Submerged prehistoric cultural resources within the California Study Area may include Paleocoastal and Archaic archaeological sites in waters near island and southern coastal areas of the Study Area. These sites are most likely to occur nearshore within water depths of 100 m below mean high tide, reflecting the range of sea level rise that has occurred since people first settled island and coastal California. However, many of these sites would not have been preserved as the encroaching ocean inundated, reworked, and redeposited sediments. Approximately 110 submerged artifacts and sites from the Archaic period that have been identified in Southern California (Masters & Schneider, 2000a). Prehistoric cultural materials, such as stone bowls and mortars, have been found off the coast of San Diego County (Masters & Schneider, 2000b). A concentration of this cultural material is located off La Jolla and Point Loma and within the Study Area; however, proposed activities would not occur in these areas (Masters, 2003).

PaleoIndian and Archaic period sites may occur on the continental shelf off the northern coast of California. However, much less is known about such sites as compared to the sites from these periods in Southern California and the Channel Islands. There is a recognized potential for the remains of prehistoric and historic sites, isolated artifacts, and Native American watercraft to be present offshore, although there is a lower potential for their preservation in-situ. At this time, no maritime finds of prehistoric origin are recorded within the NOCAL Range Complex.

3.10.2.2 Known Wrecks, Obstructions, Occurrences, or “Unknowns”

Freighters, tankers, ships-of-war, passenger ships, submarines, and fishing vessels have been sunk, lost, or run aground within the Study Area. Natural activities and features have played important roles in creating submerged historic-era cultural resources; those include powerful currents, winds, rough seas, and coastal topography.

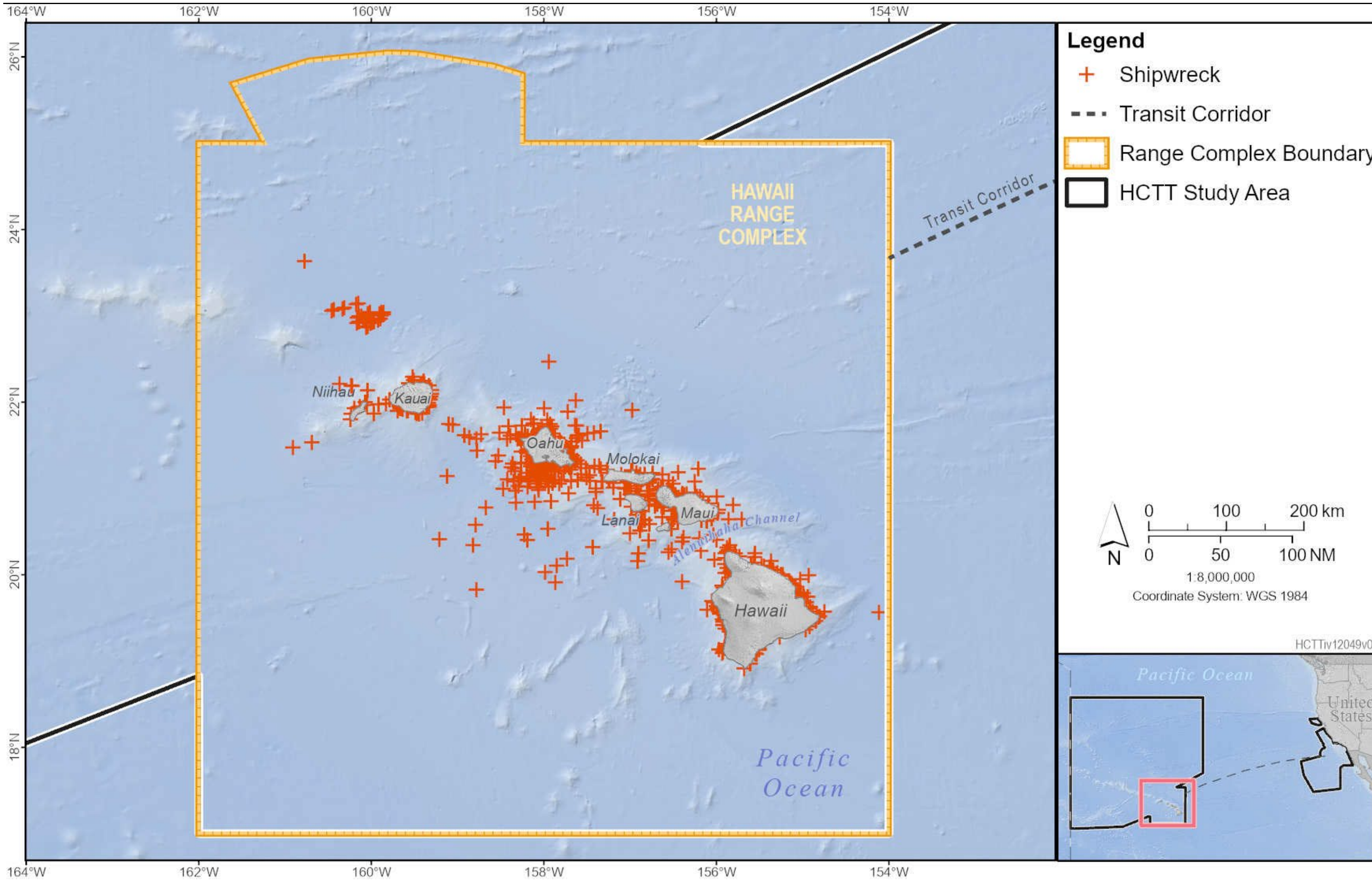
3.10.2.2.1 Hawaii

Hundreds of submerged cultural resources lie in the open, deep waters surrounding the Hawaiian Islands; typical among these are wrecks of World War II submarines and ships, commercial fishing vessels and tankers, and aircraft. The most likely types of shipwrecks to occur around the Hawaiian Islands are 19th century cargo ships, submarines, old whaling and merchant ships, fishing boats, 20th century U.S. warships, and recreational crafts. Shipwrecks recorded around the Hawaiian Islands are depicted in Figure 3.10-1. The Automated Wreck and Obstruction Information System, Region 16 (2010) records the approximate locations of some deep-water submerged shipwrecks. Wrecks that were intentionally sunk to serve as artificial reefs or as a military target are not eligible to be placed on the NRHP.

Shipwrecks located near the Island of Hawaii are concentrated along the northwestern coastline and within Hilo Bay. The Hawaii Study Area contains the sites of two major World War II exchanges: Pearl Harbor and the Battle of Midway. The Papahanaumokuakea Marine National Monument boundaries include the Midway Atoll, which has been designated as a National Memorial to the Battle of Midway. Aircraft and shipwrecks that are sunken from the Battle of Midway are considered war graves. None of the sunken sites from the battle that are currently known are eligible for listing on the NRHP. The Papahanaumokuakea Marine National Monument was inscribed to the World Heritage List in 2010, becoming the first U.S. site to be listed for the significance of its cultural and natural resources.

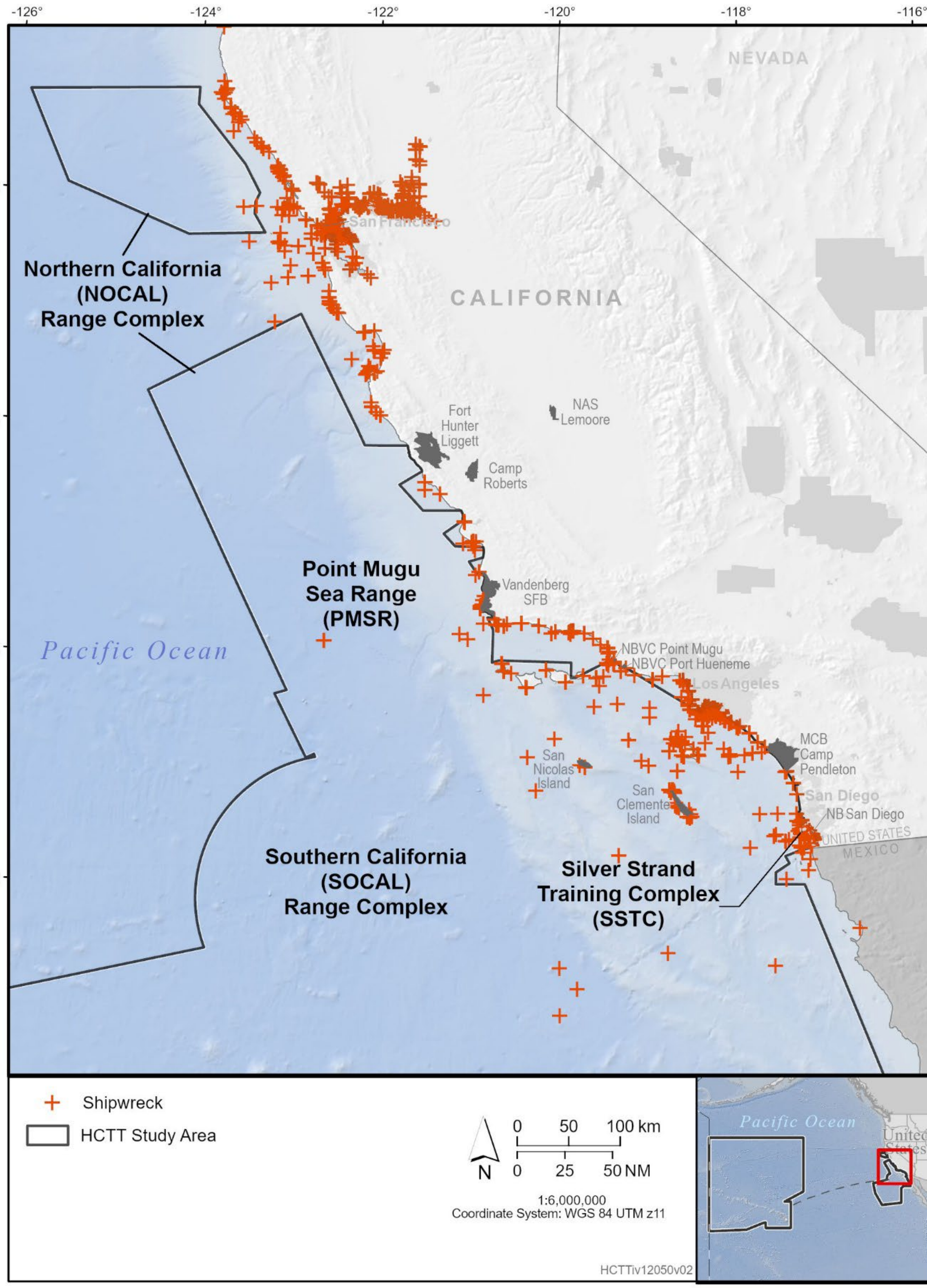
3.10.2.2.2 California

Thousands of vessels of varying types and descriptions have sunk off the coast of California (Figure 3.10-2). Various databases of these shipwrecks have been compiled, including the Automated Wreck and Obstruction Information System database, which collected data up until 2016 (National Oceanic and Atmospheric Administration, 2017). As part of a Minerals Management Service study (Minerals Management Service, 1990), a database was compiled that documents 4,676 shipwrecks off the coast of California, with 876 wrecks in Southern California. The California State Lands Commission maintains a list of known shipwrecks in state waters and documents at least 384 known wrecks within the coastal counties of San Diego, Orange, Los Angeles, Ventura, Santa Barbara, and San Luis Obispo counties (Automated Wreck and Obstruction Information System Database, 2010). The SSTC, SOCAL Range Complex, PMSR, and proposed amphibious approach lanes, located along the coast of PMSR and the southern portion of the NOCAL Range Complex, could also contain submerged archaeological sites on the continental shelf within 12 NM from shore, although none have been documented.



Notes: HCTT = Hawaii-California Training and Testing

Figure 3.10-1: Known Shipwrecks Within the Hawaii Study Area



Notes: HCTT = Hawaii-California Training and Testing

Figure 3.10-2: Known Shipwrecks Within the California Study Area

Southern California Range Complex

Known submerged cultural resources within the SOCAL Range Complex include 174 shipwrecks. Submerged cultural resources in the waters around SCI include pleasure craft, sport and commercial fishers, and cargo and military vessels (U.S. Department of the Navy, 2008). Twenty-two submerged cultural resources are within 12 NM of SCI and seven are beyond the territorial limit. Figure 3.10-3 illustrates known shipwrecks near SCI. Additional submerged cultural resources in the area include 17 aircraft, an anchor, and the abandoned Sea Lab (an old Navy asset).

Silver Strand Range Complex

Submerged cultural resources are found on the bay and ocean sides of the SSTC. On the bay side of the Silver Strand peninsula, three shipwrecks are in or near the training beaches. Unnamed wrecks are recorded in shallow water at the northern end of Delta South beach, in the middle of San Diego Bay, and at the mouth of Fiddler's Cove. The ages and cultural value of these wrecks are not known (U.S. Department of the Navy, 2008). On the ocean side of the peninsula, three shipwrecks are located near the Silver Strand Training Complex training areas: the bark (a three- or four-masted sailing vessel) Narwhal (sank in 1934), the submarine S-37 (SS-142) which was decommissioned and sunk as target in 1945, and the subchaser YC689 (sank in 1943). The destroyer USS Hogan (DD178), a military aircraft (S2F Tracker), and a sunken sailboat are located offshore, south of the Silver Strand Training Complex and west of the City of Imperial Beach (U.S. Department of the Navy, 2008). Cultural resources in San Diego Bay were reviewed for the San Diego Deepening at Tenth Avenue Marine Terminal project. This review identified three known submerged cultural features: a shipwreck (the Della), an 1887 marine utility cable, and a sunken Ford Model T. Twenty-four shipwrecks were identified with unknown locations, but known to be lost in the San Diego area, including schooners, barges, a submarine, clippers, gas and oil screws, a yacht, a bark, a ferry, a ship, and a steamer. Figure 3.10-4 illustrates known shipwrecks in the vicinity of the SSTC.

Point Mugu Sea Range

Shipwrecks and planes comprise all of the documented submerged cultural resources within the PMSR. There are 195 shipwrecks known to have occurred within the PMSR, 129 of them with plottable coordinates (Morris & Lima, 1996; U.S. Department of the Navy, 1999). The largest number of shipwrecks found within the PMSR is near Santa Rosa Island, in the vicinity of Talcott Shoal, Sandy Point, Bee Rock, East Point, and Becher's Bay. Thirty-two shipwrecks are known to have occurred within the vicinity of SNI (U.S. Department of the Navy, 2010) (Figure 3.10-5). These wrecks include fishing boats, barges, yachts, cargo carriers, passenger ships, freighters, and target ships. In many cases, although a shipwreck is known to have occurred and its general coordinates are known, no wreckage has been located.

Known sunken military watercraft and aircraft losses within the PMSR include 31 sunken military watercraft and 92 aircraft losses (U.S. Department of the Navy, 2020). Two of the listed shipwrecks occurred before 1920, seven of the shipwrecks were involved in the 1923 Honda Point disaster, and 22 were listed as targets as part of fleet reductions.

The 92 identified aircraft losses (military and non-military) all occurred before 1951, with 87 of those losses occurring during the 1942–1945 period, and 63 were identified as possibly occurring within the PMSR. Precise locational data was not recorded; it is unclear whether or not any aircraft were salvaged.

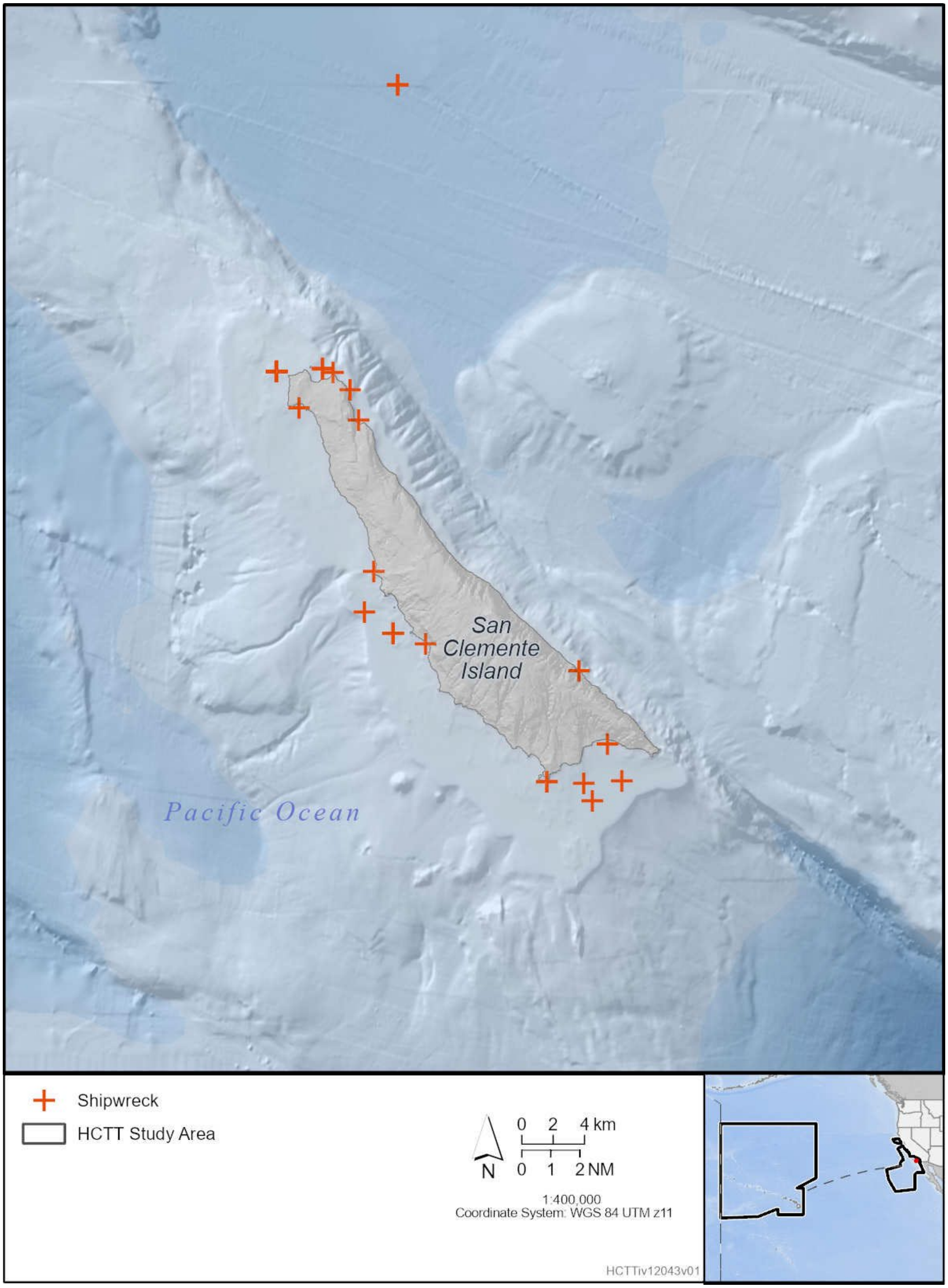
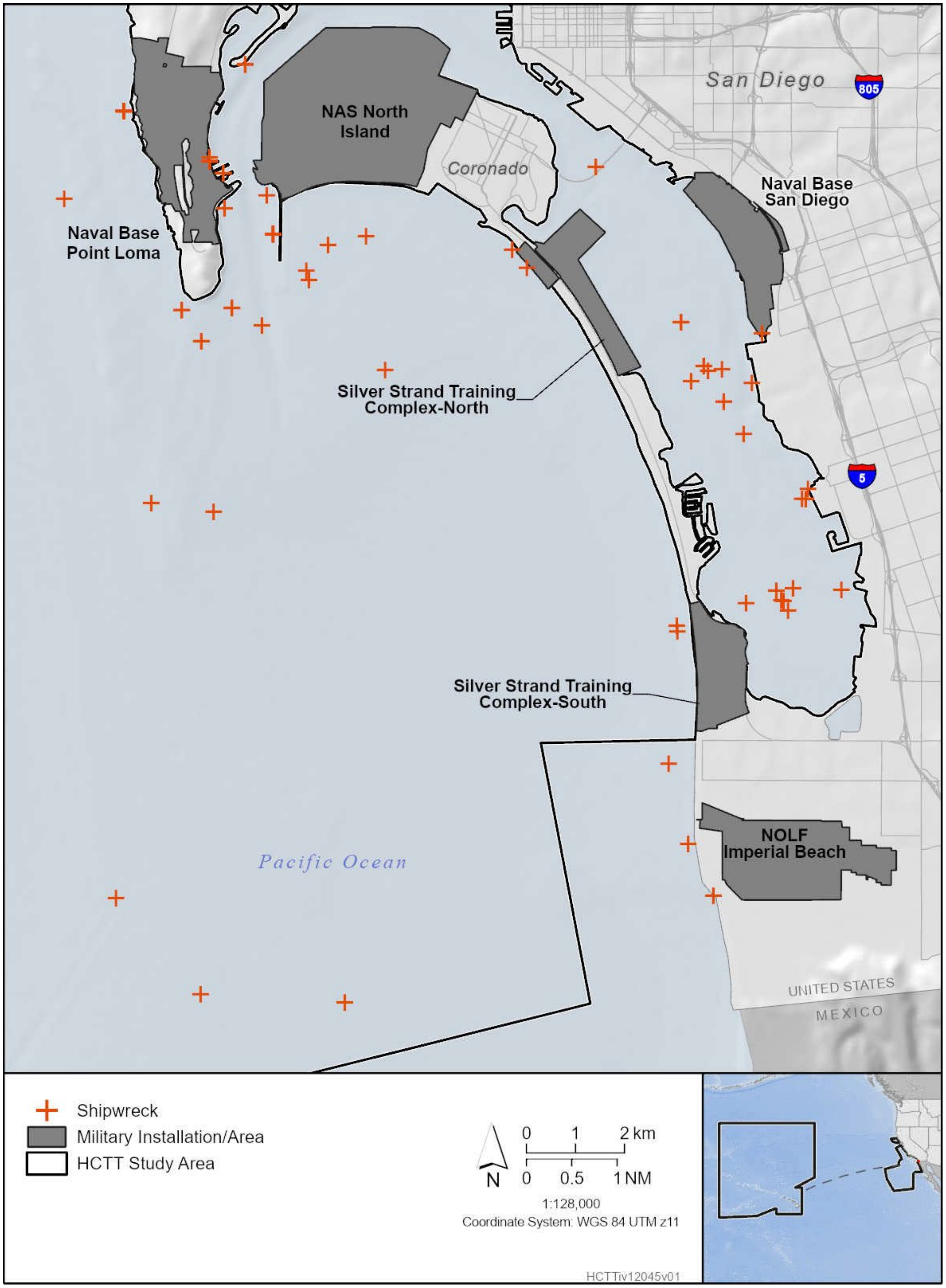


Figure 3.10-3: Known Shipwrecks Around San Clemente Island



Notes: NAS = Naval Air Station, NOLF = Naval Outlying Landing Field, HCTT = Hawaii-California Training and Testing

Figure 3.10-4: Known Shipwrecks Around the Silver Strand Peninsula

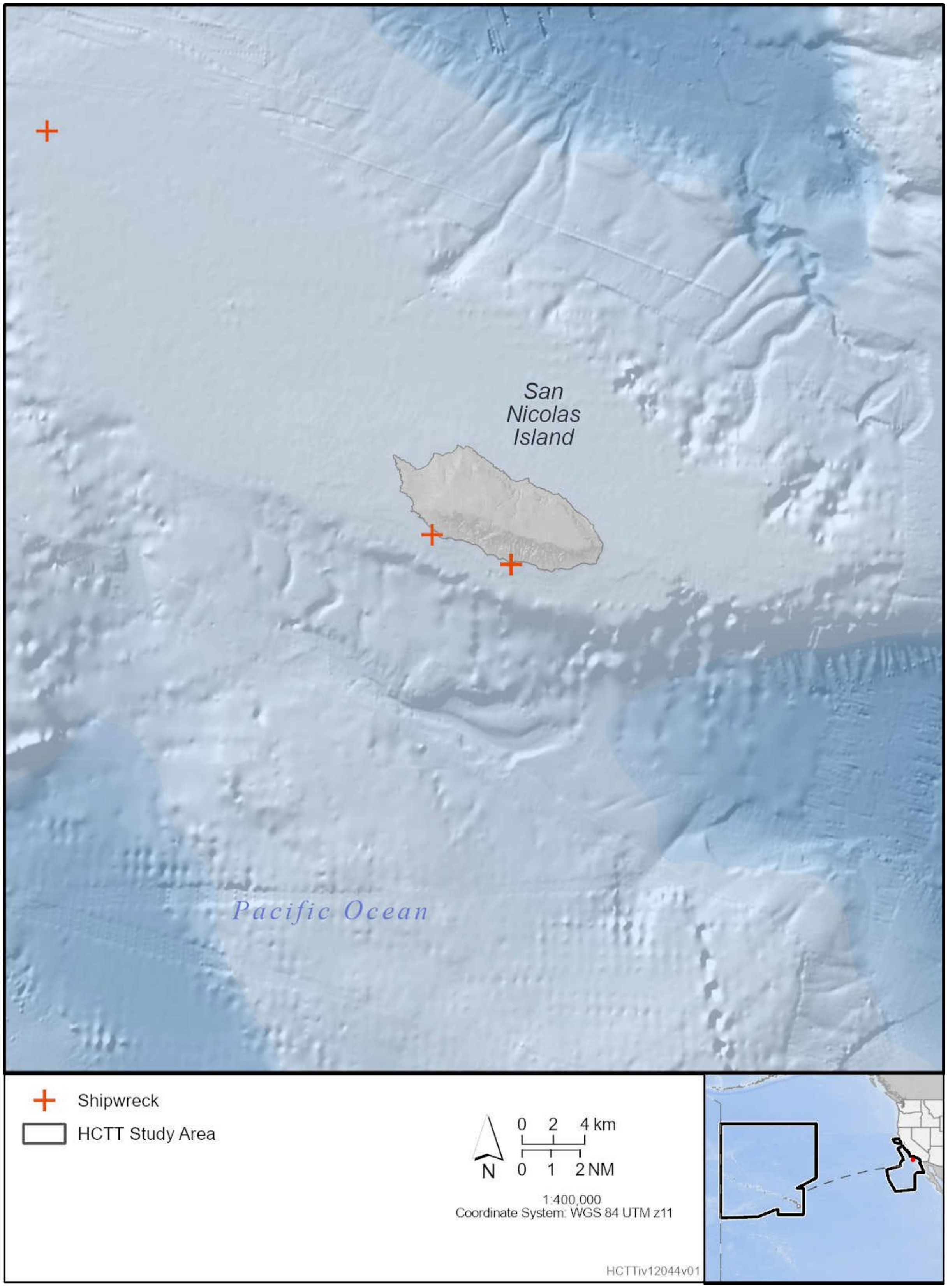


Figure 3.10-5: Known Shipwrecks Around San Nicolas Island

There are several identified cultural resources located within the proposed amphibious approach lanes within PMSR, including three destroyed wharf sites that have remnant components such as pilings on or below the mean highwater mark. The shipwreck of the SS Yankee Blade is located off the coast of Vandenberg Space Force Base and has been listed in the NRHP (as depicted in Figure 3.10-6 and detailed in Section 3.10.2.3.2).

NOCAL Range Complex

A limited number of submerged cultural resources have been identified within the NOCAL Range Complex. While the tidal and submerged lands in the vicinity of the NOCAL Range Complex, to include the Point Reyes National Seashore, Golden Gate National Recreation Area, and the Greater Farallones National Marine Sanctuary, contain approximately 151 shipwrecks, only 3 are documented within or immediately adjacent to the NOCAL Range Complex boundary.

The Automated Wreck and Obstruction Information System database (Automated Wreck and Obstruction Information System Database, 2010) documents a single shipwreck (record 50767) located during an expedition to the Cordell Banks in 1981, in the northernmost section of the NOCAL Range Complex, and two shipwrecks on the northern boundary of the southernmost portion of this range (Figure 3.10-7). The locational accuracy for all three wrecks is recorded as low.

No cultural resources have been identified within the proposed amphibious approach lanes in the southern portion of the NOCAL Range Complex.

3.10.2.3 Cultural Resources Eligible for or Listed on the National Register of Historic Places

3.10.2.3.1 Hawaii

There are nine properties in the State of Hawaii that are listed on the NRHP (Table 3.10-1)(Figure 3.10-8). Pearl Harbor, which is also listed on the NRHP as a National Historic Landmark (16 U.S.C. 470a [a][1]), contains an abundance of submerged cultural resources associated with World War II. Major shipwrecks include the USS Arizona and the USS Utah, both of which are listed on the NRHP. The whaleship Two Brothers, located in the Northern Hawaiian Islands encompassed by the Papahanaumokuakea Marine National Monument, is listed on the NRHP.

Hanalei Pier, located on the northern shore of Kauai, is listed on the NRHP for its association with the rice industry in Hawaii.

There are several extant fishponds that have been listed on the NRHP. Heeia, Huilua, and Kahaluu fishponds are on the eastern shore of Oahu, and Okiokilepe fishpond is located within Pearl Harbor on the southwestern side of Oahu. Kalepolepo fishpond is on the western shore of Maui. The fishponds consist of a seawall barrier, the condition of which varies by site.

No effect from the Proposed Action is expected on the fishponds or pier because they are in waters that are too shallow for most ships to safely navigate, or they are in coastal environments not used for training and testing.

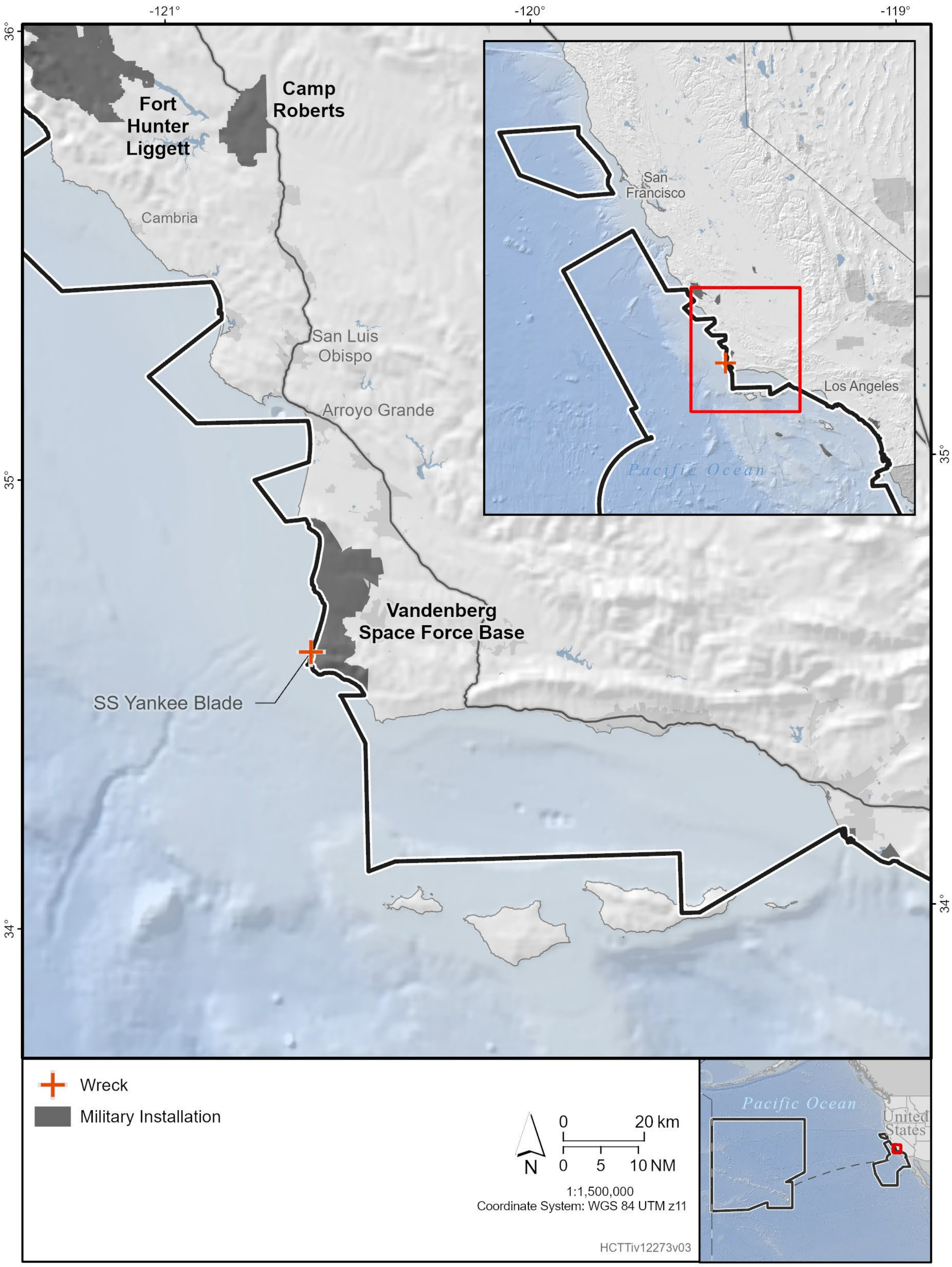


Figure 3.10-6: Properties Listed on the National Register of Historic Places Within the California Study Area

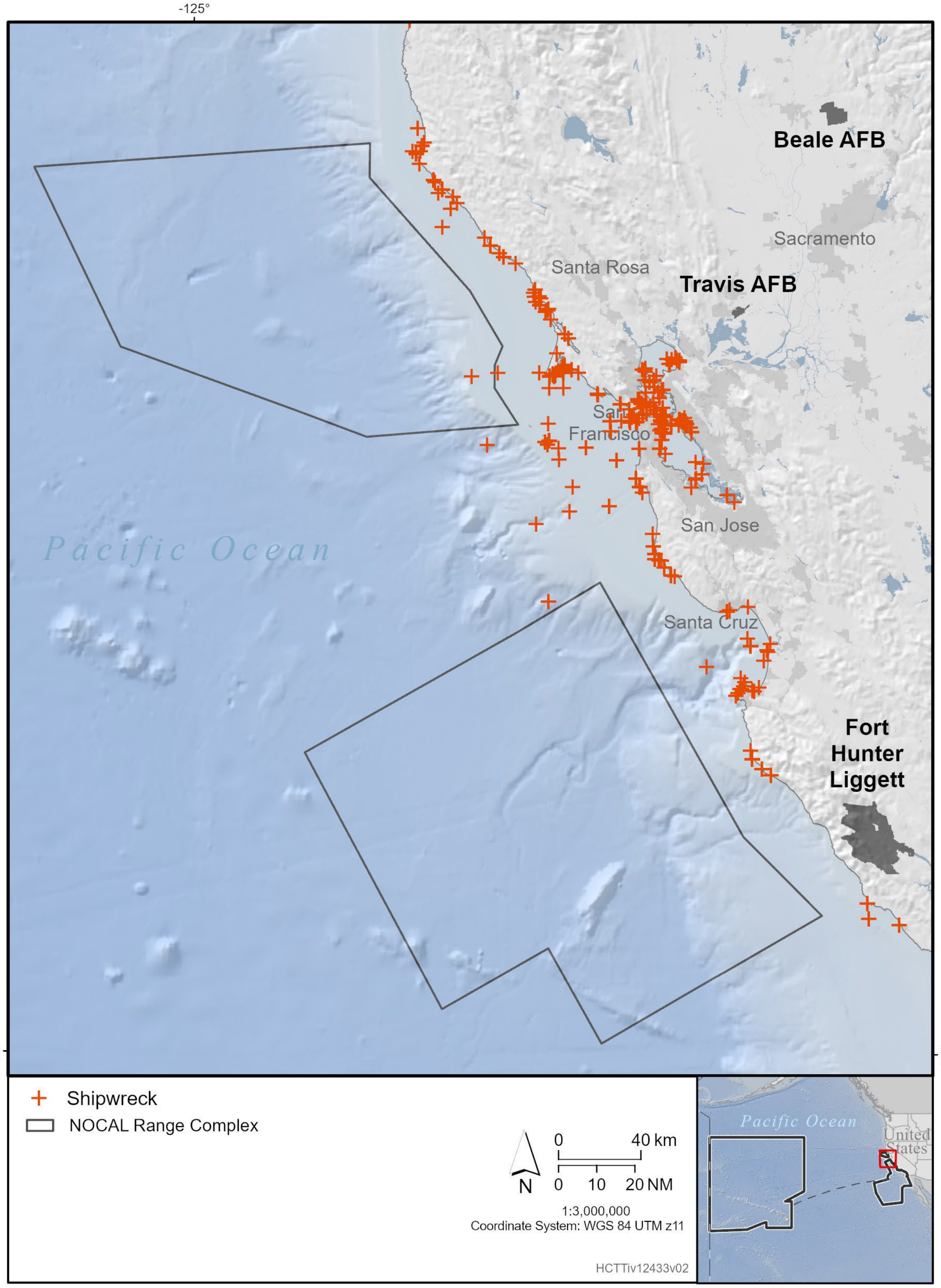


Figure 3.10-7: Known Shipwrecks in the Vicinity of the NOCAL Range Complex

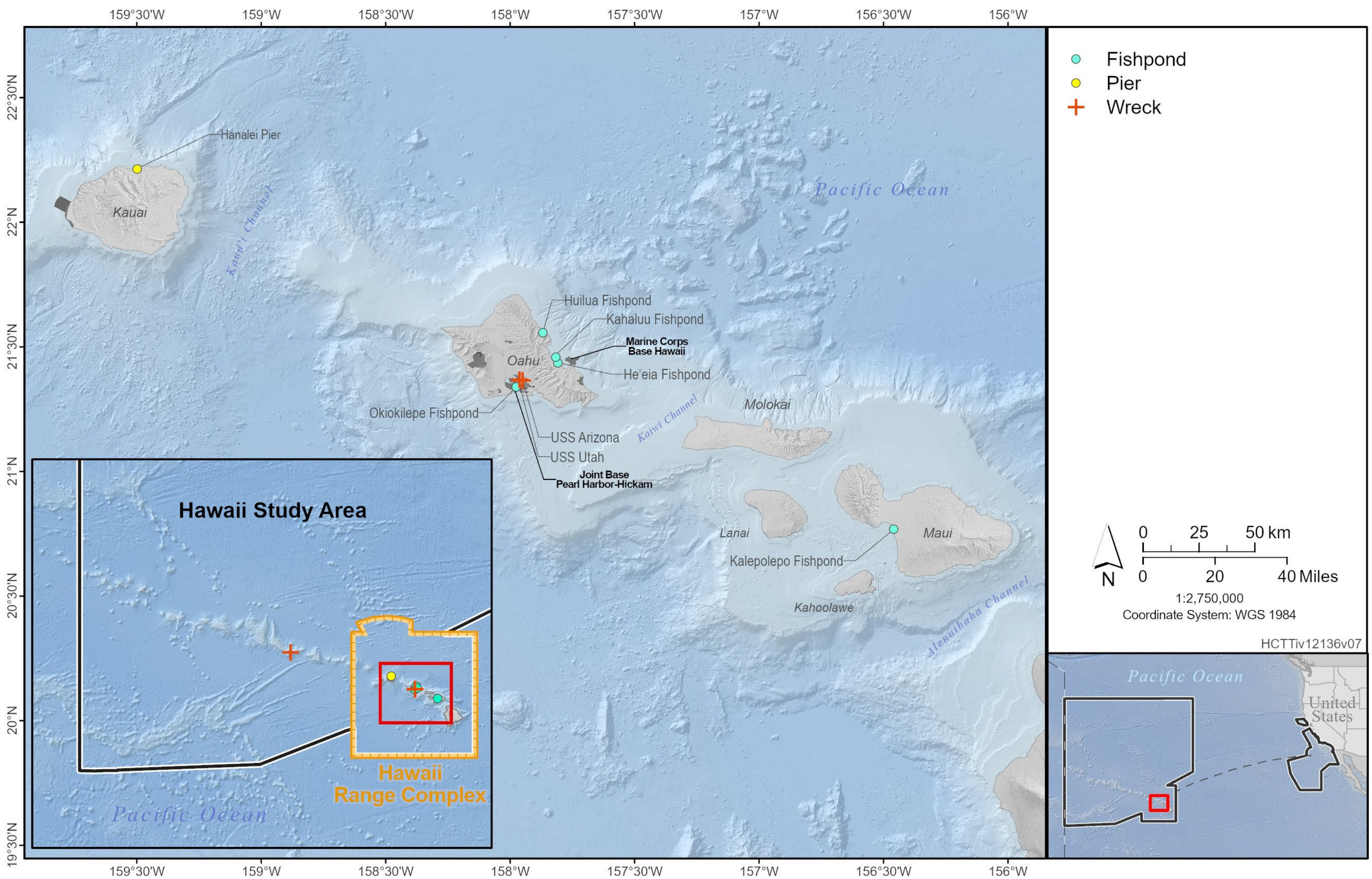


Figure 3.10-8: Properties Listed on the National Register of Historic Places Within the Hawaii Study Area

3.10.2.3.2 California

Based on a literature search and previous consultations, the California Study Area contains one NRHP-listed site (Table 3.10-1, Figure 3.10-6). The S.S. Yankee Blade was a three-masted side-wheel steamship which struck a rock off Point Pedernales during a heavy fog on October 1, 1854, while en route from San Francisco to Panama. The S.S. Yankee Blade was listed on the NRHP May 16, 1991. The wreck is located in approximately 75 feet of water in an area that is known for hazardous sea conditions, making it unlikely that training and testing activities would be conducted in the area. One historic period archaeological site, CA-SBA-3574H, includes a remnant of a concrete feature possibly dating to the Camp Cooke period (1941–1958) of Vandenberg Space Force Base; a portion of the feature wall extends to the beach below the mean high-water mark. The site has not been evaluated for inclusion on the NRHP. The military uses sonar in navigation and seafloor maps to avoid submerged cultural resources. Therefore, the Proposed Action will have no effect on these cultural resources.

As described in Chapter 2, this EIS/OEIS analyzes at-sea military readiness activities. SNI and SCI have been identified as Traditional Cultural Properties and part of a Traditional Cultural Landscape in previous consultations with tribes; however, they are not part of the Study Area, and no new land-based training and testing activities are proposed. SNI land activities continue to be covered under the 2022 PMSR EIS/OEIS. Tribal, SHPO, and ACHP consultation for PMSR EIS/OEIS was completed in September 2021.

3.10.2.4 World Heritage Sites

3.10.2.4.1 Hawaii

The Hawaii Study Area contains one World Heritage Site, the Papahanaumokuakea Marine National Monument (refer to Chapter 6, Figure 6-4). This area encompasses 583,000 square miles of ocean and 10 islands and atolls northwest of Kauai. This World Heritage Site is the single largest fully-protected conservation area in the United States (bigger than all U.S. National Parks combined), and one of the largest marine conservation areas in the world. Attributes of the Papahanaumokuakea Marine National Monument that contribute to its cultural significance include notable features such as seamounts and submerged banks, coral reefs, and lagoons. The monument is significant to the cultural heritage of the Native Hawaiians not only for the unique ecosystem and geological features, but also voyaging and wayfinding. Wayfinding, which relies on celestial, biological, and natural signs, plays an important role within the cultural voyaging seascape of the Hawaiian Archipelago. Further details of the Papahanaumokuakea Marine National Monument and the Proposed Papahanaumokuakea National Marine Sanctuary are described in Sections 6.1.2.2.2.2 and 6.1.2.2.4.7, respectively.

3.10.2.4.2 California

The California Study Area contains no World Heritage Sites.

3.10.2.5 Traditional Cultural Practices in Hawaii

Traditional cultural practices may be implemented within the Hawaii Study Area and are described below. Such practices are not defined or protected under the NRHP.

Traditional Hawaiian cultural resources, such as koʻa (fishing areas and stone markers for fishing grounds), and freshwater seeps are located in the nearshore waters. Since these sites are considered sacred and secret, their locations were not disclosed during past consultations. Traditional Hawaiian settlements along the coast focused on the ocean and collection of its resources, and Native Hawaiians view their relationship to all things living as connected; this includes the plants and animals that live in the mountains, those that live in and along the streams, and the sea creatures that live in the waters that flow into the ocean. Na aumakua are deities who Native Hawaiians believe they are connected to through their family lineage. Aumakua may manifest as animals, places, plants, and even other people. The relationship Native Hawaiians have with their aumakua is described as symbiotic; caring for or providing tribute to one’s aumakua in turn brings comfort and protection, and can even bring vengeance on those who menace the aumakua’s kin. Native Hawaiians who participated in Section 106 consultation for past EISs were concerned about any harm the Proposed Action would bring to the natural world, including harm to Kanaloa, who manifests as the ocean itself.

Military readiness activities within the Hawaii Study Area are believed by Native Hawaiians to hinder their cultural beliefs and their ability to practice cultural traditions. The presence of naval ships is believed to alter the behavior of marine life in traditional fishing grounds. It is said to affect not only traditional fishing methods, but also the manner that fishing is taught to younger generations. In addition, military readiness activities utilizing sonar or explosives may negatively affect their cultural interactions with marine life. Due to the close relationship Native Hawaiians have with aumakua living in the ocean, Native Hawaiians believe they are able to sense distress felt by marine life due to in-water military readiness activities. The presence of military warships and submarines in the waters around Hawaii is viewed as causing an elemental imbalance in nature. The military’s presence in and around the Hawaiian Islands is also viewed as disrespectful and in contrast to the Native Hawaiian belief that they are a peaceable and neutral nation. During past consultations, it was consistently conveyed that military readiness activities in waters within the Study Area causes the Native Hawaiians emotional and at times physical distress.

Table 3.10-1: National Historic Landmarks, Monuments, and Cultural Resources Eligible for or Listed on the National Register of Historic Places Within the HCTT Study Area

Resource	Location	Description	National Register of Historic Places	Reference Number	National Historic Landmark/ Monument	Reference
Okiokilepe Pond	HI Study Area (Oahu)	Native Hawaiian Fishpond	Listed	73000673	No	National Park Service (2023b)
Heeia	Oahu	Native Hawaiian Fishpond	Listed	73000671	No	(National Park Service, 2023b)
Huilua	Oahu	Native Hawaiian Fishpond	Listed	66000295	No	(National Park Service, 2023b)
Kahaluu	Oahu	Native Hawaiian Fishpond	Listed	73000668	No	(National Park Service, 2023b)
Kalepolepo	Maui	Native Hawaiian Fishpond	Listed	96001503	No	(National Park Service, 2023b)
Hanalei Pier	Kauai	Pier	Listed	79000757	No	(National Park Service, 2023b)
Pearl Harbor	HI Study Area (Oahu)	Strategic Naval Base and site of the December 7, 1941, attack by the Japanese in WWII.	Listed	66000940	Yes	(National Park Service, 2023b)
Two Brothers Shipwreck	HI Study Area (Northern. Hawaiian Islands)	Whaling Ship, 1818–1823	Listed	100001416	No	National Park Service (2023a); (National Park Service, 2023b), (National Oceanic and Atmospheric Administration, 2021)
USS Arizona	HI Study Area (Pearl Harbor, HI)	U.S Battleship, 1916–1941	Listed	89001083	Yes	(National Park Service, 2023b)
USS Utah	HI Study Area (Pearl Harbor, HI)	U.S. Battleship, 1911–1941	Listed	89001084	Yes	(National Park Service, 2023b)
SS Yankee Blade	CA Study Area (Central Coast)	Steamship 1853–1854	Listed	91000564	No	(National Park Service, 2023b)

* An ethnographic study for SNI and SCI is underway. Notes: CA = California, HI = Hawaii, USS = United States Ship, SS = Steamship, SNI = San Nicolas Island, SCI = San Clemente Island

3.10.2.6 Resources with Sovereign Immunity

Sovereign immunity is a principle of international law which recognizes each nation's sovereignty over its warships and vessels that are owned or operated by the nation for non-commercial service. Additional regulations and guidelines for submerged historic resources include 10 U.S.C. section 113, Title XIV for the Sunken Military Craft Act; *Abandoned Shipwreck Act Guidelines*, prepared by the National Park Service (National Park Service, 2007); and, for purposes of conducting research or recovering Navy ship and aircraft wrecks, *Guidelines for Archaeological Research Permit Applications on Ship and Aircraft Wrecks under the Jurisdiction of the Department of the Navy* (36 CFR part 767) overseen by the Naval History and Heritage Command. The Sunken Military Craft Act does not apply to actions taken by, or at the direction of, the United States. In accordance with the Abandoned Shipwreck Act of 1987, abandoned shipwrecks in state waters are considered the property of the U.S. government if the shipwreck meets the criteria for inclusion in the NRHP. However, the federal government may transfer the title of an abandoned shipwreck to the state if the shipwreck falls within the jurisdiction of the state (Barnette, 2010). Warships or vessels owned or operated by a state for non-commercial purposes at the time of their sinking retain sovereign immunity (e.g., Japanese freighters). Consistent with the principle of sovereign immunity, foreign warships sunk in U.S. territorial waters are protected by the U.S. government, which acts as custodian of the sites in the best interest of the sovereign nation (Neyland, 2001). In addition, the National Park Service Archeology Program, developed as a result of a Presidential Order, includes a collection of historical and archaeological resource protection laws to which federal managers adhere.

3.10.2.6.1 Hawaii

The Hawaii Study Area contains at least one resource with sovereign immunity. A World War II-era Japanese Midget "A" submarine was sunk by the USS Ward 90 minutes prior to the attack on Pearl Harbor in the first combat exchange of WWII in the Pacific. (New South Wales, 2012). While Japan has jurisdiction and ownership of the Midget submarine, it is included in the Pearl Harbor National Landmark.

3.10.2.6.2 California

The California Study Area contains no resources with sovereign immunity.

3.10.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, baseline conditions of the existing environment for cultural resources would remain unchanged. As a result, the No Action Alternative is not analyzed further within this section.

This section describes and evaluates how and to what degree the activities described in Chapter 2 potentially affect cultural resources within U.S. territorial waters located in the Study Area.

The stressors applicable to cultural resources that are analyzed in this EIS/OEIS include the following:

- **explosives** (explosives – shock [pressure] waves from underwater explosions, explosives – cratering)
- **physical disturbance and strikes** (in-water devices, MEM, seafloor devices, and pile driving)

As stated in Section 3.0.2, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in 40 CFR 1501.3(d). Both explosives, and physical disturbance and strike could have a reasonably foreseeable adverse effect, thus requiring a significance determination.

A stressor is considered to have a significant effect on the human environment based on an examination of the context of the action and the intensity of the effect. In the present instance, the effects of explosives or physical disturbance and strike would be considered significant if cultural resources or historic properties are physically destroyed, damaged, or altered in a manner that compromises the integrity of the resource.

Archaeologists regularly use multi-beam sonar and side-scan sonar to explore shipwrecks without disturbing them. Based on the physics of underwater sound, the shipwreck would need to be very close (less than 22 ft.) to the sonar sound source for the shipwreck to experience any slight oscillations from the induced pressure waves. Any oscillations experienced within a few yards from the sonar source would be negligible. This distance is smaller than the typical safe navigation and operating depth for most sonar sources and is not expected to affect historic shipwrecks. Therefore, sonar is not considered a stressor that would result in an effect on cultural resources and will not be analyzed further in this document. Additionally, there are no cultural resources within the Hawaii and California Study Areas that are susceptible to sonic booms, so sonic booms are not analyzed further in this EIS/OEIS. Submerged cultural resources located in the NOCAL Range Complex are not considered further in this analysis as they are located beyond 12 NM from shore.

The analysis for stressors and substressors in this section is derived from the 2018 HSTT and 2022 PMSR EIS/OEISs in comparison with the factors that have changed for the current Proposed Action alternatives that are being addressed in this EIS/OEIS.

The analysis considers SOPs and mitigation measures that would be implemented under Alternative 1 and Alternative 2 of the Proposed Action. The SOPs and mitigation measures that are specific to cultural resources are listed in Table 3.10-2. In the event that a submerged historic property is inadvertently affected, consultation would be conducted with the appropriate SHPO in accordance with Title 36 CFR section 800.13(a)(3).

Table 3.10-2: List of Standard Operating Procedures, Best Management Practices, and Mitigations for Cultural Resources

Applicable Stressor	Requirements Summary and Protection Focus	Section Reference/Mitigation Measure
Explosives (in-water explosives); physical disturbance and strike (seafloor devices)	• The Action Proponents will not detonate explosives, or place non-explosives, on or near the seafloor (e.g., explosive bottom-laid or moored mines) within a horizontal distance of 350 yd. from shipwrecks (except in designated areas in the Hawaii California OPAREAs, such as the nearshore areas of San Clemente Island and in the Silver Strand Training Complex, where these features will be avoided to the maximum extent practical). • The Action Proponents will not set vessel anchors within the anchor swing circle radius from shipwrecks (except in designated anchorages). • The Action Proponents will not position precisely placed non-explosive seafloor devices directly on shipwrecks. • The Action Proponents will avoid positioning precisely placed non-explosive seafloor devices near shipwrecks by the largest distance that is practical to implement based on mission requirements.	Chapter 5, Section 5.7.2.
Explosives (in-water explosives); physical disturbance and strike (seafloor devices)	Cultural Resources (Shipwrecks); Military readiness activities are only conducted in designated locations where no cultural resources are known to exist.	Chapter 3, Section 3.10
Explosives (in-water explosives); physical disturbance and strike (seafloor devices)	Cultural Resources (Shipwrecks); Locations of known submerged cultural resources are routinely avoided by the military by utilizing sonar and seafloor maps.	Chapter 3, Section 3.10

3.10.3.1 Explosive Stressors

Table 3.10-3 contains brief summaries of background information that is relevant to the analyses of effects for each substressor. Detailed information on explosive effect categories in general, as well as effects specific to each substressor, is provided in Appendix D.

Table 3.10-3: Explosive Stressors Information Summary

Substressor	Background Information Summary
Explosions in Air	Explosive stressors from in-air explosions are not anticipated to have an effect on submerged cultural resources as the shockwaves dissipate as they travel through the air and water column.
Explosions in Water	Explosive stressors that could affect cultural resources are vibration, shock waves, and explosive cratering from underwater explosions. A shock wave and oscillating bubble pulses resulting from any kind of underwater explosion, such as explosive torpedoes, missiles, bombs, projectiles, mines, and explosive sonobuoys, could affect the exposed portions of submerged cultural resources if such resources were located nearby. Shock waves (pressure) generated by underwater explosions would be periodic rather than continuous, and could create overall structural instability and eventual collapse of architectural features of submerged cultural resources. The amount of damage would depend on factors such as the size of the charge, the distance from the historic shipwreck, the water depth, and the topography of the ocean floor.

Table 3.10-3 contains a summary of the background information used to analyze the potential effects of explosive stressors on cultural resources. For a discussion of the types of activities that create an explosive stressor, refer to Appendix B, and for information on the number of activities proposed for each alternative, see Tables 2-11 through 2-19.

As discussed in Chapter 5 (Section 5.6.1, Table 5-2, and Section 5.7.2), the military will avoid effects from explosives on seafloor resources in mitigation areas throughout the Study Area. SOPs for in-water explosive safety, found in Section 3.0.4, Table 3.0-27 will also be followed. SOPs listed in Table 3.10-2, including the avoidance of wrecks by utilizing sonar and seafloor maps, provide additional protection to known cultural resources; in addition, the Navy's Section 106 compliance under the Navy's PAs ensures the effects to applicable historic properties by a proposed action are taken into account.

3.10.3.1.1 Effects from In-Water Explosives under Alternative 1

Military readiness activities involving explosives in water would generally continue as described in the 2018 HSTT and 2022 PMSR EIS/OEISs. Details on location-specific frequency and types of explosives to be used in the proposed military readiness activities can be found in Chapter 2 and Appendix A.

In California, cratering would be associated with diver-placed underwater detonations in shallow water at SCI (Pyramid Cove Target Minefield, TAR-2, and TAR-3), Camp Pendleton Amphibious Assault Area, Advanced Research Projects Agency, and SSTC (Echo Training Area, Imperial Beach Mine Training Range, Airborne Mine Countermeasure Mine Training Range, SSTC-N Boat Lanes, SSTC-S Boat Lanes, and Training Area [TA]-Kilo) (Figure 3.10-9). In Hawaii, cratering would be associated with underwater detonations at Pearl Peninsula, Puuloa Underwater Range, Barbers Point Underwater Range, Lima Landing, and Ewa Training Minefield (Figure 3.10-10) (U.S. Department of the Navy, 2003).

Training and Testing. Under Alternative 1, shock waves and cratering created from underwater explosives are not expected to result in effects on cultural resources within the Study Area because (1) shock waves dissipate over distance and would be infrequent in areas where known resources occur, (2) bottom-placed explosives that could cause cratering are laid by divers in specific locations where bottom detonations have been conducted for decades, (3) bottom-placed explosives would be infrequent (one to three events every other year) and occur only on sandy bottom habitat in the same specific locations,

(4) cratering would be temporary and refilled with sand between activities through tidal and current movements, and (5) there are no known cultural resources within areas where bottom-placed explosives would occur. Additionally, per the military's SOPs (Table 3.10-2), locations of known submerged cultural resources are routinely avoided by utilizing sonar and seafloor maps. Refer to Section 3.5 (Habitats) for more information regarding overall effects on the seafloor from explosive stressors.

Modernization and Sustainment of Ranges. No explosives in water would be used in range modernization and sustainment activities.

Conclusion. Activities that include the use of in-water explosives under Alternative 1 would result in less than significant effects due to shock waves and cratering. No cultural resources have been identified within the designated detonation areas in the California or Hawaii Study Areas; however, activities would continue to be conducted in accordance with the SOPs (Table 3.10-2) that protect submerged cultural resources.

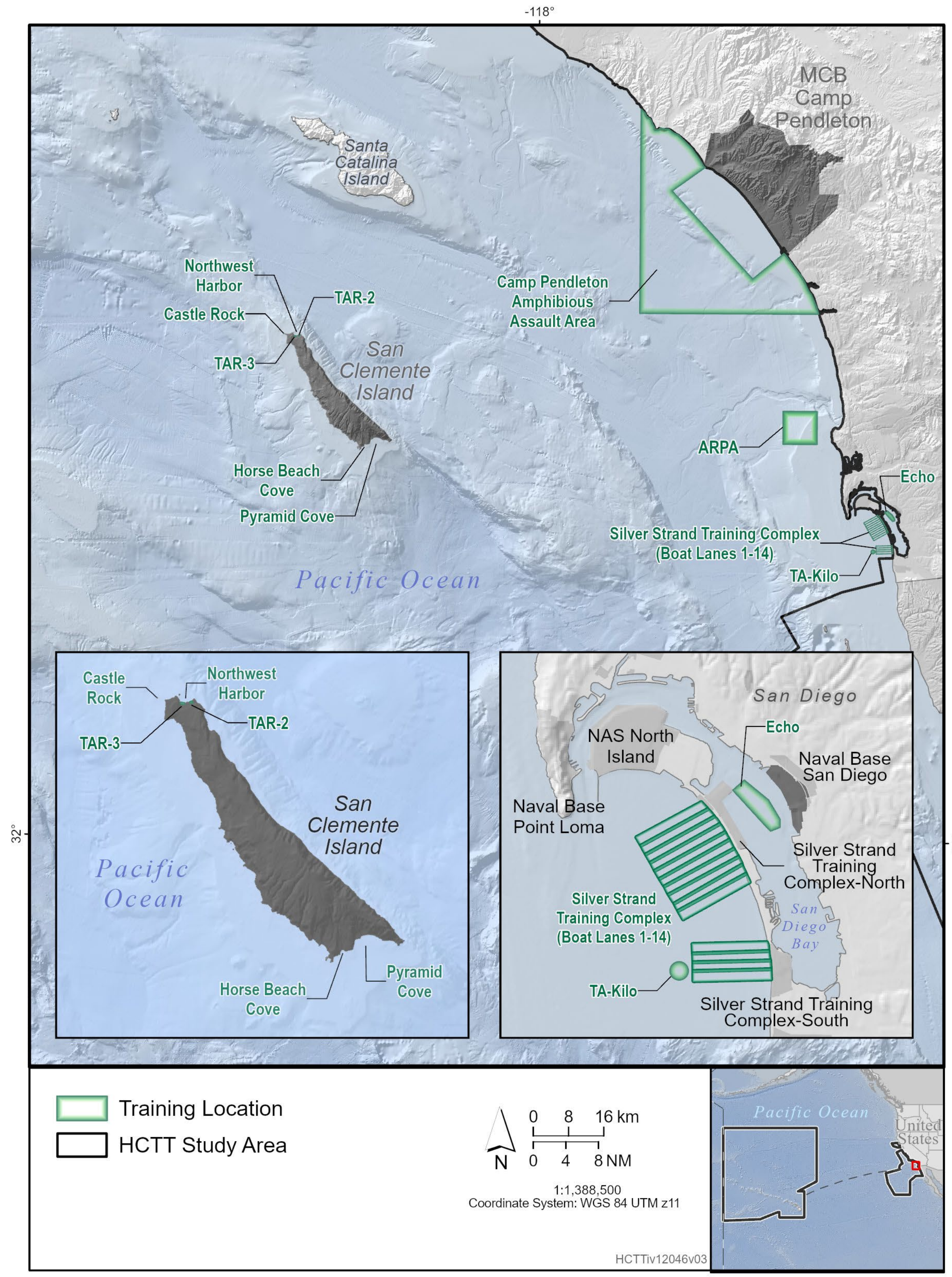


Figure 3.10-9: Detonation Areas in the California Study Area

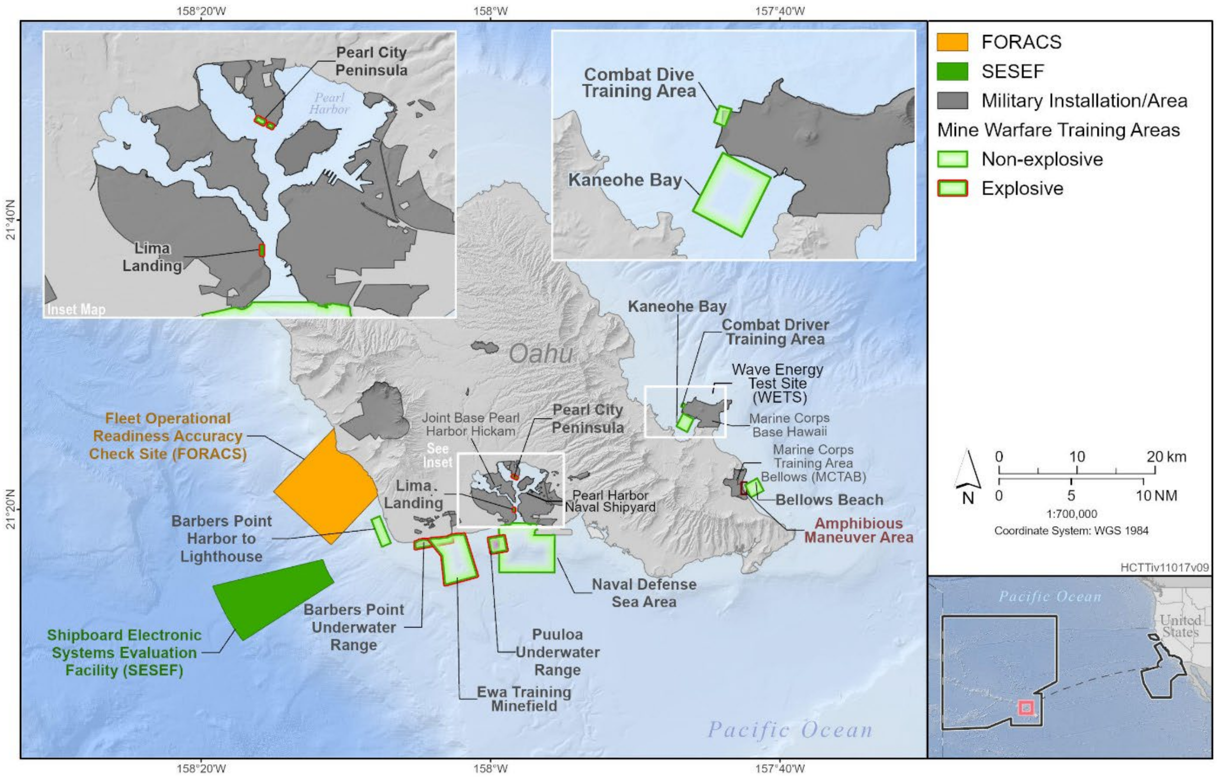


Figure 3.10-10: Detonation Areas in the Hawaii Study Area

3.10.3.1.2 Effects from In-Water Explosives under Alternative 2

Under Alternative 2, military readiness activities would reflect the maximum frequency of activities to occur annually over a seven-year timeframe. As a result, the number of annual events conducted that involve in-water explosives would increase compared to Alternative 1. However, military readiness activities involving explosives in water would generally continue as described in the 2018 HSTT and 2022 PMSR EIS/OEISs. Although no cultural resources have been identified within the designated detonation areas, activities would be conducted in accordance with the SOPs described in Table 3.10-2. Therefore, activities that include the use of in-water explosives under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.10.3.2 Physical Disturbance and Strike Stressors

The evaluation of the effects from physical disturbance and strike stressors on cultural resources focuses on proposed activities that may cause cultural resources to be damaged by an object that is moving through the water (e.g., vessels and in-water devices), dropped into the water (e.g., MEM), deployed on the seafloor (e.g., mine shapes and anchors), or propelled through the water column (e.g., explosive fragments).

Table 3.10-4 contains brief summaries of background information relevant to the analyses of effects for each physical disturbance and strike substressor. Detailed information on physical disturbance and strike stressors and substressors can be found in Chapter 3 of this Draft EIS/OEIS. Additionally, the types of training and testing activities analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs are consistent with the Proposed Action. As such, the analysis included in those documents remains valid.

Table 3.10-4: Physical Disturbance and Strike Stressor Information Summary

Substressor	Background Information Summary
Vessels and In-Water Devices	Physical disturbance and strike can occur as vessels move through the water and as some smaller craft and amphibious vessels can come into contact with the seafloor in the nearshore environment, potentially affecting submerged cultural resources. • Vessels used as part of the Proposed Action include ships (e.g., aircraft carriers, surface combatants), support craft, and submarines ranging in size from 15 feet to over 1,000 feet. • In-water devices as discussed in this analysis include unmanned vehicles, such as remotely operated vehicles, unmanned surface vehicles, unmanned underwater vehicles, motorized autonomous targets, and towed devices.
Military Expended Materials	The deposition of non-explosive practice munitions, sonobuoys, and military expended materials other than munitions could affect submerged cultural resources if such resources are located nearby. • Most of the anticipated expended munitions (e.g., large-caliber explosive munitions) would be small objects and fragments that would slowly drift to the seafloor after striking the ocean surface. • Larger and heavier objects (e.g., non-explosive practice munitions) could displace sediments and artifacts upon impacting the ocean floor despite a reduction in their descent velocity. • Effects on sites could occur should expended material fall on or near them.
Seafloor Devices	Physical disturbances on the continental shelf and seafloor, such as precision anchoring, targets or mines resting on the ocean floor, moored mines, bottom-mounted tripods, bottom crawlers (unmanned underwater vehicles), and cable installation activities could damage or destroy submerged cultural resources if such resources are located nearby. • Seafloor devices are either stationary or move very slowly along the bottom. • Bottom-placed instruments usually include an anchor which may be expended while recovering the instrument.
Pile Driving	Impact pile driving (installing piles with an impact hammer mechanism) and vibratory pile removal could affect submerged cultural resources, if located nearby. • Pile driving would subject surrounding sediments to vibration, disruption, and compaction which could affect cultural resources, if in close proximity. • Soft substrates such as sand bottom at the proposed elevated causeway system locations would absorb or attenuate impact more readily than hard substrates.

3.10.3.2.1 Effects from Vessels and In-Water Devices

Table 3.10-4 contains a summary of the background information used to analyze the potential effects of vessel and in-water devices on cultural resources. For a discussion of the types of activities that utilize vessels and in-water devices, refer to Appendix B, and for information on locations and the number of activities proposed for each alternative, see Table 3.0-17.

3.10.3.2.1.1 Effects from Vessels and In-Water Devices under Alternative 1

Military readiness activities involving vessels and in-water devices would generally continue as described in the 2018 HSTT and 2022 PMSR EIS/OEISs. Most military readiness activities include vessels, while a lower number of activities include in-water devices. As indicated in Section 3.0.3.3.4.1, vessel operation would be widely dispersed throughout the Study Area but would be more concentrated near ports, naval installations, and range complexes. Most vessel use would occur in the California Study Area.

Training and Testing. Under Alternative 1, training and testing activities using vessels and in-water devices would occur within the Hawaii and California Study Areas. Vessels and in-water devices are operated in a manner that avoids known submerged cultural resources and amphibious activities only occur in designated areas. Training and testing activities involving vessels and in-water devices would largely remain unchanged in nature and location as activities assessed in the 2018 HSTT and 2022 PMSR EIS/OEISs. One exception to this is the inclusion of proposed amphibious approach lanes along the coast of PMSR and the southern portion of the NOCAL range complex. Although vessels and in-water devices have not been utilized for training and testing activities in this capacity or location in the past, amphibious activities would only occur in designated areas where no known cultural resources are present.

Modernization and Sustainment of Ranges. The vessels used to deploy seafloor cables associated with the SOAR modernization, SWTR installation, Sustainment of Undersea Ranges, and deployment of seafloor cables and instrumentation using existing undersea infrastructure in the California and Hawaii Study Areas would avoid submerged cultural resources by utilizing sonar and seafloor maps. Previous installation planning and successful historical cable deployments indicates that the seafloor within SOAR is mostly flat and of constant depth with little if any underwater obstructions or seafloor anomalies.

Conclusion. Activities that include the use of vessels and in-water devices under Alternative 1 would result in less than significant effects. Military readiness activities involving vessels and in-water devices would remain unchanged in nature as activities assessed in the 2018 HSTT and 2022 PMSR EIS/OEISs; therefore, the analysis and conclusions on effects on cultural resources from vessels and in-water devices under Alternative 1 of the Proposed Action would not be meaningfully different from the findings of these previous analyses. Training and testing activities conducted in the newly proposed amphibious approach lanes would only occur in designated areas where no known cultural resources are present. Overall types and locations of military readiness activities are not expected to change from those currently conducted by the military in the Study Area. Known cultural resources and historic properties would be avoided, and the stipulations of applicable SOPs (Table 3.10-2) that protect submerged cultural resources and historic properties remain in place and would continue to be implemented.

3.10.3.2.1.2 Effects from Vessels and In-Water Devices under Alternative 2

Under Alternative 2, military readiness activities would reflect the maximum frequency of activities to occur annually over a seven-year timeframe. As a result, the number of annual events conducted that involve in-water devices would increase compared to Alternative 1. However, military readiness activities involving vessels and in-water devices would generally continue as described in the 2018 HSTT and 2022 PMSR EIS/OEISs. Additionally, activities would be conducted in accordance with the SOPs described in Table 3.10-2. Therefore, activities that include the use of vessels and in-water devices under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.10.3.2.2 Effects from Military Expended Materials

Table 3.10-4 contains a summary of the background information used to analyze the potential effects of MEM on cultural resources. For a discussion of the types of activities that create MEM, refer to Appendix B, and for information on locations and the number of activities proposed for each alternative, see Appendix A and Section 3.0.3.3.4.2, Tables 3.0-16–3.0-19.

3.10.3.2.2.1 Effects from Military Expended Materials under Alternative 1

Military readiness activities involving MEM would generally continue as described in the 2018 HSTT and 2022 PMSR EIS/OEISs.

Training and Testing. Under Alternative 1, MEM could be deposited on or in the vicinity of submerged cultural resources. However, such sites are most likely to occur within water depths of 100 m below mean high tide. The majority of proposed training and testing activities would occur over the open ocean, and the settling of MEM would primarily occur in areas away from where potential submerged cultural resources would be found.

MEM settling on the seafloor on or near submerged cultural resources, would have no significant effect on submerged cultural resources because (1) areas with known submerged cultural resources would be avoided, (2) most anticipated expended munitions would be small objects and fragments that would slowly drift to the seafloor after striking the ocean surface, and (3) settling of MEM on the seafloor would be diffuse and transitory, as MEM is likely to be transported by currents and other turbulence.

Modernization and Sustainment of Ranges. No MEM would be used in range modernization and sustainment activities.

Conclusion. Activities that include the use of MEM under Alternative 1 would result in less than significant effects. Military readiness activities involving MEM would remain unchanged in nature as activities assessed in the 2018 HSTT and 2022 PMSR EIS/OEISs; therefore, the analysis and conclusions on effects on cultural resources from MEM under Alternative 1 of the Proposed Action would not be meaningfully different from the findings of these analyses. Overall types and locations of military readiness activities are not expected to change from those currently conducted by the military in the Study Area. Known cultural resources and historic properties would be avoided, and the associated SOPs (Table 3.10-2) that protect submerged cultural resources and historic properties remain in place and would continue to be implemented.

3.10.3.2.2.2 Effects from Military Expended Materials under Alternative 2

Under Alternative 2, military readiness activities would reflect the maximum frequency of activities to occur annually over a seven-year timeframe. As a result, the number of annual events conducted that involve MEM would increase compared to Alternative 1. However, military readiness activities involving MEM would generally continue as described in the 2018 HSTT and 2022 PMSR EIS/OEISs. Additionally, activities would be conducted in accordance with the SOPs described in Table 3.10-2. Therefore, activities that include the use of MEM under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.10.3.2.3 Effects from Seafloor Devices

Table 3.10-4 contains a summary of the background information used to analyze the potential effects of seafloor devices on cultural resources. For a discussion of the types of activities that utilize seafloor devices, refer to Appendix B, and for information on locations and the number of activities proposed for each alternative, see Table 3.0-22.

3.10.3.2.3.1 Effects from Seafloor Devices under Alternative 1

Military readiness activities involving seafloor device use would generally continue as described in the 2018 HSTT and 2022 PMSR EIS/OEISs.

Training and Testing. Under Alternative 1, seafloor devices could be deployed in the vicinity of submerged cultural resources in both the California and Hawaii Study Areas. Seafloor devices usually include an anchor if placed on the bottom and are either stationary or move very slowly across the seafloor, which could affect submerged cultural resources. However, effects on cultural resources would be avoided because (1) most seafloor devices are laid out in designated, shallow water areas that have been utilized for decades where no known cultural resources are present and (2) the military routinely avoids submerged cultural resources by utilizing sonar and seafloor maps. No historic properties have been identified within the areas where seafloor devices will be deployed.

Modernization and Sustainment of Ranges. Placement of seafloor devices would occur in the SOAR modernization, SWTR installation, and deployment of seafloor cables and instrumentation using existing undersea infrastructure in the California and Hawaii Study Areas activities. Activities would largely be conducted in areas where seafloor devices have already been deployed. Placement of seafloor devices would avoid submerged cultural resources by utilizing sonar and seafloor maps. No historic properties have been identified within the areas described above. Additionally, previous installation planning and successful historical cable deployments indicates that the seafloor within SOAR is mostly flat and of constant depth with little if any underwater obstructions or seafloor anomalies.

Conclusion. Activities that include the use of seafloor devices under Alternative 1 would result in less than significant effects. No historic properties have been identified within the areas where seafloor devices would be deployed under Alternative 1. Military readiness activities involving seafloor devices would remain unchanged in nature as activities assessed in the 2018 HSTT and 2022 PMSR EIS/OEISs; therefore, the analysis and conclusions on effects on cultural resources from MEM under Alternative 1 of the Proposed Action would not be meaningfully different from the findings of these analyses. Overall types and locations of military readiness activities are not expected to change from those currently conducted by the military in the Study Area. Known cultural resources would be avoided, and the SOPs (Table 3.10-2) that protect submerged cultural resources and historic properties remain in place and would continue to be implemented.

3.10.3.2.3.2 Effects from Seafloor Devices under Alternative 2

Under Alternative 2, military readiness activities would reflect the maximum frequency of activities to occur annually over a seven-year timeframe. As a result, the number of annual events conducted that involve seafloor devices would increase compared to Alternative 1. However, no historic properties have been identified within the areas where seafloor devices would be deployed and military readiness activities involving seafloor device use would generally continue as described in the 2018 HSTT and 2022 PMSR EIS/OEISs. Additionally, activities would be conducted in accordance with the SOPs described in Table 3.10-2. Therefore, activities that include the use of seafloor devices under Alternative 2 would be similar to Alternative 1 and would result in less than significant effects.

3.10.3.2.4 Effects from Pile Driving

Table 3.10-4 contains a summary of the background information used to analyze the potential effects of pile driving on cultural resources. For a discussion of the types of activities that utilize pile driving, refer to Appendix B, and for information on pile driving activities, see Tables 3.0-5 and 3.0-6. Pile driving activities are limited to Naval Base Ventura County, Port Hueneme.

3.10.3.2.4.1 Effects from Pile Driving under Alternative 1

Military readiness activities involving pile driving activities would generally continue as described in the 2018 HSTT and 2022 PMSR EIS/OEISs.

Training and Testing. Under Alternative 1, pile driving would be limited to six proposed annual Port Damage Repair training activities in the shallow waters at Port Hueneme. Pile driving activities would not take place in the Hawaii Study Area. While pile driving would subject nearshore sediments to vibration, disruption, and compaction, there are no known cultural resources or historic properties in

Port Hueneme, and the potential for encountering submerged cultural resources that retain their integrity is negligible due to extensive past disturbance.

Modernization and Sustainment of Ranges. No pile driving would occur in range modernization and sustainment activities.

Conclusion. Activities that include pile driving under Alternative 1 would result in less than significant effects. No cultural resources have been identified within the areas where pile driving would be conducted; however, activities would continue to be conducted in accordance with SOPs (Table 3.10-2) that protect submerged cultural resources.

3.10.3.2.4.2 Effects from Pile Driving under Alternative 2

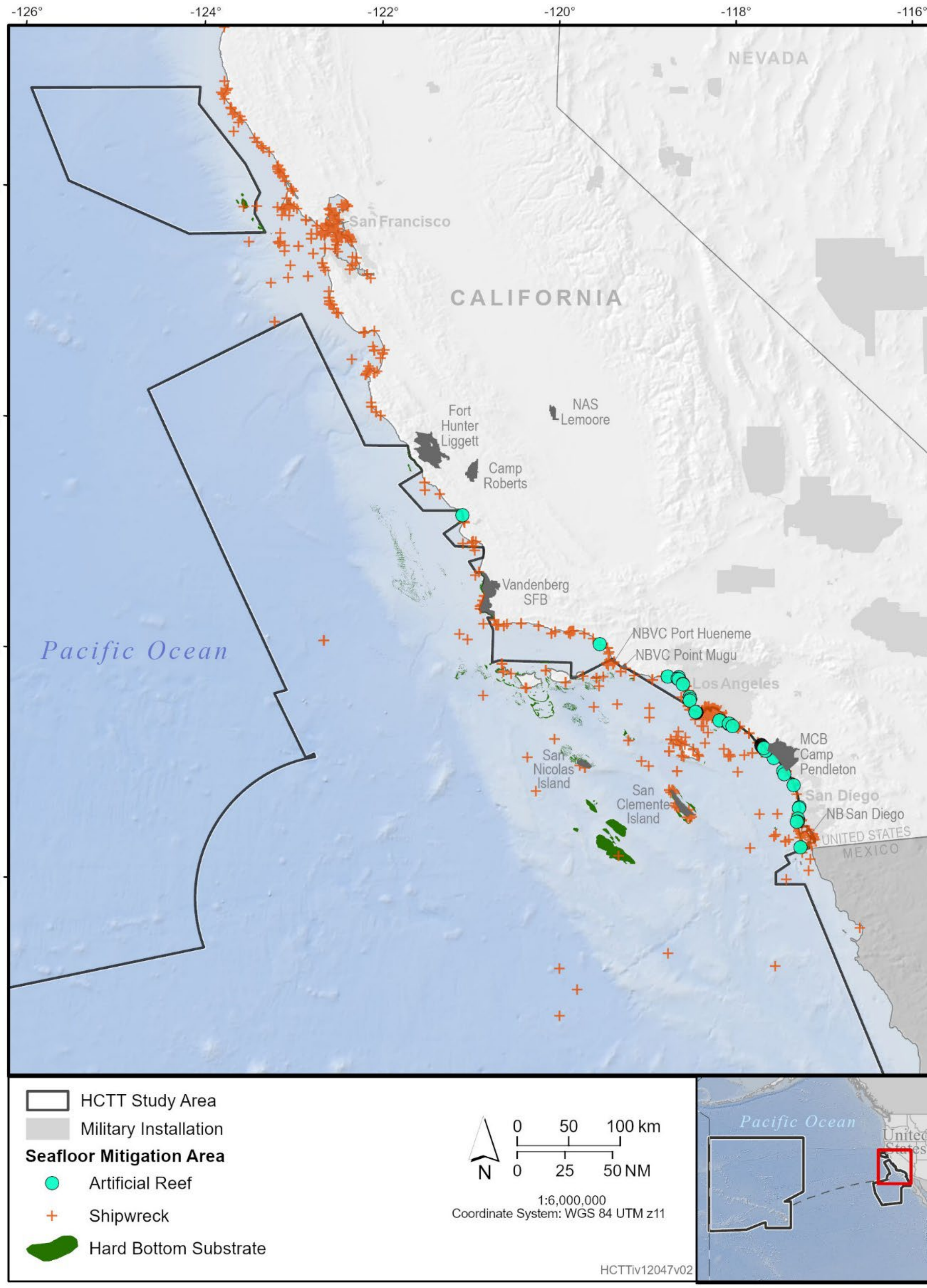
Under Alternative 2, the number of proposed annual pile driving events would be the same as Alternative 1. Therefore, activities that include pile driving under Alternative 2 would be the same as Alternative 1 and would result in less than significant effects.

3.10.4 Summary of Potential Effects on Cultural Resources

3.10.4.1 Combined Effects of All Stressors under Alternative 1

The analysis and conclusions for the potential effects from each of the individual stressors are discussed in the previous sections. Stressors associated with military readiness activities do not typically occur in isolation but rather occur in some combination. An analysis of the combined imp effects acts of all stressors considers the potential consequences of additive stressors and synergistic stressors.

Individual stressors that would otherwise have minimal to no effect may combine to have a measurable response, and a submerged cultural resource could be exposed to multiple military readiness activities over the course of its life. More than one stressor to cultural resources could result from a single training event (e.g., a single event could include activities that result in explosive and physical strike stressors within a relatively short amount of time). However, military readiness activities are conducted in a manner that avoids known cultural resources and mitigation areas (Figure 3.10-11 and Figure 3.10-12) by implementing the SOPs listed in Table 3.10-2. Additionally, activities may occur in the same general area (e.g., gunnery activities), but the majority would not occur at the same specific point each time and would therefore be unlikely to affect the same cultural resources.



Note: HCTT = Hawaii-California Training and Testing

Figure 3.10-11: Seafloor Resource Mitigation Areas off California

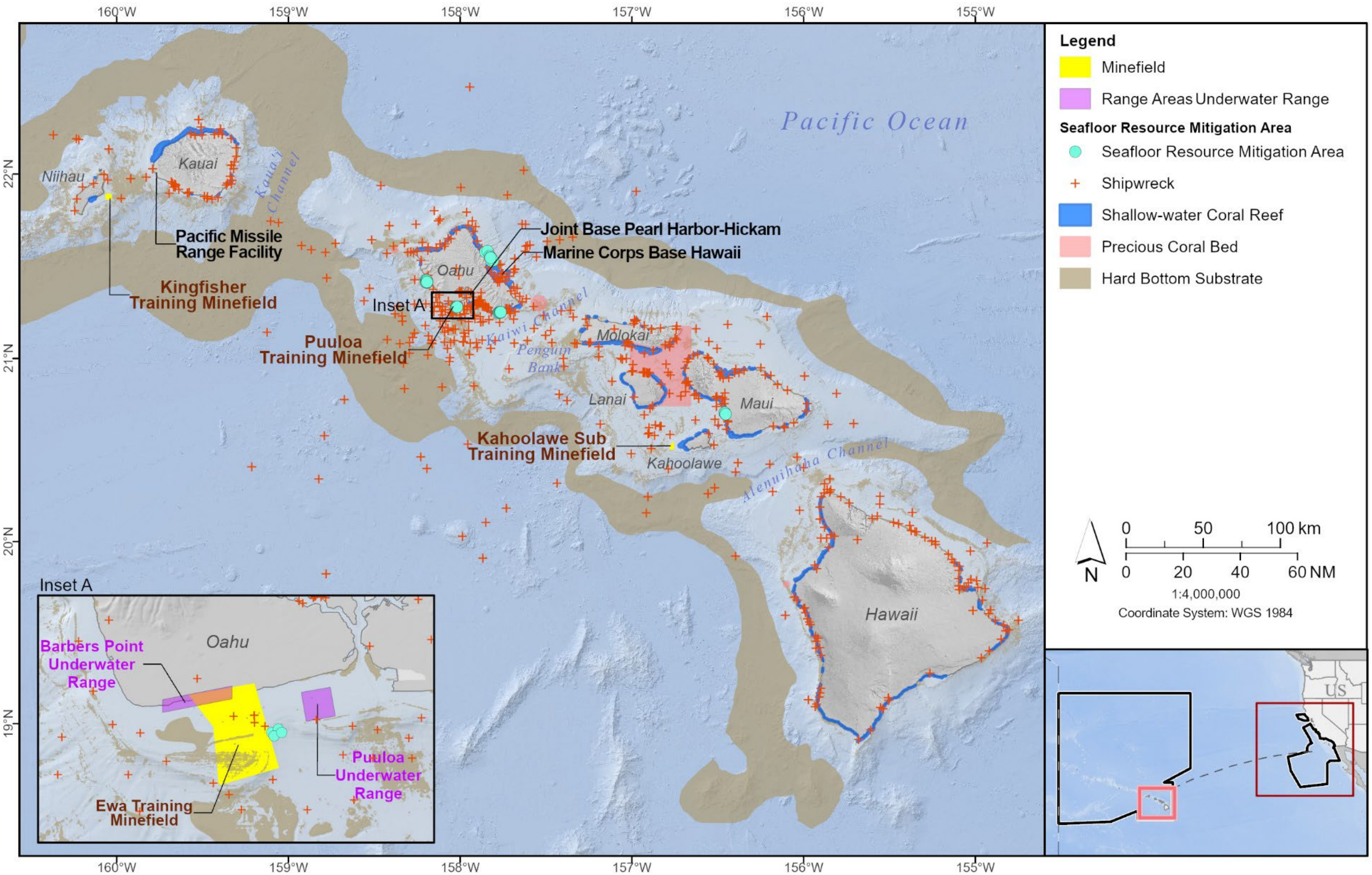


Figure 3.10-12: Seafloor Resource Mitigation Areas off Hawaii

Multiple stressors may also have synergistic effects. For example, synergistic effects of climate change and ocean acidification, sedimentation, and storms, among other factors could cause disturbance to submerged cultural resources. The potential for stressors to result in additive or synergistic consequences is limited to explosive effects and physical strike and disturbance; however, the potential synergistic interactions of multiple stressors resulting from proposed activities are difficult to predict quantitatively.

Although potential effects on cultural resources from military readiness activities may occur, they are not expected to lead to permanent damage or alteration to the character-defining features of the resource.

Overall types and locations of military readiness activities are not expected to change from those currently conducted by the military in the Study Area, and the associated SOPs (Table 3.10-2) that protect submerged cultural resources and historic properties remain in place and would continue to be implemented. As a result, the analysis of the effects on cultural resources from explosives and physical disturbance and strike stressors during military readiness activities under Alternative 1 are consistent with a less than significant determination.

3.10.4.2 Combined Effects of All Stressors under Alternative 2

Military readiness activities proposed under Alternative 2 would represent increases over what is proposed for Alternative 1. However, military readiness activities and associated SOPs would continue as described under Alternative 1. As such, the combined effects of all stressors under Alternative 2 are expected to be the same as those described under Alternative 1. Therefore, the analysis of the effects on cultural resources from explosives and physical disturbance and strike stressors during military readiness activities under Alternative 2 are consistent with a less than significant determination.

3.10.4.3 National Historic Preservation Act

Table 3.10-5 summarizes the potential effects of the Proposed Action (the undertaking) on submerged resources in accordance with Section 106 of the NHPA for Alternative 1 and Alternative 2. The Proposed Action is not anticipated to affect the characteristics that qualify a historic property for inclusion in the NRHP in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association of known historic properties within the Study Area. In both California and Hawaii, the Navy will fulfill the NHPA process with SHPO and consulting parties under procedures set forth in 36 CFR Section 800.

Table 3.10-5: Summary of Effects on Historic Resources

Alternative and Stressor	Section 106 Effects
Alternative 1	
Explosive Stressors	Explosive stressors resulting from underwater explosions creating shock waves and cratering of the seafloor would not affect known or unknown submerged historic properties; mitigation measures would continue to be implemented to protect historic properties.
Physical Disturbance and Strike Stressors	Physical stressors resulting from in-water devices, military expended materials, and seafloor devices, during military readiness activities would not affect known or unknown submerged historic properties; mitigation measures would continue to be implemented to protect historic properties.
Regulatory Determination	*Pending*
Alternative 2	
Explosive Stressors	Explosive stressors resulting from underwater explosions creating shock waves and cratering of the seafloor would not affect known or unknown submerged historic properties; mitigation measures would continue to be implemented to protect historic properties.
Physical Disturbance and Strike Stressors	Physical stressors resulting from in-water devices, military expended materials, and seafloor devices, during military readiness activities would not affect known or unknown submerged historic properties; mitigation measures would continue to be implemented to protect historic properties.
Regulatory Determination	*No Historic Properties Affected.*

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3.11 Socioeconomic Resources and Environmental Justice

SOCIOECONOMIC RESOURCES AND ENVIRONMENTAL JUSTICE SYNOPSIS

Stressors associated with the Proposed Action with the potential to affect socioeconomic resources and communities with environmental justice concerns were considered, and the following conclusions have been reached for the Preferred Alternative (Alternative 1):

Socioeconomics

- Accessibility: Accessibility stressors are not expected to measurably affect commercial transportation and shipping, commercial and recreational fishing, or tourism and recreational use because inaccessibility to areas of co-use would be temporary and of short duration. As a result, effects would be less than significant.
- Airborne Acoustics: Airborne acoustic stressors are not expected to measurably affect tourism or recreational activity because most military readiness activities would occur well out to sea, far from tourism and recreation locations. Any noise in nearshore areas would be infrequent, short term, and temporary. As a result, effects would be less than significant.
- Physical Disturbance and Strike: Physical disturbance and strike stressors are not expected to measurably affect commercial and recreational fishing or tourism and recreational use because of the large size of the HCTT Study Area, the limited areas of operations, and implementation of standard operating procedures. As a result, effects would be less than significant.

Environmental Justice

- Subsistence Fishing: Given the expansive size of the Study Area and limited amounts of activities that occur within 3 NM, effects on subsistence fishing would be less than significant. If activities were to occur in areas where subsistence fishing takes place, closures would be temporary (lasting until the activity is complete). Communities would not be disproportionately affected by changes to accessibility of ocean areas when compared to others who fish in the Study Area.
- Air Quality and Climate Change: Air pollutant emissions associated with military readiness activities would not be expected to measurably affect the air quality in nearshore communities with environmental justice concerns, including the San Diego AB-617 Portside Community. GHG emissions associated with military readiness activities would not incrementally contribute to climate change and therefore would not adversely affect communities with environmental justice concerns. As a result, effects would be less than significant.

3.11.1 Introduction and Methods

Socioeconomic Resources. CEQ regulations implementing NEPA state that when economic or social effects and natural or physical environmental effects are interrelated, the EIS/OEIS will discuss these effects on the human environment (40 CFR section 1502.16(b). CEQ regulations state that the "human environment or environment means comprehensively the natural and physical environment and the relationship of present and future generations with that environment." To the extent that the ongoing and proposed military readiness activities in the HCTT Study Area could affect the natural or physical environment, the socioeconomic analysis evaluates how elements of the human environment might be affected. Three broad socioeconomic topics were identified based on their association with human activities and livelihoods in the HCTT Study Area. Each of these socioeconomic resources is an aspect of the human environment that involves economics (e.g., employment, income, or revenue) and social conditions (i.e., enjoyment and quality of life) associated with the marine environment of the HCTT Study Area. Therefore, this evaluation considered potential effects on three elements:

- Commercial transportation and shipping
- Commercial and recreational fishing
- Tourism and recreational use

The alternatives were evaluated based on the potential for and the degree to which military readiness activities could affect socioeconomic resources. The potential for effects depends on the likelihood that the military readiness activities would interface with public activities or infrastructure. Factors considered in the analysis include whether there would be temporal or spatial interfaces between the public or infrastructure and military readiness activities. If there is potential for this interface, factors considered to estimate the degree to which an exposure could affect socioeconomic resources include whether there could be an effect on livelihood, quality of experience, resource availability, income, or employment. If there is no potential for the public to interface with an activity, then no reasonably foreseeable effects would be expected.

Environmental Justice. EO 14096 defines environmental justice as "the just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, Tribal affiliation, or disability, in agency decision-making and other federal activities that affect human health and the environment so that people:

- are fully protected from disproportionate and adverse human health and environmental effects (including risks) and federal hazards, including those related to climate change, the cumulative effects of environmental and other burdens, and the legacy of racism or other structural or systemic barriers; and
- have equitable access to a healthy, sustainable, and resilient environment in which to live, play, work, learn, grow, worship, and engage in cultural and subsistence practices."

EO 14096 also uses the term "communities with environmental justice concerns" to refer to affected communities that may "experience disproportionate and adverse human health or environmental burdens."

EO 12898 clarifies that "Just treatment" as it is used in the definition of environmental justice means no group of people should bear a disproportionate share of the negative environmental consequences resulting from industrial, governmental, and commercial operations or policies.

The 2023 Ocean Justice Strategy report by the Ocean Policy Committee, co-chaired by the Director of the Office of Science and Technology Policy and Chair of the CEQ, recognizes that many communities (including minority, low-income, tribal, and indigenous populations) depend on marine resources and a healthy ocean environment for economic, cultural, recreational, and spiritual purposes. Ocean Justice is defined as "the just treatment and meaningful involvement of all people, regardless of income, race, color, national origin, Tribal affiliation, or disability, in Federal (Agency) decision-making and other Federal activities related to the ocean." The Ocean Justice Strategy establishes goals and best practices that the Federal Government can consider when working towards addressing inequities associated with access and availability to the ocean environment and marine resources. As outlined in the Ocean Justice Strategy, the vision for Ocean Justice includes:

- "Equitable access to the benefits of a healthy and resilient ocean and sustainable ocean economy;
- meaningful engagement of all communities in Federal ocean activities;
- recognition of the value of engagement with Tribal Nations, Indigenous Peoples, and Indigenous Knowledge in ocean decision-making and research;
- expanded and improved ocean education to build knowledge about the ocean and create a diverse and inclusive ocean workforce;
- and application of an ocean justice lens to research ways of knowing" (Ocean Policy Committee, 2023).

Communities with environmental justice concerns in the HCTT Study Area that practice subsistence fishing may be affected by the implementation of the Proposed Action. Additionally, some military readiness activities may be conducted in nearshore areas and have the potential to affect the air quality in communities with environmental justice concerns. GHG emissions associated with military readiness activities also have the potential to contribute to climate change and affect communities with environmental justice concerns. Since activities are occurring at-sea, other resources would not be expected to measurably affect communities with environmental justice concerns and are not considered further in this section. The alternatives were evaluated based on the potential for and the degree to which military readiness activities could adversely, disproportionately affect communities with environmental justice concerns.

In addition to the analysis presented in Section 3.11.3.2, the Action Proponents have embarked in robust community outreach and public involvement efforts. Efforts are intended to foster community support, mutually respectful dialogue, and community coordination and meaningful involvement during decision-making activities. Further information regarding public involvement and outreach efforts in Hawaii and California is detailed in Appendix L.

3.11.2 Affected Environment

3.11.2.1 Socioeconomic Resources

The primary area of interest for assessing potential effects on socioeconomic resources is the U.S. territorial waters of Hawaii and California (seaward of the mean high-water line to 12 NM). Limited socioeconomic resources outside this area of interest (i.e., that portion of the EEZ between 12 and 200 NM from shore) are also described when relevant to human activities.

The Center for Naval Analyses (CNA) characterized military and non-military vessel traffic within the HSTT Study Area. Data is based on a four-year average (2014–2018) acquired from approximately one billion positional vessel data records. Non-military vessels account for approximately 96 percent of vessel traffic in the HSTT Study Area, whereas military vessels (Navy and USCG vessels) account for 4 percent of traffic. Given that the highest densities of military vessels analyzed in this EIS/OEIS are expected to occur in within the same geographic boundaries as the HSTT Study Area, it can be assumed that the density of military vessels in the HCTT Study Area would likely account for less than 4 percent of vessel all traffic in the region.

3.11.2.1.1 Commercial Transportation and Shipping

3.11.2.1.1.1 Ocean Transportation

Ocean transportation is the transit of commercial, private, and military vessels at sea, including submarines. Most of the waterways in the HCTT Study Area are accessible to commercial vessels; however, some areas are restricted. These areas may limit access to non-military activities on either a full-time or temporary timeframe.

The flow of vessel traffic in congested waters, especially near coastlines, is controlled by the use of directional shipping lanes for large vessels and flow controls for all vessels in harbors, bays, and ports to ensure that ports-of-entry remain as uncongested as possible. Military and non-military vessels alike adhere to regulations governing shipping traffic in these areas.

3.11.2.1.1.1.1 Hawaii Study Area

Ocean shipping is an important component of Hawaii’s economy. Major inter-island ports include Honolulu, Barbers Point, Hilo, Kawaihae, and Kahului (Figure 3.11-1). The U.S. Army Corps of Engineers ranks the top 150 U.S. ports by cargo volume (U.S. Army Corps of Engineers, 2020, 2021). Based on 2020 rankings, Honolulu (Oahu) ranked 38 in total trade (domestic and foreign) with over 14 million tons of goods transferred (U.S. Army Corps of Engineers, 2020, 2021). Other ranked ports in Hawaii were Barbers Point (Oahu) at 63, Kahului (Maui) at 87, Hilo (Hawaii) at 104, and Kawaihae at 111.

Primary shipping routes within the Main Hawaiian Islands and extending east to North America and west to Asia, primarily from Barbers Points, Oahu, are shown in Figure 3.11-1. In addition to routes traveled by large commercial vessels, other routes throughout the Study Area provide access to and from marinas, mooring locations, fishing harbors, and military installations located along the islands.

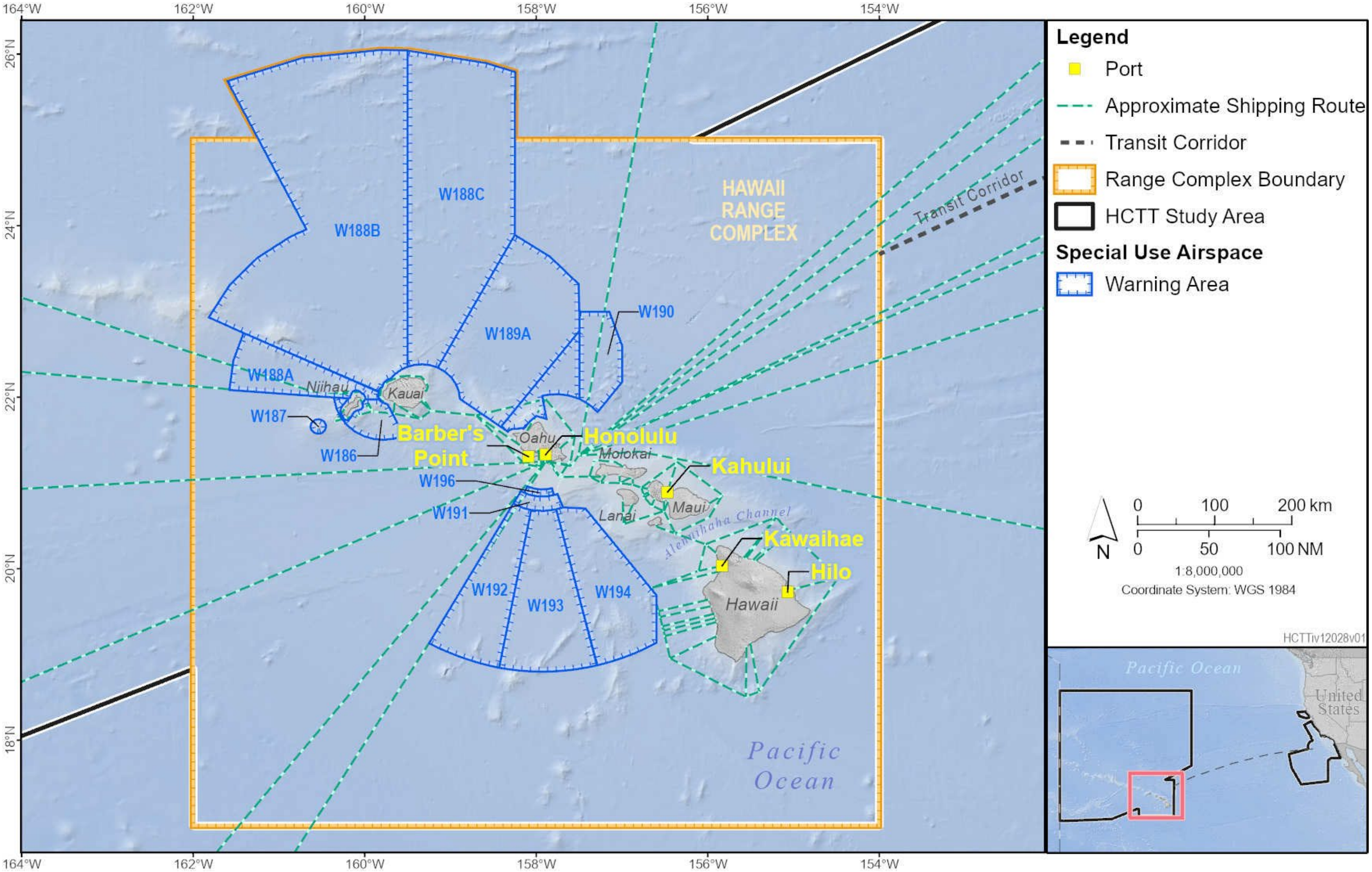


Figure 3.11-1: Main Hawaiian Islands Shipping Routes and Major Ports

3.11.2.1.1.1.2 California Study Area

Ocean shipping is a significant component of the California regional economy, and a large amount of shipping traffic occurs in Southern California. Of the 150 U.S. ports evaluated by the U.S. Army Corps of Engineers (2021), the Port of Long Beach ranked fifth in total trade (foreign and domestic) with 91.5 million tons of goods transferred in 2020. Los Angeles was ranked tenth, with over 64 million tons of goods transferred (U.S. Army Corps of Engineers, 2021). Port Hueneme, located in Ventura County, had over 1.9 million tons in foreign cargo volume traded in 2019 and ranked 63rd overall in total foreign trade (U.S. Army Corps of Engineers, 2021). The Port of San Diego traded approximately 1.3 tons in foreign cargo volume and ranked 75th overall in foreign trade (U.S. Army Corps of Engineers, 2021).

Major commercial shipping routes in California parallel the coastline, extending north to San Francisco, Seattle, Alaska, and Canadian ports and south to Central and South America. Transoceanic shipping routes extend westward from the major ports of San Diego, Long Beach, and Los Angeles to Hawaii. Several shipping routes cross the Study Area, particularly in PMSR, run through the Santa Barbra channel and north of the Channel Islands. A major commercial shipping channel established by the USCG is aligned just north of, and roughly parallel with, the northern Channel Islands. There are also shorter routes that run perpendicular to the coastline and connect smaller ports with the major shipping routes and the offshore islands as depicted in Figure 3.11-2. The shorter routes that connect vessels from Morro Bay Harbor and the Port of San Luis to shipping routes along the coastline may be in proximity to the proposed amphibious approach lanes between PMSR and the NOCAL Range Complex.

In addition to routes traveled by large commercial vessels, other routes throughout the Study Area provide access to and from marinas, mooring locations, fishing harbors, and military installations located both along the mainland and on offshore islands.

3.11.2.1.1.1.3 Transit Corridor

Major commercial shipping vessels use the transit corridor for shipping goods between Southern California and Hawaii, because it is the shortest distance between these two points (see Chapter 2; Figure 2-1). Vessels using this corridor are outside of military training areas and typically follow all USCG maritime regulations. The Action Proponents may use this corridor for military readiness activities while en route between Southern California and Hawaii.

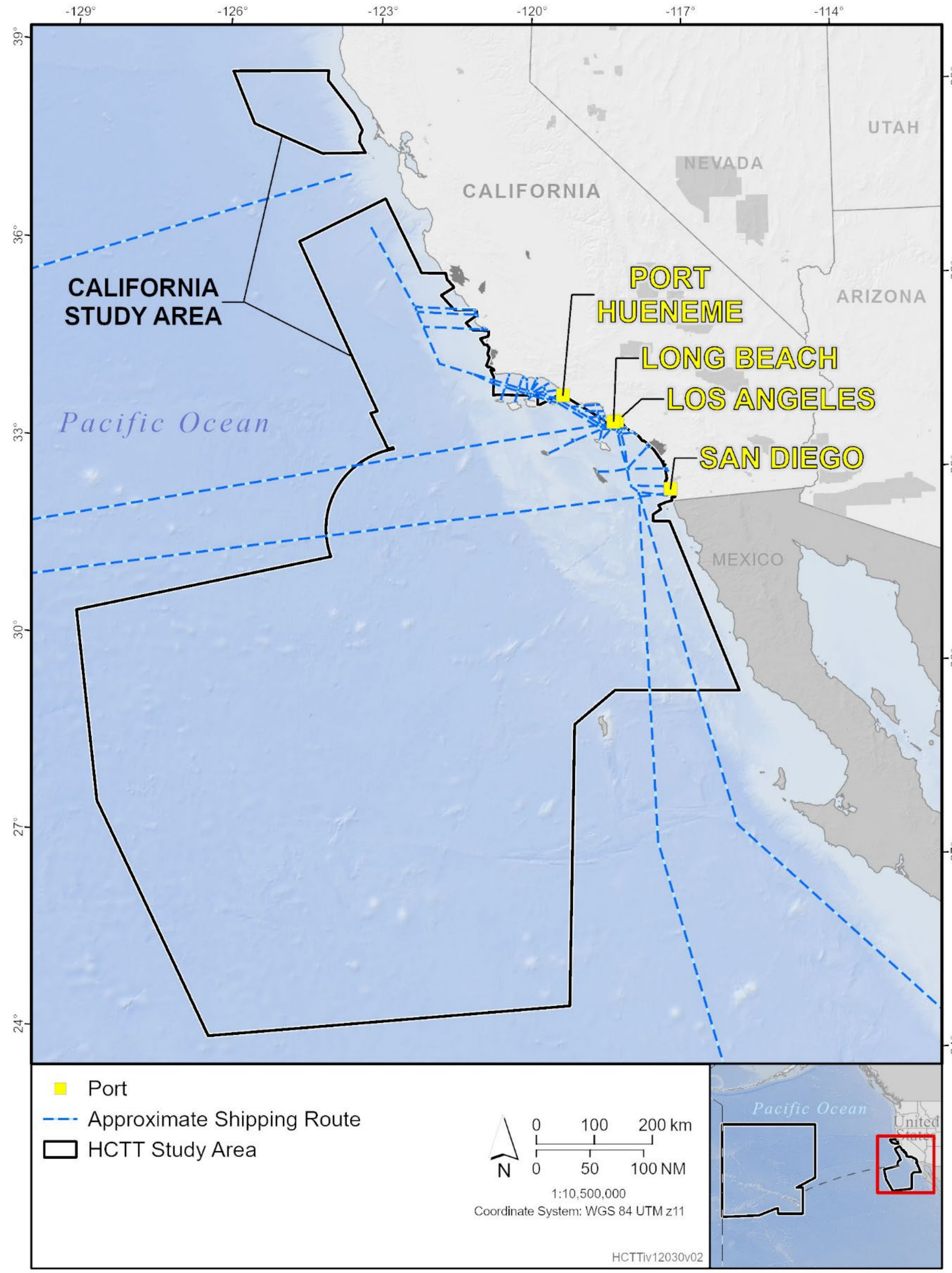


Figure 3.11-2: Shipping Routes and Major Ports in the California Study Area

3.11.2.1.1.2 Air Transport

3.11.2.1.1.2.1 Hawaii Study Area

Military Aviation. Several types of special use airspace (e.g., warning areas) are designated in the Hawaii Range Complex (Figure 3.11-3. For a detailed description of special use airspace in Hawaii, refer to the 2018 HSTT EIS/OEIS.

Commercial and General Aviation. Airspace within the Hawaii Range Complex includes several high-altitude commercial air traffic routes (Figure 3.11-3). For a detailed description of the airspace in Hawaii, refer to the 2018 HSTT EIS/OEIS.

3.11.2.1.1.2.2 California Study Area

Military Aviation. Several types of special use airspace and air traffic routes are designated throughout the California Study Area (Figure 3.11-4, Figure 3.11-5). San Diego FACSFAC is the scheduling and controlling authority for most military airspace in the SOCAL Range Complex. The Proposed Action includes the establishment of two new airspaces, W-293 and W-294, in proximity to the existing W-291 warning area (see Chapter 2; Figure 2-2) in Southern California. The proposed airspaces would be scheduled and controlled through San Diego FACSFAC.

The special use airspace in the NOCAL Range Complex is located least 12 NM from shore and encompasses approximately 16,000 NM^2 of airspace. In Northern California, FACSFAC is the using agency and the Oakland Air Route Traffic Control Center is the controlling authority for military airspace, with the exception of W-285B. W-285B is controlled by Northern California Traffic Control. For PMSR, the using agency is the NAVAIR Warfare Center Weapons Division and the controlling authority is the Los Angeles Air Route Traffic Control Center.

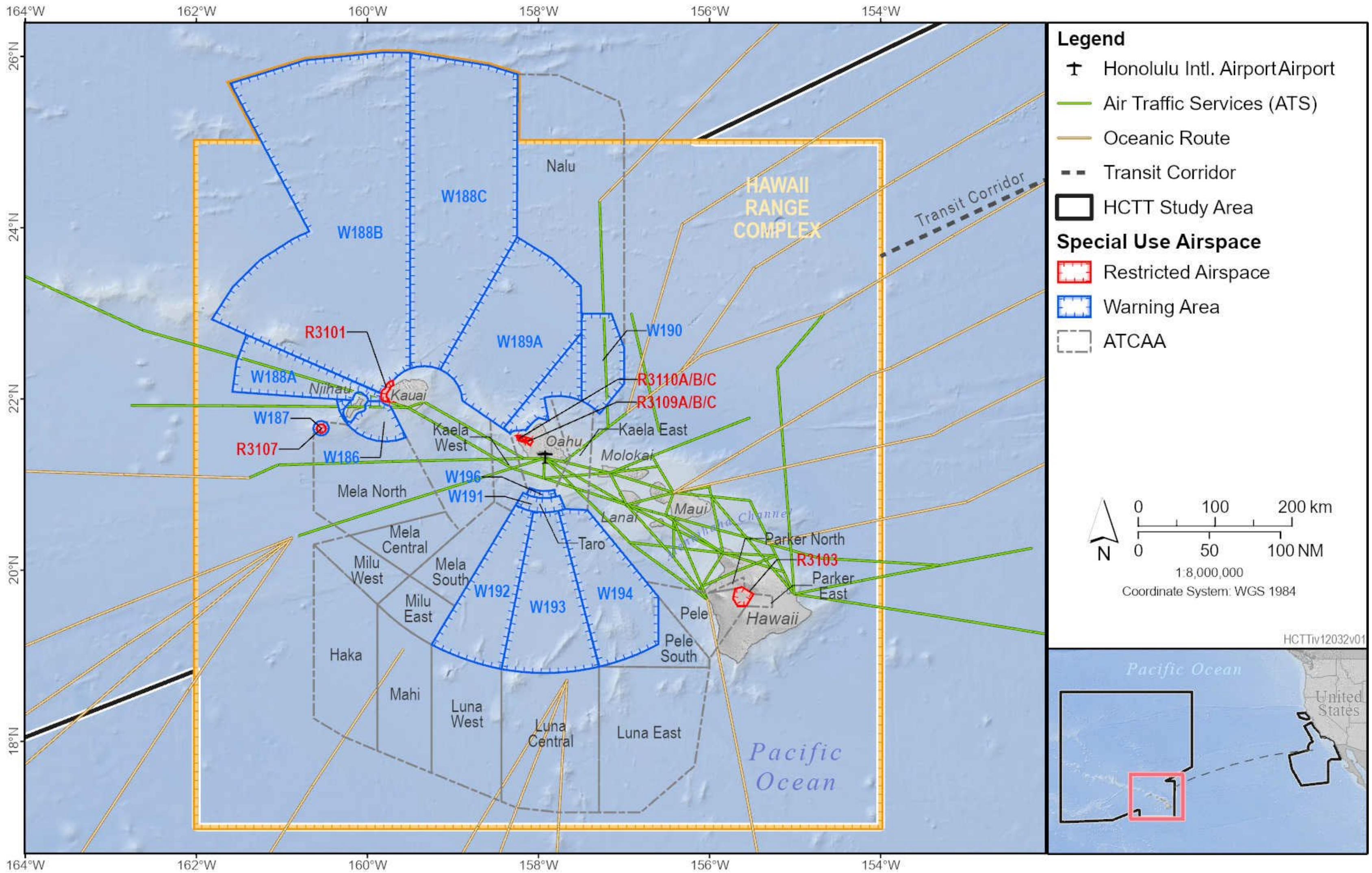


Figure 3.11-3: Air Traffic Routes and Special Use Airspace in the Hawaii Study Area

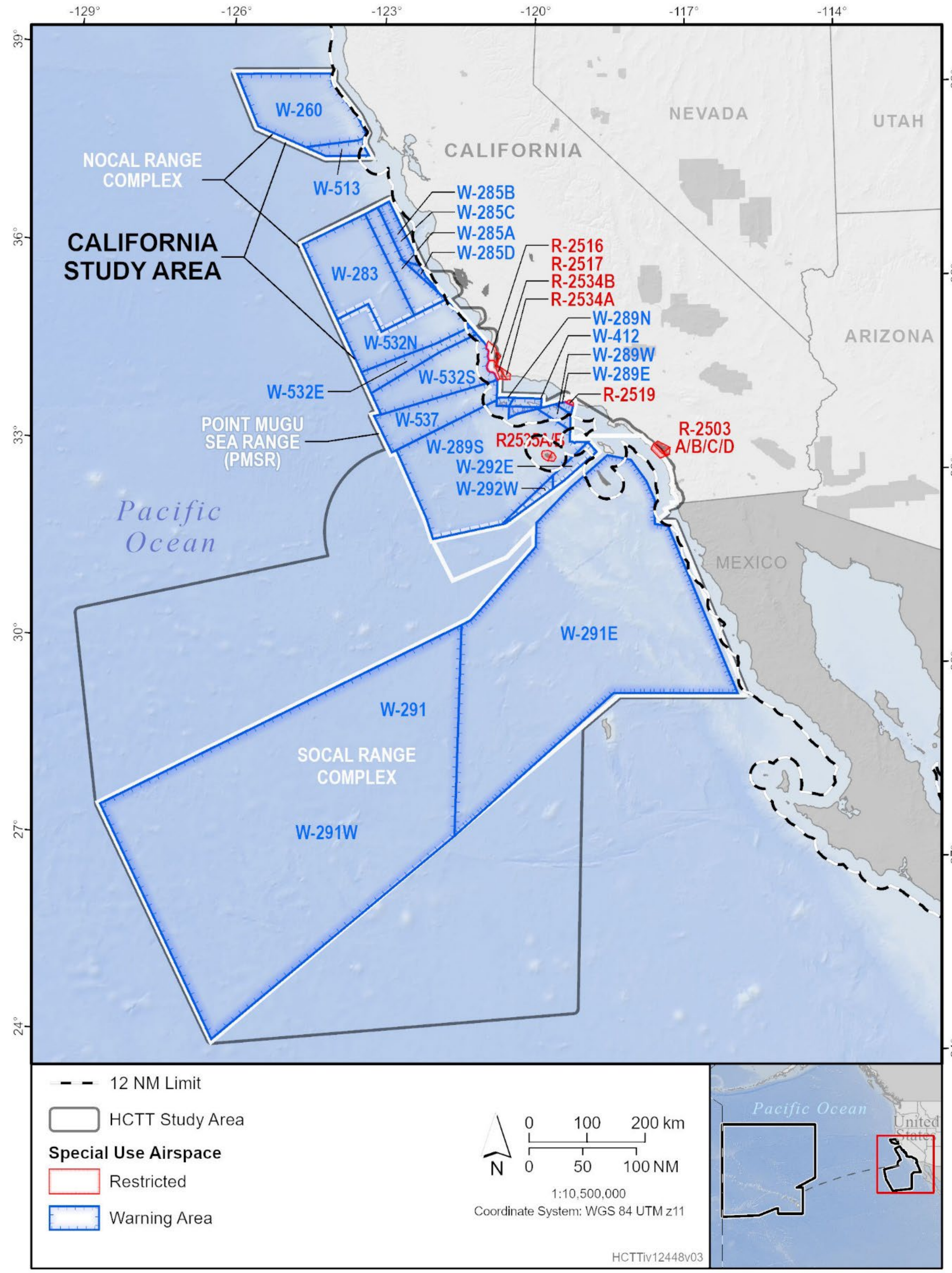
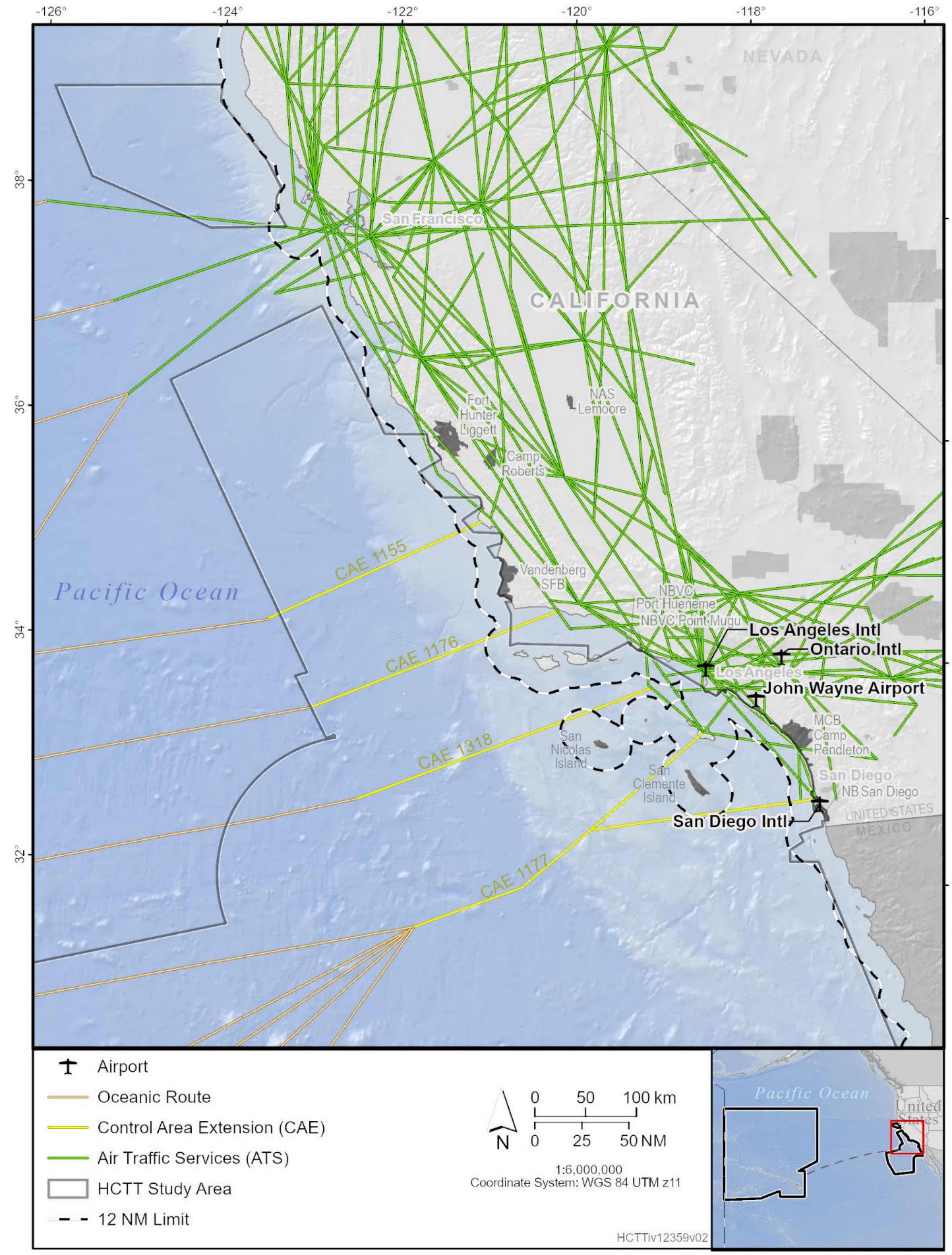


Figure 3.11-4: Special Use Airspace in the California Study Area



Notes: NAS = Naval Air Station, MCAS = Marine Corps Air Station, MCB = Marine Corps Base, Intl. = International

Figure 3.11-5: Air Traffic Routes in the California Study Area

Commercial and General Aviation. Established air routes enable general aviation and commercial air traffic to coordinate air travel with military operations. When a warning area is active, aircraft on Instrument Flight Rules clearances are precluded from entering by the Federal Aviation Administration (FAA). However, if a warning area is located entirely over international waters, non-participating aircraft operating under Visual Flight Rules are not prohibited from entering the area. Examples of aircraft flights of this nature include light aircraft, fish spotters, and whale watchers, which occur under Visual Flight Rules throughout many warning areas in California on a variable basis. Part or all of the warning areas lie within international airspace and are activated on an intermittent basis. At PMSR, air traffic routes for civilian aircraft with instrument flight rules clearances run north and south along the coast and do not enter the range. There are corridors for aircraft to cross the PMSR while under FAA control.

3.11.2.1.1.2.3 Transit Corridor

There are numerous commercial air routes over the transit corridor between California and Hawaii. Commercial aircraft typically fly above 30,000 ft. during transoceanic flight. These air routes are controlled by the FAA.

3.11.2.1.2 Commercial and Recreational Fishing

Commercial and recreational fishing takes place throughout much of the HCTT Study Area from waters adjacent to the mainland and offshore islands to offshore banks and deep waters far from land. Recreational fishing trips in Hawaii and California account for approximately 3.6 percent of total recreational fishing in the United States (National Marine Fisheries Service, 2021). Additionally, approximately 1.6 percent of total commercial landings in the United States are caught in Hawaii and California (National Marine Fisheries Service, 2021). Many fishing activities in these regions are seasonal and occur at varying degrees of intensity and duration throughout the year.

3.11.2.1.2.1 Hawaii Study Area

Commercial Fishing. The major fisheries in Hawaiian waters include tuna, billfishes, bottom fishes, other species of pelagic fish, as well as a smaller invertebrate fishery. In 2022, commercial landings in Hawaiian waters for all fisheries combined exceeded 29 million pounds and were valued at $135 million (National Marine Fisheries Service, 2023a). Offshore of the Hawaiian Islands, only 5 percent of commercial landings are caught from state waters, and over 50 percent are caught on the high seas, beyond 200 NM from the coast and outside of the U.S. EEZ.

The value of commercial landings in Hawaii has increased dramatically since the late 1980s (Figure 3.11-6). Between 1988 and 1993 the value of landings for all species increased from approximately $22 million to $73 million—an increase of over 230 percent (National Oceanic and Atmospheric Administration Fisheries, 2023a). After plateauing in the mid to late 1990s, the total value of all fisheries has increased steadily since 2001. The sharp decline in total landings and value of landings in 2020 is likely due to the Covid-19 pandemic; however, the total and value of commercial landings has since recovered and exceeded pre-pandemic levels (National Marine Fisheries Service, 2023c). The increase in the value of commercial fisheries over the past decades prior to the pandemic is indicative of the importance of commercial fishing to the Hawaiian economy.

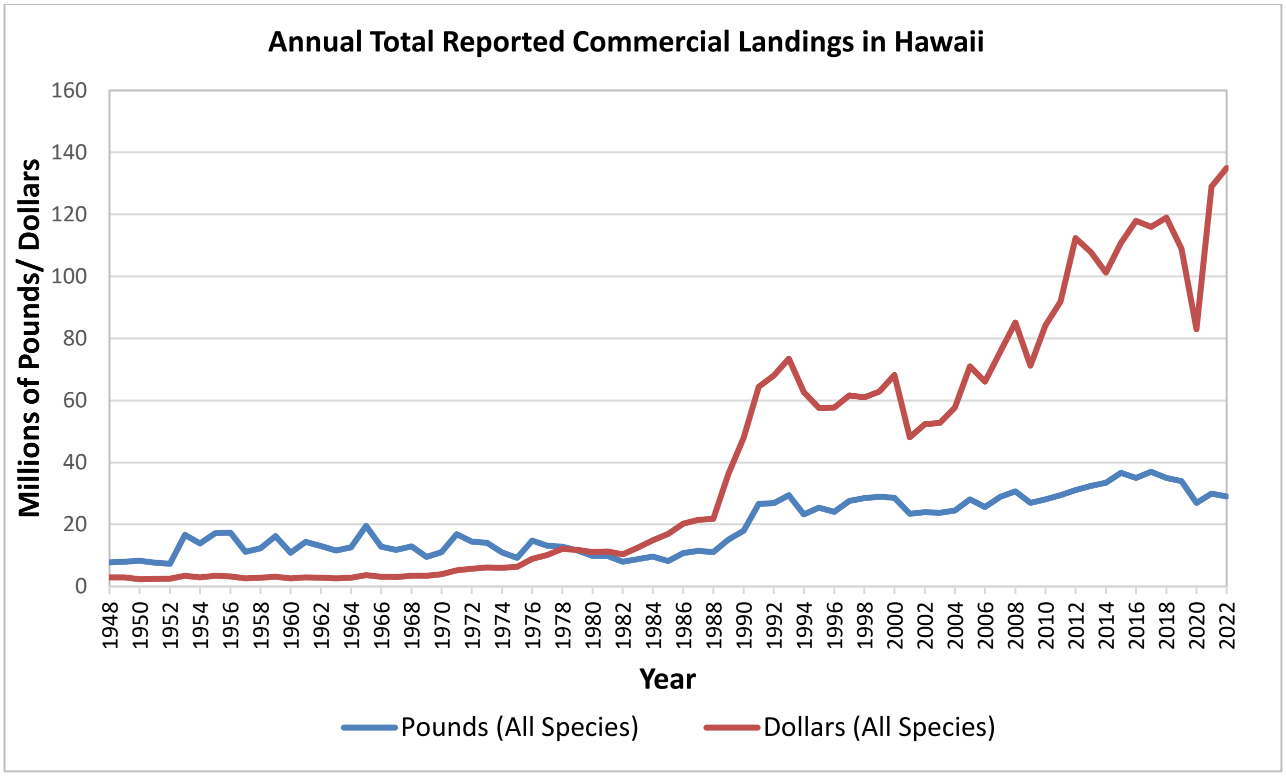


Figure 3.11-6: Annual Reported Commercial Landings for All Species in Hawaii from 1948-2022

Recreational Fishing. Hawaii does not have a mandatory recreational marine fishing license as many other coastal states do and does not have mandatory reporting of recreational catches (Hawaii Division of Aquatic Resources, 2015). The NMFS Office of Science and Technology maintains a database of statistical data on recreational fishing practices in coastal states (National Marine Fisheries Service, 2023b). Recreational catch between 2018 and 2022 totaled over 60 million fish in marine and estuarine waters (National Marine Fisheries Service, 2023b).

A report conducted by the American Sportfishing Association (2021) estimated that over 226,000 anglers spent nearly $509 million while fishing in Hawaii in 2018, generating almost $800 million in economic output for the State of Hawaii. This economic output was estimated to have supported over 5,400 jobs in Hawaii in 2018 (American Sportfishing Association, 2021).

3.11.2.1.2.2 California Study Area

Commercial Fishing. In California, commercial fisheries such as groundfishes (e.g., flatfishes, skates, some sharks, and rockfishes), highly migratory species (e.g., tuna, billfish, some sharks, dolphinfish, and swordfish), and coastal pelagic species (anchovies, mackerel, and sardines) are harvested and sold, with many of the same species also being targeted by recreational anglers. Most commercial fishing in California takes place in state waters, less than 3 NM from shore, where limited military readiness activities are conducted.

Commercial landings in California have significantly decreased since 2000, and values have fluctuated since a peak in 2013 (Figure 3.11-7). In recent years, landing values have surpassed the total pounds, indicating that the types of species landed in California remain economically valuable.

In 2022, over 184 million pounds of fishes and invertebrates valued at $197 million were harvested at California ports (California Department of Fish and Wildlife, 2022). Based on landings (pounds), Pacific sardines and sablefish were the finfish species most harvested by commercial fishers in California in 2022. California waters support a large and economically important invertebrate fishery as well, which, at a value of over $118 million in 2022, was over 2.5 times greater than the value of finfish landings (California Department of Fish and Wildlife, 2022).

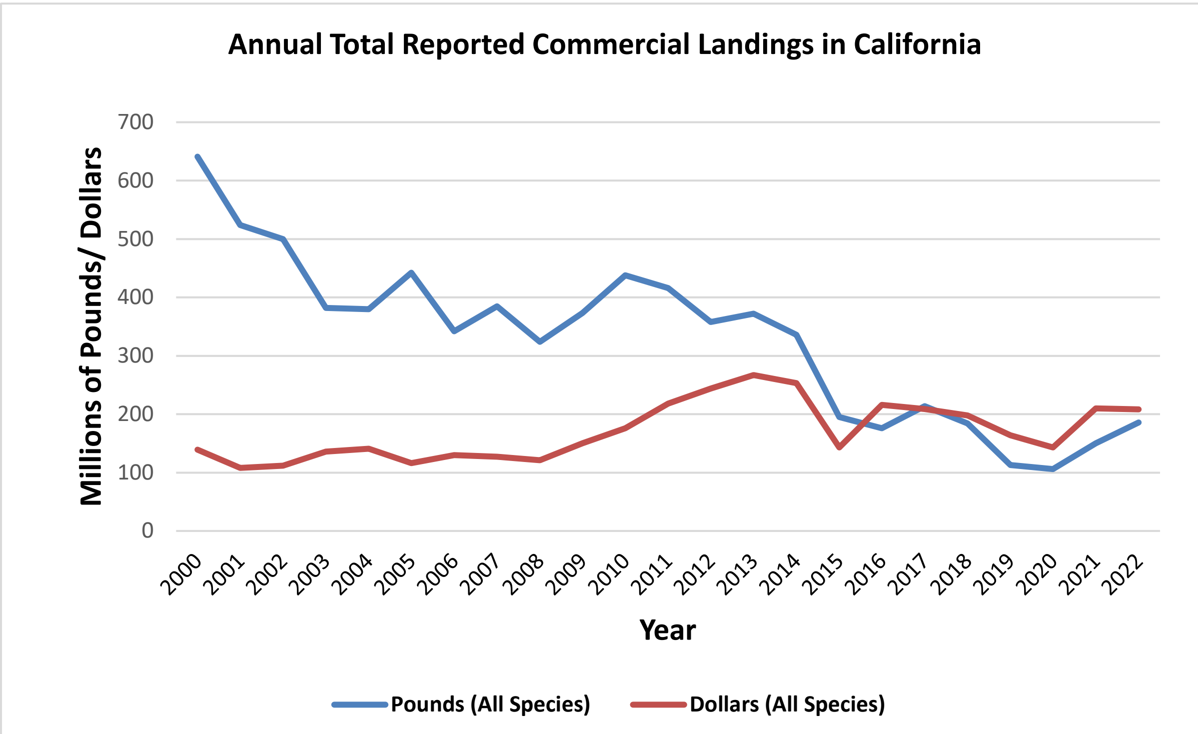


Figure 3.11-7: Annual Reported Commercial Landings for All Species in California (2000–2022)

Recreational Fishing. The California coastal marine environment, including areas within the California Study Area, continue to support a popular and thriving recreational fishing industry. From 2018 through 2022, recreational anglers caught over 47 million fishes in the waters of California (National Marine Fisheries Service, 2023b). Recreational fisheries on the U.S. West Coast primarily occur in waters 3 NM or less off the coast.

A survey conducted by the National Oceanic and Atmospheric Administration estimated that marine recreational fishing trips in California generated over $795 million in sales and $498 million in gross domestic product for the state in 2017 (Lovell et al., 2020). Sales from shore angler trips amounted to over $287 million, private boat rental trips generated nearly $141 million, and for-hire trips totaled to over $366 million in sales (Lovell et al., 2020). Recreational angler trips in 2017 were estimated to support approximately 6,311 jobs and generate $290 million in income in California (Lovell et al., 2020).

3.11.2.1.2.3 Transit Corridor

There are no data on commercial or recreational fishing within the transit corridor. Minimal fishing activity is likely to occur in the transit corridor because of the great distance from shore.

3.11.2.1.3 Tourism and Recreational Use

Coastal tourism and recreation include the full range of tourism, leisure, and recreationally oriented activities that take place in the coastal zone and offshore coastal waters. These activities include coastal tourism development (e.g., hotels, resorts, restaurants, food industry, vacation homes, and second homes) and the infrastructure supporting coastal development (e.g., retail businesses, marinas, fishing tackle stores, dive shops, fishing piers, recreational boating harbors, beaches, and recreational fishing facilities). Also included are ecotourism and recreational activities such as recreational boating, beach access, cruises, swimming, surfing, snorkeling, diving, and sightseeing (National Oceanic and Atmospheric Administration, 1998).

3.11.2.1.3.1 Hawaii Study Area

Tourism represents the largest influx of private capital into the Hawaii economy (Hawaii Tourism Authority, 2015). Tourism continues to be the biggest generator of jobs in Hawaii, supporting over 216,000 jobs (direct, indirect, and induced) in 2019 and 160,000 jobs in 2021 (Hawaii Tourism Authority, 2023). Although tourism declined in recent years due to the Covid-19 pandemic, the industry in Hawaii has started to recover. Visitor expenditures increased from $13 billion in 2021 to nearly $20 billion in 2022, an increase of over 50 percent (Hawaii Tourism Authority, 2023). With lifted domestic travel restrictions, over 9 million visitors arrived in Hawaii in 2022, and there was over 230,000 visitors in Hawaii on any given day in 2022 (Hawaii Tourism Authority, 2023).

Marine environments in Hawaii are popular locations for recreational activities such as sightseeing, whale watching, sport fishing, boating, diving, and surfing. The intensity of tourism and recreational activities generally declines with increasing distance from shore, although specific resources in the open-ocean area may result in a concentration of use. Recreational activities vary seasonally.

3.11.2.1.3.2 California Study Area

Travel and tourism are important to the California economy; however, tourism sharply declined in 2020 due to the Covid-19 pandemic. Tourism in California is gradually recovering, with visitor volume expected to recover to 100 percent of 2019 pre-pandemic visitation levels by 2024 (Visit California, 2023). In 2022, visitor spending contributed over $134 billion to California's economy. Over 1.09 million jobs in California were supported by travel and tourism in 2022 (Visit California, 2023).

Marine environments in California are popular locations for recreational activities such as sightseeing, whale watching, sport fishing, boating, diving, and surfing. Most recreation and tourist activities occur close to the mainland coast of California or between the mainland and the Channel Islands. Recreational activities may occur throughout the California Study Area, including waters off SCI. Recreational activities vary seasonally.

3.11.2.1.3.3 Transit Corridor

It is assumed that there is very minimal tourism and recreational activity within the transit corridor. It is highly unlikely that tourism activities would occur in the transit corridor because of the great distance from shore.

3.11.2.2 Environmental Justice

The primary areas of interest in assessing environmental justice are where communities with environmental justice concerns have the potential to be adversely and disproportionately affected by the implementation of the Proposed Action.

3.11.2.2.1 Subsistence Fishing

The U.S. EPA considers subsistence fishers to be people who rely on fish as an affordable food source or for whom fish are culturally important (U.S. Environmental Protection Agency, 2024). There are no particular criteria or thresholds (such as income level or frequency of fishing) that define subsistence fishers; however, survey-based studies indicate that Native Americans, low-income urban populations, and Asian-Americans are more likely to be subsistence fishers (Gassel, 1997; Schumann & Macinko, 2007). Regions with a high percentage of individuals below the poverty line or a high percentage classified as Native American or Asian may have a greater number of subsistence fishers. Therefore, minority, low-income, tribal, and indigenous communities are more likely to engage in subsistence fishing and may be disproportionately affected by changes to the accessibility and availability of marine resources. Most subsistence fishing is expected to occur within 3 NM from shore, because the smaller boats that are typically used by subsistence fishers are not equipped for long trips offshore, and traditional fishing sites are generally associated with nearshore reefs.

Many communities engage in fishing practices not just for subsistence or financial reasons, but as part of their cultural heritage, social customs, or religion. Fishing practices may be representative of traditions that have been passed on for generations that many tribal or indigenous populations practice as an important part of their cultural and social identity. Beyond that, the practice of traditional fishing has supported the conservation and protection of the natural environment for centuries using traditional ecological knowledge rooted in a deep understanding and connection with the environment.

The multifaceted nature of traditional fishing practices and their contribution to local communities remains difficult to quantify; however, it is clear that there is both a social and economic benefit to many in those communities even for those who rarely or never actually fish (e.g., someone who doesn't fish may receive fish at low or no cost within their community). Allen (2013) reported on the complicated issue of defining traditional fishers. Many fishers identifying as traditional or subsistence fishers also participate in recreational and commercial fishing. It is not always clear when fishers are engaging in subsistence fishing, fishing for cultural or social reasons, fishing for financial gain or leisure, or some combination, which can occur even on a single fishing trip.

3.11.2.2.1.1 Hawaii Study Area

In Hawaii, subsistence practices are considered to be "customary and traditional native Hawaiian uses of renewable ocean resources for direct personal or family consumption or sharing" (Zanre, 2014). The cultural and economic value of subsistence fishing to Native Hawaiians is considered an important component of many communities which strive to preserve a long-standing way of life (McClenachan & Kittinger, 2013; Steutermann-Rogers, 2015a). In a survey conducted by the Pacific Islands Fisheries Group, survey participants commonly expressed that their motivation for bottomfishing is to support family members and give fish away to eat. Others that were interviewed expressed that fishing is part of their cultural identity and is a practice that has been passed down through generations.

> "[F]ishing is what defines who I am, and I'm just trying to carry it on for my grandfather and my dad. And you know, that's definitely -- that's what I want to do and that's what I love to do. And it's my livelihood" (Calhoun, 2020).

The Hawaii bottomfish handline fishery is a culturally significant resource for Native Hawaiian populations. Hawaii bottomfish fisheries (both commercial and non-commercial) harvest approximately 14 shallow and deep-water species consisting of 9 snappers, 4 jacks, and 1 species of grouper (National Oceanic and Atmospheric Administration, 2024). The primary high-value targets, also known as the

Deep 7 bottom fishery, consist of six deep-water snappers and the grouper species. Native Hawaiians have targeted bottomfish species, particularly the Deep 7 bottom fishery, for hundreds of years using traditional handline fishing methods (National Oceanic and Atmospheric Administration, 2024).

The shallow-water reef associated fisheries in Hawaii consist of important finfishes, invertebrates, and coastal pelagic fishes that support subsistence activities. Approximately 72–74 percent of fish caught by non-commercial fishers in nearshore reef fisheries are kept for personal consumption or for sharing with their community (Grafeld et al., 2017). In 2017, the shallow-water reef associated fisheries in Hawaii were valued between approximately 10 and 16 million dollars (Grafeld et al., 2017). Majority of this value (between 7 and 12 million dollars) was associated with non-commercial fishing practices and amounts to over 7 million meals annually (Grafeld et al., 2017).

Recent efforts to preserve Native Hawaiian cultural practices, traditional ecological knowledge, and important fisheries has resulted in the establishment of community-based subsistence fishing areas (CBSFAs) in Hawaii (Levine & Richmond, 2014; Steutermann-Rogers, 2015b). These areas were established through coordination between communities practicing subsistence or traditional fishing and state and local governments, an approach that recent studies have shown to be effective at achieving the regulatory goals of sustaining the fishery (Ayers & Kittinger, 2014; Steutermann-Rogers, 2015a). As of 2024, there are three designated CBSFAs in the State of Hawaii: Haena, Milolii, and Kipahulu. The Haena CBSFA is located off the northwestern shore of Kauai between Haena and Wainiha. It extends from the shoreline to 1 NM off the coast (Figure 3.11-8). Milolii CBSFA is located between Paakai Point at Kipahoehoe to Kauna Point off the southwest coast of the island of Hawaii. It extends from the shoreline to the 100 m depth contour (Figure 3.11-9).The Kipahulu CBSFA, located off the southeast coast of Maui, was designated by law as an CBFSA in 2024 (Figure 3.11-10). It spans across approximately 5.7 miles of coastline and extends from the shoreline to approximately 60 m depth.

To aid in the preservation of subsistence and traditional fishing practices, the governor of Hawaii along with the Hawaii Department of Land and Natural Resources have signed into law specific fishing rules for the CBSFAs. The rules limit harvests and set bag limits for species; provide restrictions on the types of fishing gear and methods that may be used; and prohibit commercial fishing in the CBSFAs. These rules ultimately allow for communities to meet their consumptive needs and are reflective of traditional fishing management practices meant to preserve and maintain the sustainability of marine resources.

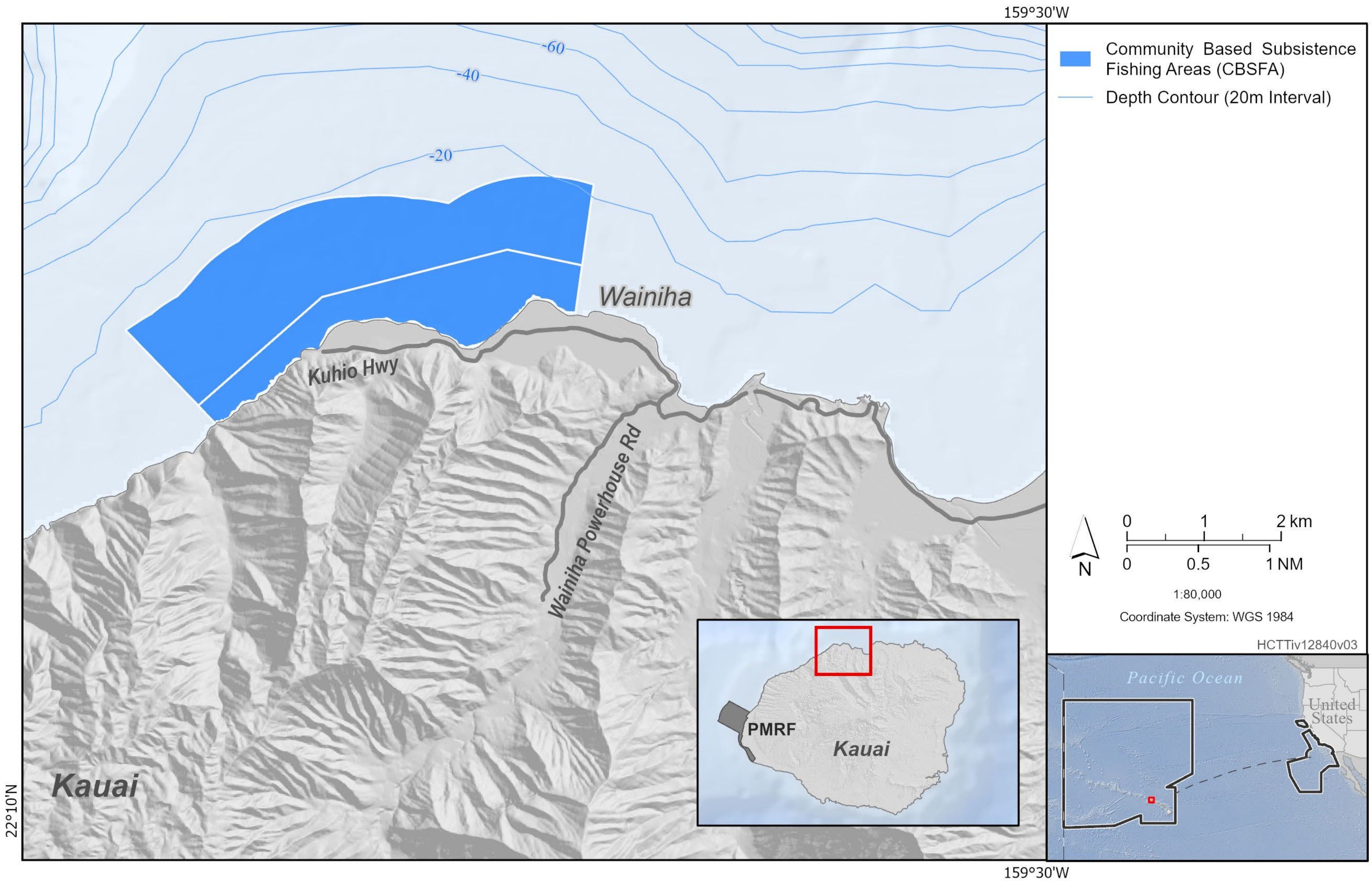


Figure 3.11-8: Haena Community Based Subsistence Fishing Area

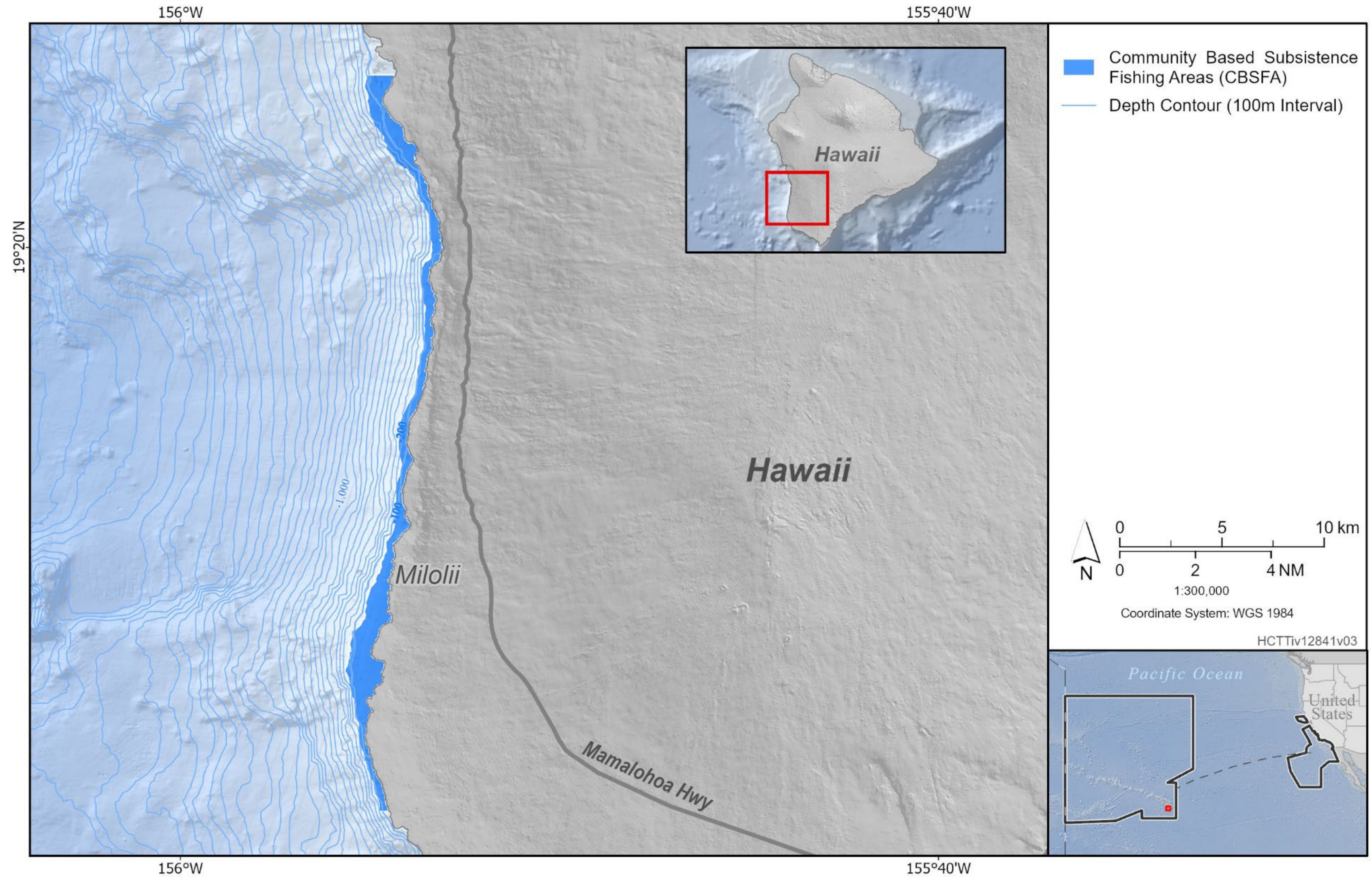


Figure 3.11-9: Milolii Community Based Subsistence Fishing Area

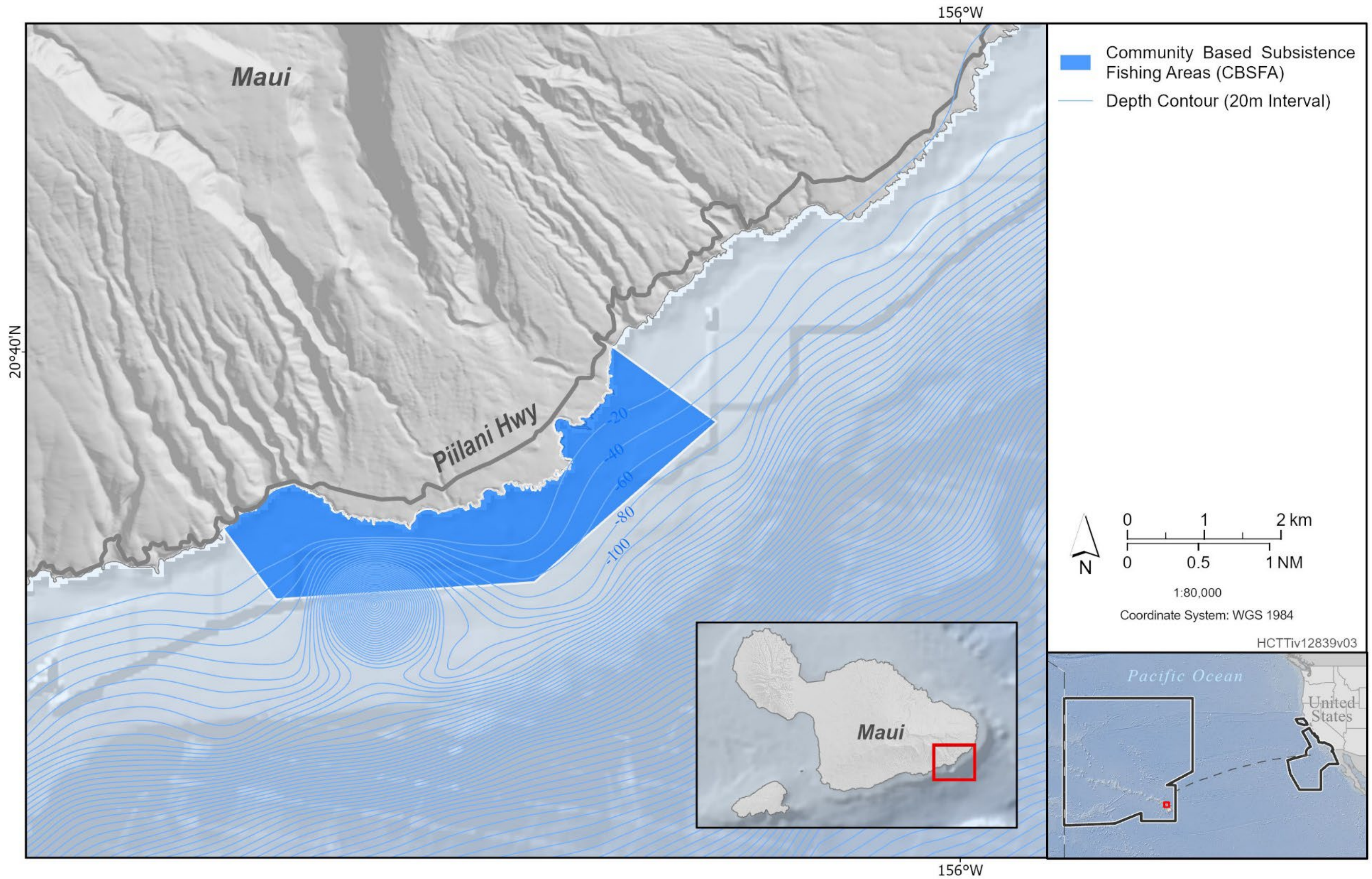


Figure 3.11-10: Kipahulu Community Based Subsistence Fishing Area

3.11.2.2.1.2 California Study Area

In California, many people fish off piers and in local bays, harbors, and waterways for regular subsistence rather than for recreation. High costs of living have produced food insecurity among low-income populations in California, and as a result subsistence fishing has become increasingly common, particularly among Asian, Hispanic, Hawaiian, Pacific Islander, and African American ethnicities (Cooper, 2023). Tribal and indigenous communities may also engage in subsistence fishing practices off the California coast. Pier fishing is especially popular throughout California because fishing is allowed on all public piers and does not require purchasing a fishing license. Based on 2015 census data, almost all pier anglers in California were reported to fall under the 200 percent poverty level, with majority under the 100 percent poverty level (Cooper, 2023). Although the economic value of subsistence fisheries may often be low in California, they may be critical for the livelihoods of many communities.

In a 2012 survey conducted at four public piers in Los Angeles County, approximately 23 percent of pier-based anglers who eat the fish they catch reported that they are dependent on their catch for their diet and cost-savings (Pitchon & Norman, 2012). Thirty-one percent of those who eat the fish they catch reported that they were concerned about their food running out before they were able to purchase more (Pitchon & Norman, 2012). Additionally, a 2017 fish consumption survey in the San Diego Bay indicates that approximately 46 percent of those surveyed eat the fish that they catch (Steinberg, 2017). Target species caught and often kept for consumption include the Pacific Chub Mackerel, California Halibut, spotted sand bass, and the bonito and short fin corvina.

People who fish off piers and in nearshore areas (e.g., harbors) and eat the fish they catch may be disproportionately exposed to contaminants. Pier anglers, who are often fishing for subsistence, are 4 times more likely to consume fish with high contaminants than boat anglers due to elevated contaminant levels near piers and in harbors and bays (Cooper, 2023).

Subsistence fishing would be expected to occur at nearshore locations throughout the California Study Area, particularly near the amphibious approach lanes at PMSR and the southern portion of the NOCAL Range Complex, areas along the Southern California coastline from approximately Dana Point to Port Hueneme, and the San Diego harbor. Subsistence fishing practices do not typically occur in the northern portion of the NOCAL Range Complex due to its distance from shore, and therefore communities that practice subsistence fishing in those areas would not be measurably affected and are not considered further in this section.

3.11.2.2.1.3 Transit Corridor

It is assumed that subsistence fishing practices do not typically occur within the transit corridor because of the great distance from shore.

3.11.2.2.2 Air Quality and Climate Change

Most military readiness activities in the Study Area would be conducted further away from shore in offshore waters, often beyond 12 NM. However, some military readiness activities may be conducted in nearshore areas within 3 NM and have the potential to affect air quality in nearby communities with environmental justice concerns.

Under the Proposed Action, GHG emissions would also be generated from mobile sources using fossil fuel combustion as a source of power (e.g., vessels, aircraft) and the expenditure of munitions. Predictable global trends associated with increasing GHG emissions and climate change include rising global temperatures, changes in precipitation patterns, increased frequency or intensity of extreme weather events, rising sea levels and associated storm surges, and ocean acidification. Communities with environmental justice concerns generally have greater sensitivity to the adverse effects of climate change and lack the resources needed to adapt to changing environments.

GHG emissions associated with the Proposed Action would contribute to climate change at a global scale, regardless of the specific location in which the emissions are produced. However, as determined in Section 3.1, emissions associated with military readiness activities would not be enough to cause or incrementally contribute to global warming. As a result, climate change-related effects associated with the Proposed Action would not adversely affect communities with environmental justice concerns and are not considered further in this section. Refer to Chapter 4 for discussion of the cumulative effects related to climate change and communities with environmental justice concerns.

3.11.2.2.2.1 Hawaii Study Area

As described in Section 3.1, the entire State of Hawaii is in attainment of the NAAQS for all criteria air pollutants. Air pollutants associated with military readiness activities that would occur within 3 NM would not measurably affect adjacent land areas because of the relatively low concentration of emissions and the generally strong ventilation resulting from regional meteorological conditions. Therefore, military readiness activities would not measurably affect the air quality in nearshore communities, including communities with environmental justice concerns, and they are not discussed further in this section. Refer to Section 3.1 for additional information regarding air quality.

3.11.2.2.2.2 California Study Area

The California Study Area encompasses nearshore locations at Naval Base Point Loma, Naval Base Coronado, and Naval Base San Diego within San Diego Bay. It also includes four amphibious approach lanes between PMSR and the NOCAL Range Complex, and areas along the Southern California coastline from approximately Dana Point to Port Hueneme. The nearshore military readiness activities occurring at the amphibious approach lane near the southern portion of the NOCAL Range Complex would occur within attainment areas. Other military readiness activities in the NOCAL Range Complex would occur at least 12 NM from shore and therefore would not adversely affect the air quality in nearshore communities, including communities with environmental justice concerns.

Emissions associated with the Proposed Action would also be below the applicable General Conformity *de minimis* levels for all pollutants established for the South Central Coast Air Basin and the South Coast Air Basin. As a result, military readiness activities conducted within 3 NM at Port Hueneme, PMSR, amphibious approach lanes, and areas along the Southern California coastline from approximately Dana Point to Port Hueneme would not measurably affect the air quality in nearshore communities, including communities with environmental justice concerns, and they are not discussed further in this section. Refer to Section 3.1 for additional information regarding air quality.

In San Diego, the AB-617 Portside Community near Naval Base San Diego is recognized by the Community Air Protection Program as a community with environmental justice concerns exposed to high levels of air pollutants. This community encompasses the neighborhoods of Barrio Logan, Logan Heights, Sherman Heights, and West National City (Figure 3.11-11). The San Diego AB-617 Portside Community has historically been exposed to air pollutants from port operations, industrial land use operations (e.g., heavy duty equipment, railways), and two freeways that run directly through them (California Air Resources Board, 2024). Sensitive receptors in the Portside Community include approximately 24 schools, 16 licensed daycare facilities, and 2 hospitals (California Air Resources Board, 2024). A CERP was adopted in 2021 that includes strategies to reduce air pollution emissions and community exposure to air pollution in the community.

According to 2022 U.S. Census Bureau American Community Survey data (based on a 5-year average), approximately 50,106 individuals reside in the portside community. Of the individuals living within the portside community, 18.6 percent fall below the poverty line and 50.5 percent are considered minority populations (Table 3.11-1).

3.11.2.2.2.3 Transit Corridor

Due to the great distance from shore, military readiness activities that occur in the transit corridor would not affect air quality in nearshore communities with environmental justice concerns.

Table 3.11-1: San Diego AB-617 Portside Community Population Demographics

Census Tract	Total Population (2022)	Percent Minority	Percent Hispanic or Latino Origin	Percent Below Poverty
San Diego Portside Community	50,106	50.5	71.6	18.6
Census Tract 35.02	4,917	57.7	89.2	21.8
Census Tract 36.01	3,526	54.6	88.7	14.7
Census Tract 36.03	3,312	44.9	80.8	15.8
Census Tract 39.01	4,375	60.9	91.3	19.8
Census Tract 39.02	4,282	53.6	84.3	6.2
Census Tract 40	4,164	48.9	82.8	21.4
Census Tract 47	1,446	37.4	56.7	4.3
Census Tract 49	4,877	52.5	77.4	24.9
Census Tract 50	2,108	41.9	80.8	24.2
Census Tract 51.01	2,912	62.8	45.0	9.4
Census Tract 51.02	4,200	37.7	21.4	18.4
Census Tract 51.03	2,732	38.1	35.9	51.6
Census Tract 116.02	4,031	34.6	71.1	11.6
Census Tract 219	3,224	63.8	71.6	22.0

Sources: U.S. Census Bureau (2022d), U.S. Census Bureau (2022c), U.S. Census Bureau (2022a), U.S. Census Bureau (2022b)

Figure 3.11-11: San Diego AB-617 Portside Community

3.11.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, baseline conditions of the existing environment for socioeconomic resources and environmental justice would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section evaluates how and to what degree the activities described in Chapter 2 could affect socioeconomic resources of the HCTT Study Area. This section also identifies and evaluates effects associated with military readiness activities that could adversely and disproportionately affect communities with environmental justice concerns. This analysis considers standard operating procedures and mitigation measures that would be implemented under Alternative 1 and Alternative 2 of the Proposed Action.

As stated in Section 3.0.2, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in 40 CFR 1501.3(d). All of the stressors analyzed in this section could have a reasonably foreseeable adverse effect, thus requiring a significance determination.

A stressor is considered to have a significant effect on the human environment based on an examination of the context of the action and the intensity of the effect. In the present instance, the effects of the stressors analyzed would be considered significant if the effects would be long term (lasting for more than a year after the activity) and extend beyond the local geographical area into a broad regional area.

Secondary stressors resulting in indirect effects on socioeconomic resources and communities with environmental justice concerns are discussed in Section 3.11.4.

3.11.3.1 Socioeconomic Resources

For socioeconomic resources, this section evaluates the effects of the alternatives on the economy of the region of influence as well as social effects. The evaluation addresses how the action may affect the way individuals live, work, play, relate to one another, and function as members of society. Because military readiness activities are predominantly offshore, socioeconomic effects would be associated with economic activity, employment, income, and social conditions (e.g., livelihoods) of industries or operations that use the ocean resources within the Study Area. Although the typical socioeconomic considerations such as population, housing, and employment are not applicable, this section will analyze the potential for economic effects on marine-based activities and coastal communities. When considering effects on recreational activities such as fishing, boating, and tourism, both the economic effect associated with revenue from recreational tourism and public enjoyment of recreational activities are considered.

Military readiness activities were evaluated to identify specific components that could act as stressors by directly or indirectly affecting socioeconomic resources (i.e., commercial transportation and shipping, commercial and recreational fishing, tourism and recreation). The stressors analyzed for socioeconomic resources include:

- **accessibility** (availability of access to ocean and airspace)
- **airborne acoustics** (weapons firing, aircraft, pile driving, and vessel noise)
- **physical disturbance and strikes** (aircraft, vessels and in-water devices, MEM)

A stressor is considered to have a significant effect on the human environment based on an examination of the context and intensity of the effect. In the present instance, the effects related to accessibility, airborne acoustics, or physical disturbance and strike would be considered significant if the effects have short-term or long-term changes that would result in a direct loss of income, revenue, or employment.

3.11.3.1.1 Effects on Accessibility

Military readiness activities have the potential to temporarily limit access to areas of the ocean for a variety of activities associated with commercial transportation and shipping, commercial and recreational fishing, and tourism and recreation in the HCTT Study Area. In 2015, the Navy completed the SOCAL and NOCAL Range Complexes Encroachment Action Plan to evaluate the use of offshore and nearshore waters by military and civilian stakeholders (U.S. Department of the Navy, 2015). The Navy does not possess exclusive rights to these waters. Based on freedom of the seas and open access rights to citizens and commercial organizations alike, these same waters are used by civilians for commercial and recreational activities.

Figure 3.11-12, Figure 3.11-13, Figure 3.11-14, and Figure 3.11-15 depict defensive and restricted areas in the Study Area. When military readiness activities are scheduled that require specific areas to be free of non-participating vessels and aircraft due to public safety concerns, the Action Proponents request that the USCG and FAA issue Local Notices to Mariners (LNM)s and Notices to Airmen (NOTAMs), respectively, to warn the public of upcoming activities and allow them to plan accordingly. These temporary clearance procedures are established and implemented for the safety of the public and have been employed regularly over time without substantial effects on socioeconomic resources.

Limits on accessibility in most areas of the HCTT Study Area due to military readiness activities would essentially remain unchanged from the current conditions, with the exception of the proposed special use airspace (W-293 and W-294), areas along the Southern California coastline from approximately Dana Point to Port Hueneme, and four amphibious approach lanes providing access between PMSR and the NOCAL Range Complex. Since these locations would be in proximity to publicly accessed areas, accessibility would be occasionally limited in these areas. However, accessibility, or restrictions to the availability of air and ocean space, throughout the HCTT Study Area, including the proposed airspace and amphibious approach lanes, would be a temporary condition. While mariners and pilots have a responsibility to be aware of conditions on the ocean and in the air, direct conflicts in accessibility would not be expected to occur. The locations of restricted areas are published and available to mariners and pilots, who typically review such information before boating or flying in any area.

Prior to initiating a military readiness activity, standard operating procedures would be followed to visually scan an area to ensure that nonparticipants are not present. If nonparticipants are present, the Action Proponents delay, move, or cancels the activity. Accessibility is no longer restricted once the activity concludes. Additional information on existing procedures for mitigating potential effects on accessibility are described in the SOCAL and NOCAL Range Complexes Navy Encroachment Action Plan (U.S. Department of the Navy, 2015).

3.11.3.1.1.1 Commercial Transportation and Shipping

Restricted areas, danger zones, and temporary closures of areas as a result of military readiness activities have the potential to disrupt accessibility to sea and airspace used for commercial transportation and shipping in the HCTT Study Area. However, commercial vessels entering areas within the HCTT Study Area, including established restricted areas and danger zones, operate under maritime regulations, and potential disruptions to commercial shipping would be limited or avoided by the use of LNMs (Section 3.0). Additionally, pilots are notified of upcoming temporary closures to special use airspace via NOTAMs.

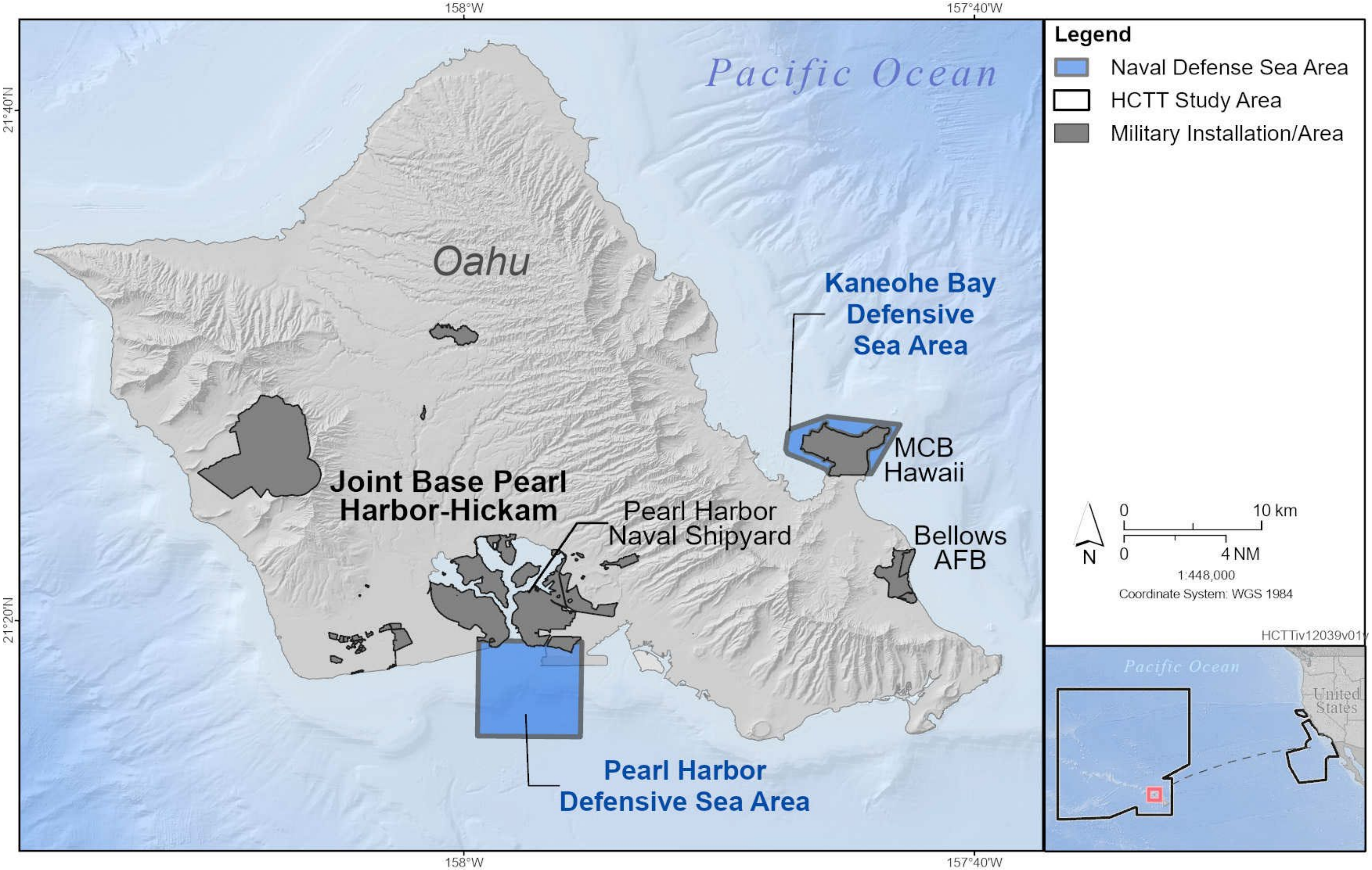


Figure 3.11-12: Defensive Sea Areas in the Hawaii Study Area

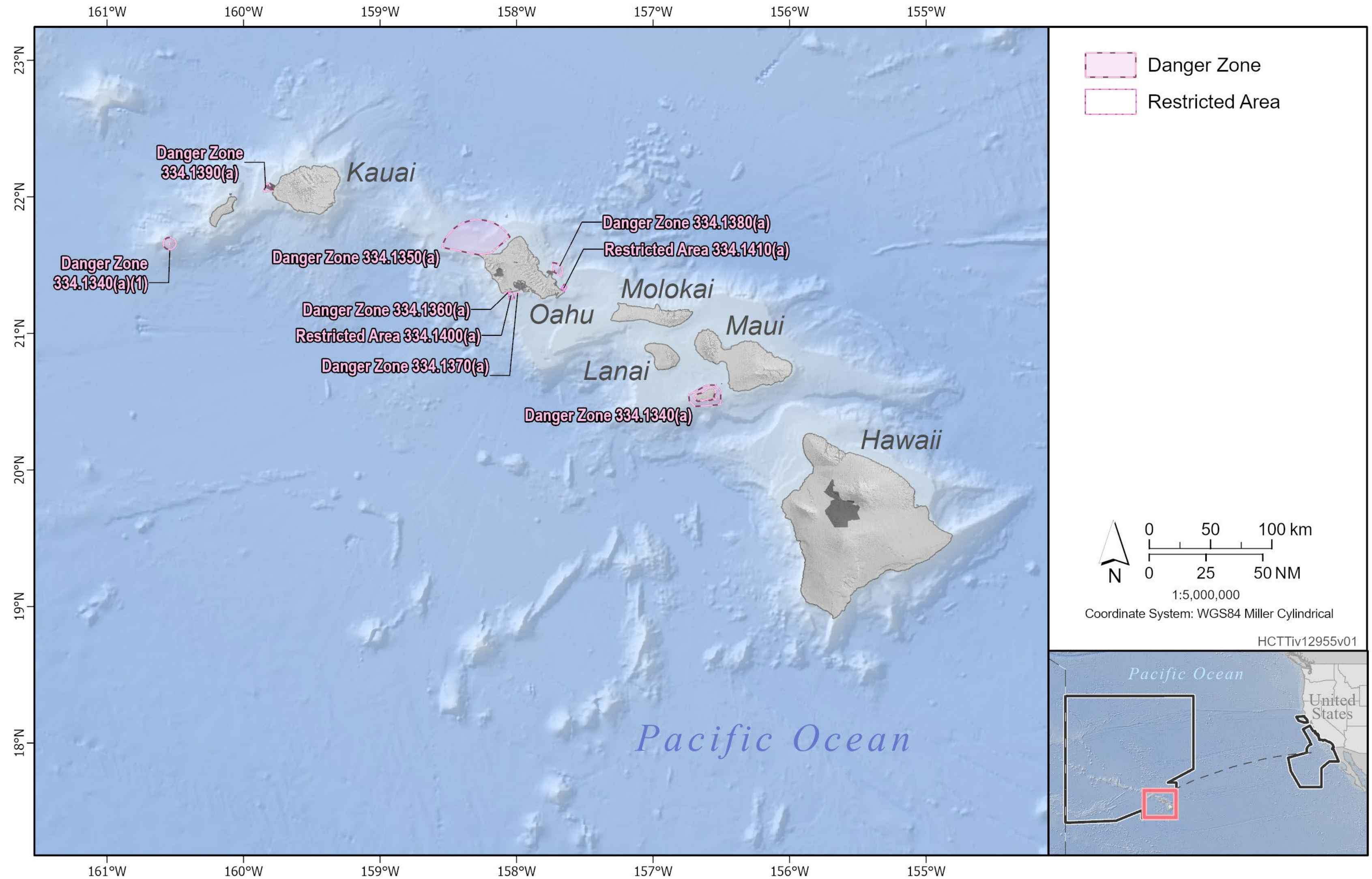


Figure 3.11-13: Restricted Sea Areas in the Hawaii Study Area

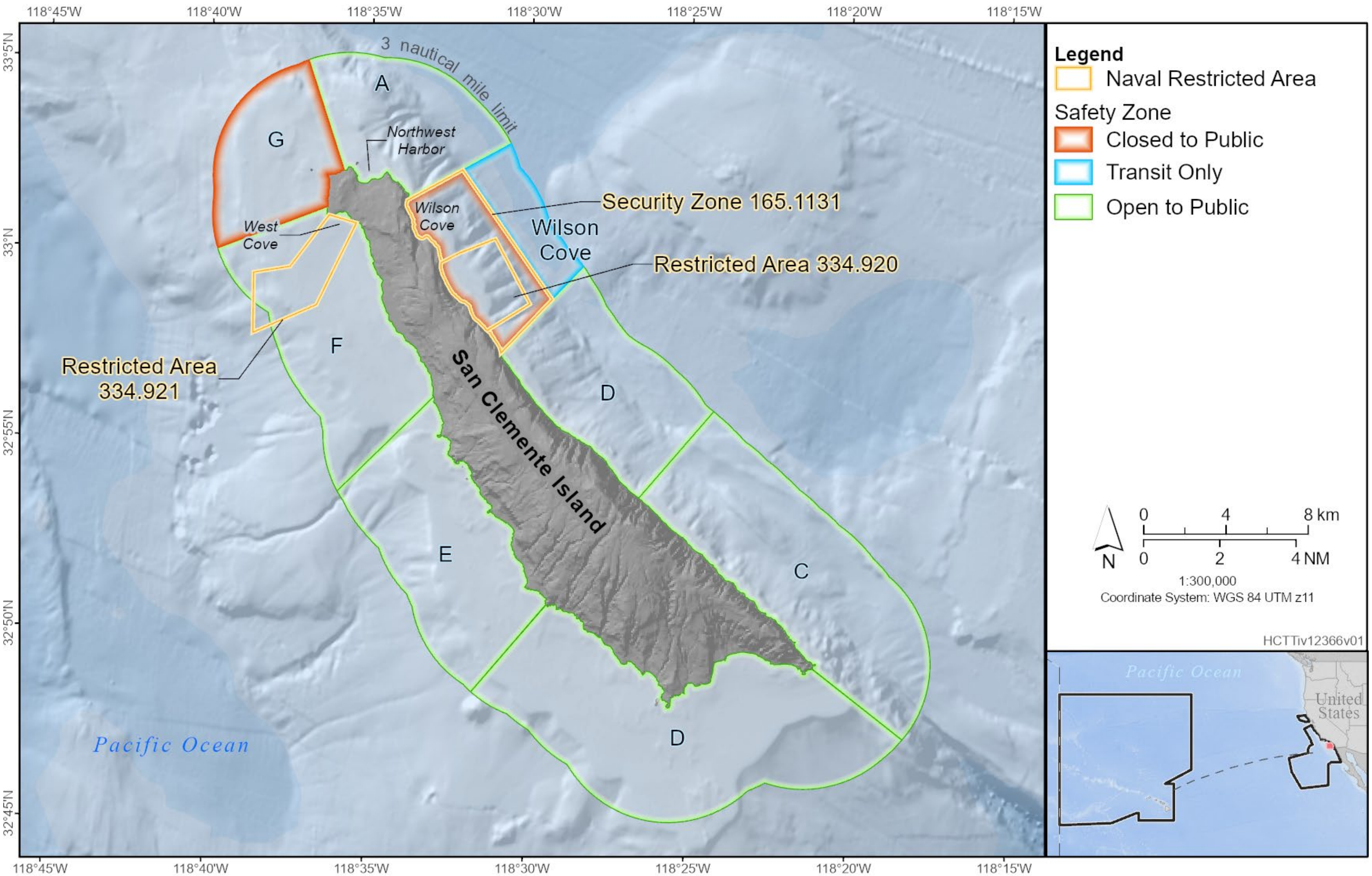


Figure 3.11-14: Restricted Sea Areas near San Clemente Island

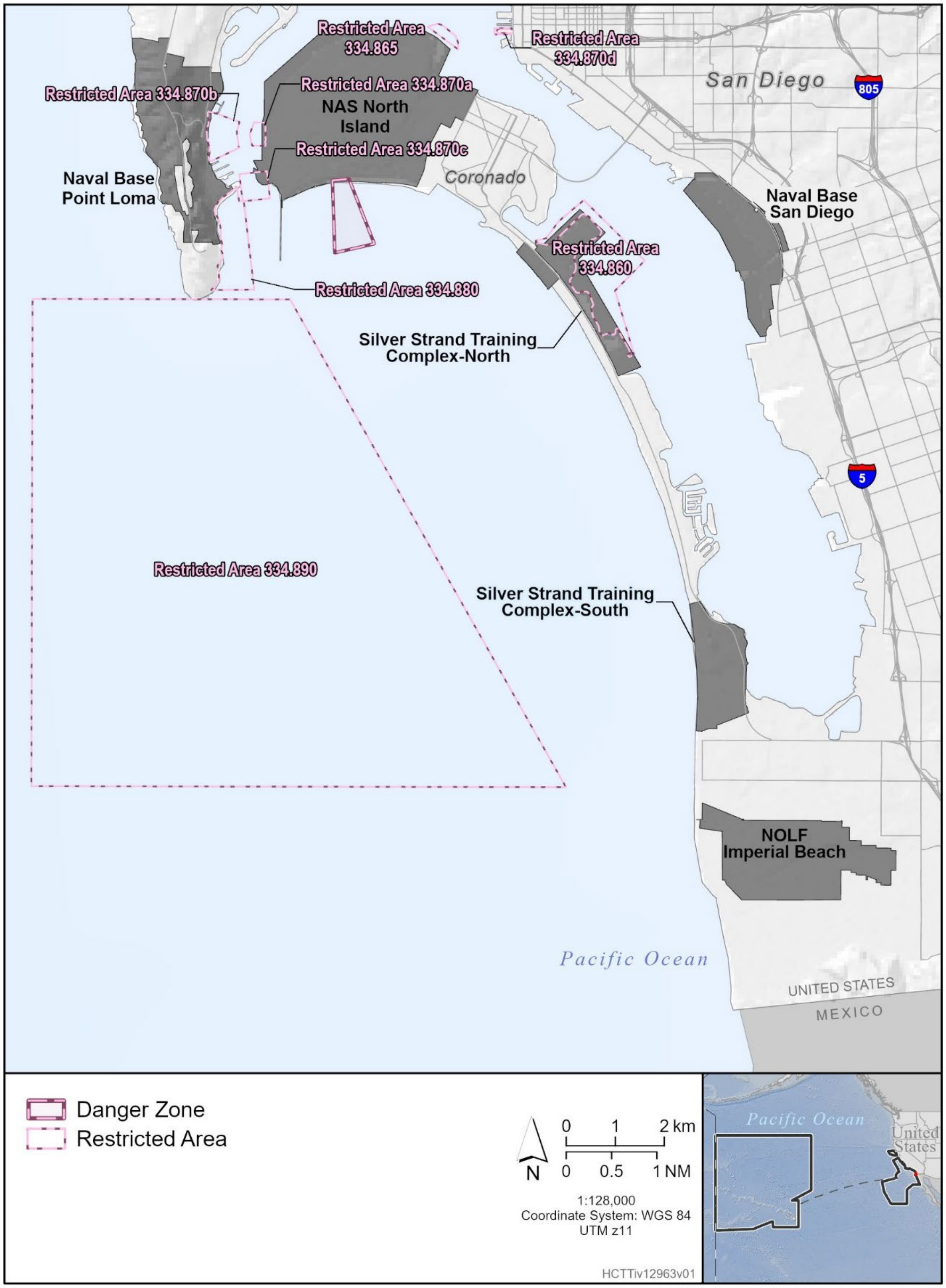


Figure 3.11-15: Restricted Areas in the Southern California Range Complex

3.11.3.1.1.2 Commercial and Recreational Fishing

The Action Proponents have performed military readiness activities within this region in the past with limited interruption to fishing or recreational activities. Knowledge and avoidance of popular fishing areas would minimize interactions between training and testing activities and fishing. Commercial and recreational interests such as fishing, boating, and beach use are only restricted temporarily for the duration of the activity. Temporary closing of areas within the Study Area for security and safety would not limit public access to surrounding areas. Areas that would be temporarily closed are re-opened at the completion of the activity.

These range clearance procedures for safety purposes would not adversely affect commercial and recreational fishing activities because displacement is temporary, only lasting for the duration of the military readiness activity. Limited military readiness activities are expected to occur within 3 NM, where most commercial and recreational fishing is anticipated to occur. When a range clearance is required, the public is notified via LNMs issued by the USCG (Section 3.0).

SCI, located in the California Study Area, is an area subject to frequent military readiness activities that may require closures of the area. SCI is also a popular area for fishing and recreational activities due to the presence of highly productive and valuable fisheries. Closures affecting waters around San Clemente Island are posted at https://www.scisland.org/. Refer to the 2018 HSTT EIS/OEIS for information regarding methods implemented by the Navy to avoid conflicts between civilian and military activities during potentially hazardous events off of SCI.

SNI, 43 miles northwest from SCI in the California Study Area, is also subject to frequent closures due to military readiness activities. A naval restricted area extends from the shoreline to approximately 3 miles seaward; however, the restricted area is open to all vessels for activities such as recreational fishing and diving when there are no closures. There is a requirement that all non-military vessels and personnel always remain 300 yards from the shoreline when in the area.

Upon completion of a military readiness activities in the Study Area, the safety zone would be reopened, and fishers and boaters would be able to return to the previously closed area. To help manage competing demands and maintain public access in the Study Area, the Action Proponents conduct their offshore operations in a manner that minimizes restrictions to commercial fishers. Military ships, commercial fishers, and recreational users can operate within the area together while maintaining a safe separation distance. If necessary, the Action Proponents would relocate to avoid conflicts with civilians and maintain the safety of non-participants.

The Action Proponents may also temporarily establish an exclusion zone for the duration of a specific activity (e.g., an activity involving the detonation of explosives) to prevent non-participating vessels and aircraft from entering an unsafe area. Establishment of an exclusion zone would temporarily limit commercial and recreational fishing in that specific area; however, other areas in the HCTT Study Area would remain open to commercial and recreational fishing (U.S. Department of the Navy, 2015). The Action Proponents does not exclude fishing activities from occurring in areas of the HCTT Study Area that are not being used during military readiness activities.

To minimize potential military/civilian interactions, the Navy will continue to publish scheduled operation times and locations on publicly accessible Navy websites and through USCG issued LNMs up to six months in advance to ensure that commercial and recreational users are aware of the Navy's plans and allow users to plan their activities to avoid scheduled military readiness activities. Therefore, decreases in the frequency of fishing trips or in the availability of desirable fishing locations due to military readiness activities would not be expected. Should there be nonparticipants present in an exclusion zone, the Action Proponents would halt or delay (and reschedule, if necessary) all potentially hazardous activity until the nonparticipants have exited the exclusion zone.

3.11.3.1.1.3 Tourism and Recreational Use

Temporary range clearance procedures in the Study Area, for safety purposes, would not adversely affect tourism and recreational activities because displacement is of short duration and are in areas where tourism activities are not as prevalent. Published notices (i.e., LNMS) would allow recreational users to adjust their routes to avoid temporary restricted areas. If civilian vessels are within an activity area at the time of a scheduled operation, military personnel would continue operations only where and when it is safe and possible to avoid the civilian vessels. If avoidance is not safe or possible, the operation would be halted and may relocate or be delayed. Therefore, there would be no adverse effects on tourism and recreational activities from conducting military readiness activities in the HCTT Study Area.

As described in detail in Section 3.7, military readiness activities have been occurring in the same areas for decades, and there are no data or other information to indicate that populations of any marine mammals, including those popular with whale watchers, have been or would be affected for viewing. Therefore, no effects on wildlife viewing and other wildlife-dependent recreational activities and no economic effects on tourism (such as whale watching) and related businesses dependent on observing wildlife in their natural habitats are anticipated.

3.11.3.1.1.4 Effects on Accessibility Under Alternative 1

Training and Testing. Potential effects on accessibility associated with training and testing activities would be associated primarily with air warfare, surface warfare, anti-submarine warfare, mine warfare, amphibious warfare, and vessel evaluations. There would be minimal anticipated effects on commercial transportation and shipping, commercial and recreational fishing, and tourism and recreational activities because inaccessibility to areas of co-use for training and testing would be temporary and of short duration. In addition, the Action Proponents have implemented standard operating procedures to improve communications between the military and fishers, both recreational and commercial, and reduce the number of instances when fishers must leave a temporarily closed area. Other areas not in use or temporarily restricted would remain accessible and available for use.

Modernization and Sustainment of Ranges. Potential effects on accessibility would be associated primarily with special use airspace modifications and the installation of training minefields, seafloor cables, and seafloor sensors. There would be minimal anticipated effects on commercial transportation and shipping, commercial and recreational fishing, and tourism and recreational activities associated with modernization and sustainment of ranges because inaccessibility to areas of co-use would be temporary and of short duration, lasting until an activity (e.g., installation of cables) concludes. Other areas not in use or temporarily restricted would remain accessible and available for use. For proposed special use airspace W-293, a lower altitude ceiling of 17,000 ft. would apply to avoid affecting commercial air traffic that fly through the area.

Conclusion. The changes in accessibility as a result of military readiness activities under Alternative 1 are consistent with a less than significant determination since (1) standard operating procedures would be implemented so that there would be minimal anticipated effects on commercial transportation and shipping, commercial and recreational fishing, and tourism and recreational activities; (2) closures are temporary, and the large expanse of the HCTT Study Area would remain available to the public for commercial and recreational use; and (3) effects on accessibility of areas within the Study Area would not result in a direct loss of income, revenue, or employment.

3.11.3.1.1.5 Effects on Accessibility Under Alternative 2

The locations and types of activities that have the potential to affect accessibility in the Study Area would be the same under Alternative 1 and 2. However, there would be a small increase in the number of activities conducted in the Study Area. The increases would not result in substantive changes to the potential for or types of socioeconomic effects associated with changes in accessibility. There would also be no changes to the standard operating procedures defining safety precautions and actions taken by the Action Proponents to protect the public during military readiness activities occurring at-sea. Therefore, changes to accessibility associated with military readiness activities under Alternative 2 would be less than significant.

3.11.3.1.2 Effects from Airborne Acoustics

As an environmental stressor, loud noises, sonic booms, and vibrations generated from military readiness activities such as weapons firing, in-air explosions, aircraft transiting, and pile driving have the potential to disrupt wildlife and humans in the HCTT Study Area. The public might intermittently hear noise from ships or aircraft overflights if they are in the general vicinity of the activities.

3.11.3.1.2.1 Commercial Transportation and Shipping

Airborne noise associated with military readiness activities would not be expected to affect commercial transportation and shipping.

3.11.3.1.2.2 Commercial and Recreational Fishing

Based on the analysis of effects from the Proposed Action, fishes would not experience substantial effects from airborne acoustics (Section 3.6). Marine invertebrates (Section 3.4), also important commercial fishery resources, would not be affected by airborne acoustics, because most marine invertebrates are limited in their ability to sense sound. Therefore, airborne noise from military readiness activities would not significantly affect the availability of target species for commercial or recreational fishing.

3.11.3.1.2.3 Tourism and Recreational Use

Noise interference could decrease public enjoyment of tourism and recreational activities. These effects would occur on a temporary basis, only when weapons firing; in-air explosions; aircraft transiting and participating in military readiness activities; and pile driving occur. Military readiness activities involving weapons firing and in-air explosions would only occur when it is confirmed the area is clear of nonparticipants, reducing the likelihood these activities would be a disturbance. Although pile driving would occur inshore, noise would be temporary, intermittent, and would only last for the duration of the activity. The possibility of encountering some type of noise related to a military readiness activity is unlikely to deter a resident or tourist from participating in a recreational activity (e.g., a fishing trip) in nearshore or offshore areas.

3.11.3.1.2.4 Effects from Airborne Acoustics Under Alternative 1

Training and Testing. Potential airborne noise effects would be associated primarily with air warfare, surface warfare, anti-submarine warfare, mine warfare, and amphibious warfare. There would be minimal anticipated effects on commercial transportation and shipping, commercial and recreational fishing, and tourism and recreational activities because most training and testing activities occur well out to sea, while most civilian activities, including tourism, fishing, and recreational activities, occur closer to shore. Although there is the potential for training and testing to generate noise that coastal residents and tourists on the water and land may be exposed to, noise would be infrequent, short term, and temporary. Additionally, standard operating procedures are already in place to avoid effects on civilian activities and would require that the area is clear of nonparticipants before initiating an activity.

Modernization and Sustainment of Ranges. Potential airborne acoustic effects would be associated primarily with the installation of training minefields, seafloor cables, and seafloor sensors. There would be minimal anticipated effects on commercial transportation and shipping, commercial and recreational fishing, and tourism and recreation because activities would be of short duration and temporary, lasting until installation or maintenance is complete.

Conclusion. The analysis of effects of airborne acoustics from military readiness activities under Alternative 1 are consistent with a less than significant determination since (1) noise would be temporary, lasting for the duration of the activity; and (2) infrequent exposure to airborne noise would not result in a direct loss of income, revenue, employment, resource availability, or quality of experience.

3.11.3.1.2.5 Effects from Airborne Acoustics Under Alternative 2

The locations and types of activities associated with airborne acoustics would be the same under Alternative 1 and 2. However, there would be a small increase in the number of activities conducted in the Study Area. The increases would not result in substantive changes to the potential for or types of effects associated with airborne acoustics. Therefore, airborne acoustic effects during military readiness activities under Alternative 2 would be less than significant.

3.11.3.1.3 Effects from Physical Disturbance and Strike

As an environmental stressor, direct physical encounters or collisions with objects moving through the water or air (e.g., vessels, aircraft, unmanned devices, and towed devices), dropped or fired into the water (non-explosive practice munitions, other military expended materials, and seafloor devices), or resting on the ocean floor (anchors, mines, and targets) may damage or encounter civilian equipment. Physical disturbances that damage equipment and infrastructure could disrupt the collection and transport of products, which may affect industry revenue or operating costs.

Military readiness equipment and vessels moving through the water could collide with non-military vessels and equipment. Most of the military readiness activities involve vessel movement and use of towed devices. However, the likelihood that a military vessel would collide with a non-military vessel is remote, because of the use of navigational aids or buoys separating vessel traffic, shipboard lookouts, radar, and marine band radio communications by both the military and civilians. Therefore, the potential to affect commercial transportation and shipping by physical disturbance or strike is negligible and requires no further analysis.

Aircraft conducting military readiness activities in the HCTT Study Area operate in designated military special use airspace (e.g., Warning Areas and Restricted Areas). All aircraft, military and civilian, are subject to FAA regulations, which define permissible uses of designated airspace, and are implemented to control those uses. These regulations are intended to accommodate the various categories of aviation, whether military, commercial, or general aviation. By adhering to these regulations, the likelihood of civilian aircraft encountering military aircraft or munitions is remote. In addition, military aircraft follow procedures outlined in DoD air operations manuals, which are specific to a warning area or other special use airspace, and which describe procedures for operating safely when civilian aircraft are in the vicinity. The proposed airspace (W-291 and W-293) would follow existing standard operation procedures in place for special use airspace.

MEM can physically interact with civilian equipment and infrastructure. Many of the military readiness activities use military expended materials including chaff, flares, projectiles, casings, target fragments, missile fragments, rocket fragments, ballast weights, and mine shapes.

3.11.3.1.3.1 Commercial Transportation and Shipping

Military vessels and aircraft conducting military readiness activities generally conduct activities far from commercially used waterways and airways, although activities may occur throughout the HCTT Study Area. While physical disturbances or strikes could damage commercial marine vessels or aircraft, the Action Proponents implement standard operating procedures for clearing areas of all nonparticipants before initiating hazardous activities. Additionally, the Action Proponents recover many practice munitions (e.g., mines and mine shapes) for reuse following the activity. They also recover larger floating objects or materials, such as targets or target fragments, to avoid having them become hazards to navigation. Smaller objects that remain in the water column would be unlikely to pose a risk to commercial equipment.

3.11.3.1.3.2 Commercial and Recreational Fishing

The majority of military readiness activities takes place within 200 NM from shore (National Marine Fisheries Service, 2012a, 2012b). Most recreational fishing would occur far from potential physical disturbances and strikes associated with military readiness activities. Some commercial fishing may occur beyond state waters in the HCTT Study Area and could be affected by the proposed activities if those activities were to alter fish population levels in those areas to such an extent that commercial fishers would no longer be able to find their target species.

Section 3.6 also evaluated potential effects on fish habitat from physical disturbances, strikes (by small-medium-, and large-caliber projectiles), and the use of electromagnetic and towed devices. Physical disturbances and strikes would be concentrated within designated areas, resulting in localized disturbances of hard bottom areas, but could occur anywhere in the HCTT Study Area. Direct and indirect effects on the fishes using hard bottom habitat in the HCTT Study Area could occur. The use of towed devices may result in short-term and localized movement of fishes to avoid the device; however, long-term avoidance of an area is not anticipated. Effects on populations of fishes in the HCTT Study Area would not be expected, and, therefore, loss of revenue or employment by commercial fishers would not occur.

Commercial fishing activities have the potential to be affected by military equipment placed in the water column or on the seafloor for use during military readiness activities. This equipment could include ship anchors; moored or bottom-mounted targets, mines, and mine shapes; seafloor cables and sensors; bottom-mounted tripods; and the use of towed system and attachment cables. Many different types of commercial fishing gear are used in the HCTT Study Area, including gillnets, longline gear, troll gear, trawls, seines, and traps or pots. Commercial bottom-fishing activities, such as dredging, bottom trawling, long lines, and pots and traps have the greatest potential to be affected by materials expended during military readiness activities that ultimately reside on the seafloor. For example, military expended materials, such as decelerators/parachutes, cables, and guidance wires, would ultimately sink to the seafloor and could inadvertently snag, entangle, and damage fishing equipment. Interaction with bottom-fishing gear could result in the loss of or damage to commercial fishing gear and military equipment. When these rare events occur, they could result in loss of income, revenue, and employment. Commercial fishers anticipate that fishing gear will be lost or damaged throughout the year and incorporate the economic loss into their business model.[1]

The Action Proponents recover many of the targets and target fragments used in military readiness activities and would continue to do so to minimize the potential for interaction with fishing gear and fishing vessels. Unrecoverable items are typically small, constructed of soft materials or are intentionally designed to sink to the bottom after serving their purpose, so that they would not represent a collision risk to vessels, including commercial fishing vessels. Although larger expended items may pose a risk to certain types of fishing gear used for bottom fishing, the probability of encountering such an item is remote given the large area over which expended materials would be distributed; the depth of the water where most activities using expended materials would occur; and the tendency for larger, heavier materials to become embedded in soft sediments, making them less likely to be snagged by fishing gear.

3.11.3.1.3.3 Tourism and Recreational Use

While military readiness activities can occur throughout the HCTT Study Area, most activities (especially hazardous) occur well out to sea. Most civilian recreational activities engaged in by both tourists and residents take place within a few miles of land or in many cases along the shoreline. As a result, conflicts between military readiness activities and tourist activities within the offshore areas, such as recreational diving and snorkeling, would not occur.

Other tourist and recreational activities occurring farther from shore would usually be conducted from larger boats that are typically well marked and visible to ships conducting military readiness activities. Vessel operators engaged in tourism activities are responsible for being aware of designated danger zones in surface waters and any LNMs that are in effect. Operators of recreational or commercial vessels are responsible for abiding by USCG maritime regulations. In conjunction with these responsibilities, standard operating procedures require military vessels to ensure that an area is clear of nonparticipants before conducting military readiness activities. Conflicts between military readiness activities in offshore areas and offshore recreational activities are not expected to occur. The Action Proponents would continue to recover larger pieces of targets used in certain activities so that target debris would not pose a collision risk to civilian vessels. Unrecoverable pieces of targets are typically small, constructed of soft materials such as cardboard, are pieces of tethered target balloons, or are designed to sink to the seafloor after use and would not damage civilian vessels if encountered.

Temporary range clearance procedures in the Study Area, for safety purposes, would not adversely affect tourism activities, because displacement is of short duration (typically less than 24 hours) and are in areas where tourism activities are not as prevalent. Action Proponents temporarily limit public access to areas where there is a risk of injury or property damage using LNMs. If civilian vessels are within a military readiness activity area at the time of a scheduled operation, military personnel could continue operations and avoid them if it is safe and possible to do so. If avoidance is not safe or possible, the operation may relocate or be delayed. In some instances where safety requires exclusive use of a specific area, nonparticipants in the area are asked to relocate to a safer area for the duration of the operation.

[1] Should the gear lost be causally connected to military activity, the fisher could file a claim in Admiralty. (see https://www.jag.navy.mil/legal-services/code-15/admiralty/)

3.11.3.1.3.4 Effects from Physical Disturbance and Strike Stressors Under Alternative 1

Training and Testing. Potential physical disturbance and strike effects would be associated primarily with air warfare, surface warfare, anti-submarine warfare, mine warfare, and amphibious warfare. Military readiness activities in these warfare areas would continue at current levels within established ranges and locations. The Action Proponents recover many practice munitions (e.g., mines and mine shapes) for reuse following the activity. They also recover larger floating objects or materials, such as targets or target fragments, to avoid having them become hazards to navigation. Smaller objects that remain in the water column would be unlikely to pose a risk to fishing gear. In addition, the Navy provides advance notification of activities to the public through LNMs and postings on Navy websites. As a result, damage to or loss of commercial and recreational fishing gear from interaction with military vessels, equipment, or other expended materials is unlikely.

Furthermore, the Action Proponents will implement mitigation to avoid effects from explosives and physical disturbance and strike stressors on seafloor resources in areas with geographic mitigation throughout the HCTT Study Area (see Chapter 5). Geographic mitigation will help avoid potential effects on shallow-water coral reefs, biogenic habitat, artificial reefs, and shipwrecks, which are valuable components of the snorkeling, diving, and fishing industries.

Modernization and Sustainment of Ranges. Potential physical disturbance and strike effects would be associated primarily with the installation of training minefields, seafloor cables, and seafloor sensors. Prior to in-water installations, construction, or maintenance, the Navy would issue LNMs to alert boaters to the avoid areas of activity. Entanglement by cables associated with modernization and sustainment of ranges would not affect fish habitat and is unlikely to be encountered by commercial fishers. As a result, damage or encounters with civilian equipment used for commercial transportation and shipping, commercial and recreational fishing, and tourism and recreation would be unlikely to occur.

Conclusion. Physical disturbance and strike associated with military readiness activities under Alternative 1 are consistent with a less than significant determination since (1) standard operating procedures are implemented to avoid interactions with civilian vessels and equipment, (2) military expended materials are widely distributed throughout the expansive size of the HCTT Study Area, (3) many practice munitions are recovered after an activity concludes, and (4) LNMs are released prior to conducting activities to inform civilians to temporarily avoid areas.

3.11.3.1.3.5 Effects from Physical Disturbance and Strike Stressors Under Alternative 2

The locations and types of activities associated with physical disturbance and strike would be the same under Alternative 1 and 2. However, there would be a small increase in the number of activities conducted in the Study Area. The increases would not result in substantive changes to the potential for or types of effects associated with the probability of physical disturbance and strike. As a result, potential effects from physical disturbance and strike associated with military readiness activities under Alternative 2 would be less than significant.

3.11.3.2 Environmental Justice

The stressors that could affect environmental justice populations are those that would have the potential to adversely and disproportionately affect communities with environmental justice concerns. Military readiness activities analyzed in this EIS/OEIS would be conducted in the ocean and in harbors and bays, and as a result, communities that practice traditional or subsistence fishing may be affected by the Proposed Action as activities have the potential to affect accessibility and availability of marine resources. Additionally, some military readiness activities may occur nearshore and have the potential to affect the air quality in nearshore communities and contribute to climate change.

Secondary stressors resulting in indirect effects on environmental justice communities of concern, such as population-level effects to fishes, are discussed in Section 3.11.4.

3.11.3.2.1 Effects on Subsistence Fishing

Subsistence fishing typically occurs from the shore (e.g., pierside) or from small vessels within 3 NM or closer to shore. Military readiness activities, especially those that involving explosives or expended materials, generally occur farther from shore (beyond 12 NM) in waters where subsistence fishing typically does not occur. Although public access may be limited throughout the HCTT Study Area during military readiness activities due to safety reasons; however, restrictions would be temporary and of short duration (lasting until the activity is complete).

Most closures would occur in established ranges, warning areas, and danger zones located primarily beyond 3 NM. As a result, popular subsistence fishing areas, including the CBSFAs and pierside locations throughout the Study Area, would not be subject to frequent closures. Most military readiness activities conducted near the island of Kauai, where the Haena CBSFA is located, would be expected to occur in waters off PMRF located on the western side of the island. Most military readiness activities conducted off Maui, where the Kipahulu CBSFA is located, would be expected to occur in the Hawaii Area Tracking System Area, Kahoolawe Sub Training Minefield, and the Maui Basin, all of which are located in waters beyond 3 NM. Limited military readiness activities would be expected to occur off the island of Hawaii within 3 NM. SUA off the southwest coast of the island of Hawaii would start at least 3 NM shore, and therefore activities conducted in the SUA would not overlap the Miliolii CBSFA.

Due to the expansive size of the Study Area in which activities may occur throughout and the sporadic timing when activities may take place, there is low potential to displace or alter the distribution of species permanently, including species targeted by subsistence fishers. Additionally, standard operating procedures (refer to Section 3.0) would continue to be implemented to protect the health and overall condition of target species and marine resources, including those targeted by subsistence fishers.

3.11.3.2.1.1 Effects on Subsistence Fishing Under Alternative 1

Training and Testing. Potential effects to subsistence fishing would be associated primarily with air warfare, surface warfare, anti-submarine warfare, mine warfare, and amphibious warfare. The Action Proponents have conducted training and testing within these regions in the past with limited interruption to subsistence fishing practices. Knowledge and avoidance of popular fishing areas, including designated CBSFAs, would minimize interactions between training and testing activities and fishing practices. Additionally, most military readiness activities that are conducted repeatedly over time typically use established ranges, warning areas, and danger zones and would not be expected to affect accessibility to popular subsistence fishing areas. If closure of an area is required, largely for safety purposes, the public is notified using LNMs. Closures of areas would be temporary and of short duration (lasting until the activity is complete). Areas not in use or temporarily restricted would remain accessible and available for use. Accessibility is no longer restricted once the activity concludes.

Range Modernization and Sustainment. Potential effects on subsistence fishing would be associated primarily with the installation of training minefields, seafloor cables, and seafloor sensors. Closures of areas associated with range modernization and sustainment would be temporary and of short duration, lasting until the activity (e.g., installation temporary minefields) is complete. LNMs would be issued to the public to inform the public of these temporary closures. Range modernization and sustainment activities would not be anticipated to occur in proximity to public piers, popular fishing areas, or near the Hawaii CBSFAs.

Conclusion. There would be less than significant adverse effects on communities with environmental justice concerns who engage in subsistence fishing practices since (1) limited military readiness activities would be conducted within 3 NM (where most subsistence fishing occurs); (2) closures are temporary and the large expanse of the HCTT Study Area would remain available to the public for use; and (3) popular subsistence fishing areas, including CBSFAs and pierside locations throughout the Study Area, would not be subject to frequent closures as most closures would occur in established ranges, warning areas, and danger zones located primarily beyond 3 NM.

Military readiness activities that require temporary closures of areas, largely for safety purposes, are not expected to disproportionately occur in popular subsistence fishing areas as most closures would be expected to occur in areas beyond 3 NM. As a result, communities with environmental justice concerns who practice subsistence fishing would not be disproportionately affected by changes to accessibility of ocean areas when compared to the general population who fish in the Study Area.

3.11.3.2.1.2 Effects on Subsistence Fishing Under Alternative 2

The locations and types of activities associated with the Proposed Action would be the same under Alternative 1 and 2. However, there would be a small increase in the number of activities conducted in the Study Area. The increases would not result in substantive changes to the potential for or types of effects on subsistence fishing practices. There would also be no changes to the standard operating procedures and mitigation measures that would be implemented to protect fishes and important habitats used by fish (refer to Section 3.0). As a result, potential effects from physical disturbance and strike associated with military readiness activities under Alternative 2 would be less than significant.

3.11.3.2.2 Effects on Air Quality

There would be a limited amount of military readiness activities expected to occur within 3 NM that have the potential to affect air quality in the San Diego Air Basin. All warning areas (including the proposed W-293 and W-294), where most military readiness activities would be expected to occur, extend from at least 3 NM from shore outward from the coastline. As discussed in Section 3.1, pollutants emitted beyond 3NM from shore would be dispersed and transported resulting in lower concentrations when they reach the coastal land mass. The contributions of air pollutants generated in the Study Area to the air quality in onshore areas are unlikely to measurably add to existing onshore pollutant concentrations.

3.11.3.2.2.1 Air Quality Effects Under Alternative 1

Training and Testing. There would be a limited amount of training and testing activities expected to occur within 3 NM nearshore in the San Diego Bay. As determined in Section 3.1, air pollutant emissions associated with the Proposed Action would be below the General Conformity *de minimis* thresholds for the San Diego Air Basin. As a result, training and testing activities would not be expected to measurably affect air quality in the San Diego Air Basin.

Range Modernization and Sustainment. Potential effects on air quality in the San Diego Air Basin would be associated primarily with the installation and maintenance of training minefields and other training areas, and the installation and maintenance of underwater platforms. As determined in Section 3.1, air pollutant emissions associated with the Proposed Action (including range modernization and sustainment activities in the San Diego Harbor) would be below the General Conformity *de minimis* thresholds for the San Diego Air Basin. Therefore, range modernization and sustainment activities would not be expected to measurably affect air quality in the San Diego and South Coast Air Basins.

Conclusion. There would be less than significant adverse effects on communities with environmental justice concerns, particularly the San Diego AB-617 Portside Community, related to air quality since (1) limited amounts of military readiness activities would occur within 3 NM of the shoreline, and (2) there would not be measurable changes to air quality associated with the Proposed Action. Emissions in the San Diego Air Basin would be below *de minimis* threshold levels. As a result, the San Diego AB-617 Portside Environmental Justice Community would not be disproportionately or adversely affected by implementation of the Proposed Action. Effects would be consistent with a less than significant determination.

3.11.3.2.2.2 Air Quality Effects Under Alternative 2

Changes in air quality would be similar to what is described under Alternative 1. A nominal increase in vessel and aircraft activity would occur; however, the increase would not be expected to measurably affect air quality in the San Diego Air Basin as most military readiness activities would be expected to occur beyond 3 NM. Therefore, effects on air quality under Alternative 2 would not disproportionately or adversely affect the San Diego AB- 617 Portside Community and would be less than significant.

3.11.4 Secondary Stressors

Socioeconomic resources could be indirectly affected by military readiness activities if changes to physical and biological resources were to alter the way commercial transportation, commercial or recreational fishing, and tourism and recreation were conducted. Additionally, environmental justice communities of concern could be indirectly affected if changes to resources alter the way that subsistence fishing is conducted by these communities.

Effects on sediment and water quality, fishes, invertebrates, and marine mammals were considered to be potential secondary stressors to socioeconomic resources and environmental justice communities of concern that practice subsistence fishing. Effects to sediment and water quality have the potential to affect habitat for fishes and invertebrates that are of vital importance to the commercial fishing industry as well as recreational and subsistence fishers and the local industries that support those activities. A portion of the tourism industry is also dependent on coastal and marine-based activities in both California and Hawaii and could be affected by effects on fisheries. No indirect or secondary effects on commercial transportation and shipping, and air quality are anticipated.

Commercial, recreational, and subsistence fishing and tourism could be affected if military readiness activities altered fish or invertebrate populations to such an extent that species abundance was no longer sufficient to support these activities. Disturbances to marine mammal populations that result in abandonment of areas where whales are known to occur could affect the whale watching industry. However, no secondary effects would occur to these resources within the Study Area based on the results of analyses presented in Sections 3.4, 3.5, and 3.6. These sections concluded that there would be no population-level effects on marine species from military readiness activities, including from the use of explosives and sonar and other transducers. Therefore, indirect or secondary effects on commercial transportation, commercial or recreational fishing, tourism, and subsistence fishing would be less than significant.

3.11.5 Summary of Combined Potential Effects

3.11.5.1 Combined Effects of All Stressors Under Alternative 1

Socioeconomic Resources. Military readiness activities would be widely dispersed throughout the HCTT Study Area, limiting the potential for co-occurrence of stressors from multiple military readiness activities being conducted at the same time but in a different location. Certain military readiness activities may return to a specific geographic location to use its unique physical characteristics. Repeatedly using the same area may limit accessibility to that area for commercial or recreational activities, relative to a less frequently used area. The Action Proponents typically use established ranges, warning areas, and danger zones for military readiness activities that are conducted repeatedly over time. Many commercial and recreational users in the region are familiar with the locations of military readiness activities, which allows for better planning and fewer instances of conflict. When an area needs to be temporarily closed to the public, the Navy notifies the public through LNMs and NOTAMs ahead of time to avoid potential conflicts with the public. If multiple, incompatible military readiness activities need to use a specific location, the activities would not be scheduled at the same time, and stressors associated with each activity would not occur at the same time. Therefore, an increase in effects to resulting from a combination of stressors occurring simultaneously is not expected.

Environmental Justice. Limited military readiness activities would be expected to occur within 3 NM. Military readiness activities would be dispersed throughout the HCTT Study Area, mainly beyond 3 NM, limiting the potential for the co-occurrence of stressors related to subsistence fishing and air quality to occur at the same time at a location where communities with environmental justice concerns are present. Therefore, an increase in effects on communities with environmental justice concerns resulting from a combination of stressors occurring simultaneously is not expected.

3.11.5.2 Combined Effects of All Stressors Under Alternative 2

The number and types of activities that would be conducted is similar to those described under Alternative 1 (see Chapter 2). Therefore, the combined effects of all stressors for socioeconomics and environmental justice would be similar to what is described under Alternative 1.

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3.12 Public Health and Safety

PUBLIC HEALTH AND SAFETY SYNOPSIS

Stressors to public health and safety that could result from the Proposed Action within the Study Area were considered, and the following conclusions have been reached for the Preferred Alternative (Alternative 1):

- Underwater Energy: Because of the military's SOPs, activities that involve underwater energy would not have reasonably foreseeable adverse effects on public health and safety.
- In-Air Energy: Because of the military's SOPs, activities that involve in-air energy would not have reasonably foreseeable adverse effects on public health and safety.
- Physical Interactions: Because of the military's SOPs, activities that involve potential physical interactions would not have reasonably foreseeable adverse effects on public health and safety.

3.12.1 Introduction

This section provides the analysis of potential effects on public health and safety within the HCTT Study Area.

Generally, the greatest potential for a proposed activity to affect the public is in nearshore areas because that is where public activities are most concentrated. Proposed military readiness activities in nearshore areas could be close to dive sites and other recreational areas where the collective health and safety of groups of individuals would be of concern. Most commercial and recreational marine activities (with the exception of commercial shipping) occur close to the shore, usually limited by the capabilities of the vessel or equipment used.

The military employs SOPs to provide for the safety of personnel and equipment as well as the success of the military readiness activities. SOPs designed to prevent public health and safety effects are discussed in detail in Section 3.0.4. The following subsections generally discuss established safety protocols and SOPs associated with the sea space and airspace environment, as well as specific procedures associated with aviation safety, submarine navigation safety, surface vessel navigation safety, sonar safety, electromagnetic energy and laser safety, and munitions safety.

Methods

The requirements for public health and safety were derived from federal regulations, DoD directives, and military service instructions for military readiness activities. The directives and instructions provide specifications for mission planning and execution, including criteria for public health and safety considerations.

The alternatives were evaluated based on two factors: the potential for specific military readiness activities to affect public health and safety, and the degree to which those activities could have an effect. The likelihood that members of the public would be near a training or testing activity determined the potential for exposure to the activity. If the potential for exposure existed, the degree of the potential effects on public health and safety, including increased risk for injury or loss of life, was determined. If the potential for exposure did not exist, it was determined that there would be no effects on public health and safety.

3.12.2 Affected Environment

The affected environment provides the context for evaluating the effects of the proposed military readiness activities on public health and safety.

3.12.2.1 General Background

The area of interest for assessing potential effects on public health and safety is the Study Area as defined in Chapter 2. As noted there, the HCTT Study Area differs from the HSTT Study Area in that HCTT includes the following:

- an expanded SOCAL Range Complex (W-293 and W-294 and the sea space beneath)
- new testing sea space between W-293 and PMSR
- the inclusion of two existing training and testing at-sea ranges (PMSR and the NOCAL Range Complex)
- inclusion of areas along the Southern California coastline from approximately Dana Point to Port Hueneme
- four amphibious approach lanes providing California land access from NOCAL and PMSR (Figure 2-2)
- nearshore areas within the Hawaii Study Area, such as Kaneohe Bay, MCTAB, or the Naval Defense Sea Area southwest of the entrance to Pearl Harbor (may be used more frequently or for new military readiness activities)

Military, commercial, institutional, and recreational activities have taken place simultaneously in the HSTT Study Area and have coexisted safely for decades. Implementation of the same or similar rules and practices implemented under HSTT, activities which have coexisted safely because of these established rules and practices, would lead to safe use of the waterway and airspace throughout the larger HCTT Study Area. The following paragraphs briefly discuss the rules and practices for recreational, commercial, and military use in sea surface areas and airspace.

3.12.2.1.1 Sea Space

Most of the sea space in the Study Area is accessible for recreational and commercial activities; however, some activities are prohibited or restricted in certain areas (e.g., danger zones and restricted areas).

In accordance with Title 33 CFR part 165 (Regulated Navigation Areas and Limited Access Areas) and Title 33 CFR part 334 (Danger Zone and Restricted Area Regulations), these restrictions can be permanent or temporary. Nautical charts issued by the National Oceanic and Atmospheric Administration include these federally designated zones and areas. Operators of recreational and commercial vessels have a duty to abide by maritime regulations administered by the USCG.

In accordance with Title 33 CFR part 72 (Aids to Navigation), the USCG informs private and commercial vessels about temporary closures via LNM. These notices provide information about durations and locations of closures because of activities that are potentially hazardous to surface vessels. Broadcast notices on maritime frequency radio, weekly publications by the appropriate USCG Navigation Center, and global positioning system navigation charts disseminate these navigational warnings.

3.12.2.1.2 Airspace

Most of the airspace in the Study Area is accessible to general aviation (recreational, private, corporate) and commercial aircraft; however, some airspace, as with waterways, are temporarily off-limits to civilian and commercial use. The FAA has established special use airspace, which is airspace of defined dimensions wherein activities must be confined because of their nature or wherein limitations may be imposed upon aircraft operations that are not part of those activities (Federal Aviation Administration, 2023). SUA in the Study Area includes the following:

- Restricted airspace: Areas where aircraft are subject to restriction due to the existence of unusual (often invisible) hazards to aircraft (e.g., release of munitions). Some areas are under strict control of the DoD, and some are shared with nonmilitary agencies (FAA Order 7400.2P, Chapter 23).
- Warning areas: Areas of defined dimensions, extending from 3 NM outward from the coast of the United States, that serve to warn non-participating aircraft of potential danger (FAA Order 7400.2P, Chapter 24).

Additionally, Air Traffic Control Assigned Airspace is airspace of defined vertical/lateral limits, implemented by Letter of Agreement between the user and the concerned Air Route Traffic Control Center, and assigned by Air Traffic Control for the purpose of providing air traffic segregation between the specified activity being conducted within the assigned airspace and other instrument flight rules traffic.

NOTAMs are created and transmitted by government agencies and airport operators to alert aircrews of any hazards en route to or at a specific location. The FAA issues NOTAMs to disseminate information on upcoming or ongoing military exercises with resulting airspace restrictions. Civilian aircraft operators are responsible for being aware of restricted areas in airspace and any NOTAMs in effect. Pilots have a duty to abide by aviation rules as administered by the FAA.

3.12.2.2 Safety and Inspection Procedures

In accordance with military instructions presented in this chapter, safety and inspection procedures discussed in this section are designed to ensure public health and safety. The military services promote proactive and comprehensive safety programs designed to reduce to the greatest extent possible any potential adverse effects on public health and safety from military readiness activities.

As previously stated, the greatest potential for military readiness activities to affect the public is in nearshore areas, because public activities are concentrated in those areas. When planning a training or testing activity, the military considers proximity of the activity to public areas in choosing a location. Important factors considered include the ability to control access to an area; schedule (time of day, day of week); frequency, duration, and intensity of activities; range safety procedures; operational control of activities or events; and safety history.

The Navy's Fleet Area Control and Surveillance Facilities provide support and training resources for DoD, Department of Homeland Security, and foreign military units by coordinating, scheduling, and monitoring activities in the U.S. Pacific Fleet operating areas and SUA, except the PMSR, which has been delegated management of the SUA within the PMSR complex, as well as PMRF. At each range, Range Control is responsible for hazard area surveillance and clearance and the control of all range operational areas. Range Control coordinates the real-time control of ranges with the FAA and other military users and communicates with the operations conductors and all participants entering and leaving the range areas. The FAA and the USCG issue NOTAMs and LNMs, respectively.

During military readiness activities in the Study Area, the military ensures that the appropriate safety zone is clear of non-participants before engaging in certain activities, such as firing weapons. Inability to obtain a "clear range" could result in the delay, cancellation, or relocation of an event. This approach ensures public safety during military readiness activities that otherwise could harm non-participants. Current practices employ the use of sensors and other devices (e.g., radar and big-eye binoculars) to ensure public health and safety while conducting military readiness activities. The following subsections outline the current requirements and practices for human safety as they pertain to range safety procedures, range inspection procedures, exercise planning, and scheduling and coordinating procedures.

Training and testing activities must comply with Fleet Area Control and Surveillance Facility, PMRF, or PMSR procedures, depending on the activity's location. Fleet Area Control and Surveillance Facilities San Diego and Hawaii have published safety procedures for activities conducted both nearshore and offshore, to include the NOCAL Range Complex (U.S. Department of the Navy, 2020a, 2022a, 2022b). These guidelines (and others) apply to range users as noted in Table 3.12-1.

Table 3.12-1: Range Users General Guidelines

HCTT Range Users General Guidelines	
Activity Type	**Guideline Description**
Hazardous (All Munitions Delivery)	The command conducting the exercise is responsible for ensuring that impact areas and targets are clear before commencing hazardous activities.
In-water Munitions Delivery	The use of in-water munitions must be coordinated with submarine operational authorities. The coordination also applies to towed sonar arrays and torpedo countermeasures.
Hazardous (Munitions Delivery)	Aircraft or vessels expending munitions shall not commence firing without the permission of the Range Safety Officer for their specific range area.
Hazardous (Munitions Delivery)	Firing units and targets must remain in their assigned areas, and units must fire in accordance with current safety instructions.
Hazardous (Munitions Transport)	Aircraft carrying munitions to or from ranges shall avoid populated areas to the maximum extent possible.
Hazardous (All Munitions Delivery)	Strict on-scene procedures include the use of ship sensors, visual surveillance of the range from aircraft and range safety boats, and radar and acoustic data to confirm the firing range and target area are clear of civilian vessels, aircraft, or other non-participants.

Comprehensive safety planning instructions exist for specific testing activities, such as laser and electromagnetic energy testing (U.S. Department of the Navy, 2008); (U.S. Department of Defense, 2009). These instructions provide guidance on how to identify the hazards, assess the potential risk, analyze risk control measures, implement risk controls, and review safety procedures. They apply to all testing activities including ground, waterborne, and airborne testing activities involving personnel, aircraft, inert minefields, equipment, and airspace. The guidance applies to system program managers, program engineers, test engineers, test directors, and aircrews that are responsible for incorporating safety planning and review when conducting test programs.

3.12.2.2.1 Aviation Safety

The Navy procedures regarding planning and management of SUA are provided in the Chief of Naval Operations Instruction 3770.2L, Airspace Procedures and Planning Manual (U.S. Department of the

Navy, 2017). Scheduling and planning procedures for air operations on range complexes are issued through the Navy's Fleet Area Control and Surveillance Facilities San Diego (U.S. Department of the Navy, 2020a, 2022a, 2022b) for their assigned areas, and PMSR for their assigned areas.

Testing activities have their own procedures that require that safety be considered in any testing event. For example, the Navy's Operational Test and Evaluation Manual prescribes policies and procedures for the planning, conducting, and reporting of Operational Test and Evaluation of new and improved naval weapons and warfare support systems (U.S. Department of the Navy, 2021).

Aircrews involved in training or testing activities must be aware that non-participating aircraft and ships may or may not be precluded from entering the area (based on current regulations) and may not comply with NOTAMS or LNMs. Aircrews are required to maintain a continuous lookout for non-participating aircraft while operating in warning areas under Visual Flight Rules. In general, aircraft carrying munitions are not allowed to fly over public or commercial boats or ships.

3.12.2.2.2 Submarine Navigation Safety

Submarine crews use various methods to avoid collisions while they are surfaced, including visual and radar scanning, acoustic depth finders, and state-of-the-art satellite navigational systems. During submerged transit, submarines use all available ocean navigation tools, including inertial navigation charts that calculate position based on the submerged movements of the submarine. Submarines use these systems to avoid surface vessels as well as all other hazards to navigation.

3.12.2.2.3 Surface Vessel Navigation Safety

The Navy and Coast Guard practice the fundamentals of safe navigation. As specified in Section 3.0.4, ships operated by or for the Navy or Coast Guard have personnel assigned to stand watch at all times, day and night, when underway. Watch personnel undertake extensive training in accordance with the Navy Lookout Training Handbook or civilian equivalent, including on-the-job instruction and a formal Personal Qualification Standard program (or equivalent program for supporting contractors or civilians), to certify that they have demonstrated all necessary skills (such as detection and reporting of floating or partially submerged objects). While on watch, personnel employ visual search techniques, including the use of binoculars and scanning techniques in accordance with the Navy Lookout Training Handbook or civilian equivalent. After sunset and prior to sunrise, watch personnel employ night visual search techniques, which could include the use of night vision devices. Watch personnel are primarily posted for safety of navigation, range clearance, and man-overboard precautions. For some specific testing activities, such as unmanned surface vehicle testing, a support boat would be used in the vicinity of the testing and operation to ensure safe navigation. Before firing or launching a weapon or radiating a non-eye-safe laser, naval surface vessels are required to determine that all safety criteria have been satisfied. When applicable, the surface vessel would use aircraft and other boats to aid in navigation.

3.12.2.2.4 Sonar Safety

Surface vessels and submarines may use active sonar in the pierside locations listed in Chapter 2 and during transit to training or testing exercise locations. To ensure safe and effective sonar use, the Navy applies the same safety procedures for pierside sonar use as described in Section 3.12.2.2.

The U.S. Navy Diving Manual, Appendix 1A, *Safe Diving Distances from Transmitting Sonar*, is the Navy's governing document for protecting divers during active sonar use (U.S. Department of the Navy, 2016). The manual provides procedures for calculating safe distances from active sonar. These procedures are derived from experimental and theoretical research conducted at the Naval Submarine Medical

Research Laboratory and the Navy Experimental Diving Unit. Safety distances vary based on conditions that include diver dress, type of sonar, and duration of time in the water. These safety distances would also be applicable to recreational swimmers and divers. Some safety procedures include measurements to be taken during testing activities to identify an exclusion area for non-participating swimmers and divers.

3.12.2.2.5 Electromagnetic Energy Safety

This section discusses electromagnetic energy transmitted through the air as a result of proposed activities. All frequencies (or wavelengths) of electromagnetic energy are referred to as the electromagnetic spectrum and include electromagnetic energy and radio frequency radiation. Communications and electronic devices such as radar, electronic warfare devices, navigational aids, two-way radios, cell phones, and other radio transmitters produce electromagnetic radiation. While such equipment emits electromagnetic energy, some of these systems are the same as, or similar to, civilian navigational aids and radars at local airports and television weather stations. Radio waves and microwaves emitted by transmitting antennas are another form of electromagnetic energy, collectively referred to as radio frequency radiation. Radio frequency energy includes frequencies ranging from 0 to 3,000 gigahertz. Exposure to radio frequency energy of sufficient intensity at frequencies between 3 kilohertz and 300 gigahertz can adversely affect people, munitions, and fuel.

To avoid excessive exposures to electromagnetic energy, military aircraft are operated in accordance with SOPs that establish minimum separation distances between electromagnetic energy emitters and people, munitions, and fuels (U.S. Department of Defense, 2009). Thresholds for determining hazardous levels of electromagnetic energy to humans, munitions, and fuel have been determined for electromagnetic energy sources based on frequency and power output, and practices are in place to protect the public from electromagnetic radiation hazards (U.S. Department of Defense, 2002), (U.S. Department of Defense, 2021). These procedures include setting the heights and angles of electromagnetic energy transmissions to avoid direct exposure, posting warning signs, establishing safe operating levels, activating warning lights when radar systems are operational, and not operating some platforms that emit electromagnetic energy within 15 NM of shore. Safety instructions provide clearance procedures for non-participants in operational areas before conducting military readiness activities that involve in-water electromagnetic energy (e.g., mine warfare) (U.S. Department of Defense, 2021); (U.S. Department of the Navy, 2008).

3.12.2.2.6 Laser Safety

Lasers produce a coherent beam of light energy. The military uses lasers for precision range finding, as target designation/illumination devices for engagement with laser-guided weapons, and for mine detection and mine countermeasures, as well as for non-lethal deterrent. High-energy lasers would be used as a weapon to disable small aircraft and surface vessels. The Office of the Chief of Naval Operations Instruction 5100.27B/Marine Corps Order 5104.1C, Navy Laser Hazards Control Program, prescribes Navy and USMC policy and guidance in the identification and control of laser hazards. The Navy observes strict precautions and has written instructions in place for laser users to ensure that non-participants are not exposed to intense light energy. Laser safety procedures for aircraft require an initial pass over the target before laser activation to ensure that target areas are clear. During actual laser use, aircraft run-in headings are also restricted to avoid unintentional contact with personnel or non-participants. Additionally, laser devices switch off automatically when a lock on a target is lost. Personnel participating in laser training activities are required to complete a laser safety course (U.S. Department of the Navy, 2008).

3.12.2.2.7 Explosive Munitions Detonation Safety

Pressure waves from in-water detonations can pose a physical hazard in surrounding waters. Before conducting an in-water explosive training or testing activity, Navy personnel establish an appropriately sized exclusion zone to avoid exposing non-participants to the harmful intensities of pressure waves. The U.S. Navy Diving Manual, Section 2.7.3, *Underwater Explosions*, provides procedures for determining safe distances from in-water explosions (U.S. Department of the Navy, 2016). In accordance with training and testing procedures for safety planning related to detonations, noted in Section 3.12.2.2.8, the Navy uses the following detonation procedures:

- The command conducting the exercise is responsible for ensuring that impact areas and targets are clear before commencing hazardous activities.
- The use of in-water munitions must be coordinated with submarine operational authorities.
- Aircraft or vessels expending munitions shall not commence firing without permission of the Range Safety Officer or Test Safety Officer for their specific range area.
- Firing units and targets must remain in their assigned areas, and units must fire in accordance with current safety instructions.
- Detonation activities would be conducted during daylight hours.

3.12.2.2.8 Weapons Firing and Munitions Expenditure Safety

Military explosives safety policy is based on the requirements of DoD Defense Explosives Safety Regulation 6055.09. This DoD standard establishes uniform safety requirements applicable to ammunition and explosives and to associated and unrelated personnel and property exposed to the potentially damaging effects of an accident involving ammunition and explosives during, among other things, usage during training, testing, transportation, handling, storage, maintenance, and disposal (U.S. Department of Defense, 2019).

Safety is a primary consideration for all military readiness activities. The range must be able to safely contain the hazard area of the weapons and equipment employed. The hazard area is based on the size and net explosive weight of the weapon, and it includes a safety buffer around the target to account for items going off-range or malfunctioning. The size of the buffer zone is determined by the type of activity. For activities with a large hazard area, special sea and air surveillance measures are implemented to make sure the area is clear before the activities commence. Before aircraft can drop munitions, they are required to make a preliminary pass over the intended target area to ensure that it is clear of boats, divers, or other non-participants. Aircraft carrying munitions are not allowed to fly over surface vessels.

Military readiness activities are delayed, moved, or cancelled if there is a question about the safety of the public. Target areas must be clear of non-participants before conducting military readiness activities. When using munitions with flight termination systems (which terminate the flight of airborne missiles or launch vehicles when they veer from their targeted path), the military is required to follow SOPs to ensure public health and safety. In those cases where a weapons system does not have a flight termination system, the size of the target area that needs to be clear of non-participants is based on the flight distance of the weapon plus an additional distance beyond the system's performance capability.

3.12.3 Environmental Consequences

None of the proposed military readiness activities would be conducted under the No Action Alternative. Therefore, baseline conditions of the existing environment for public health and safety would either remain unchanged or would improve slightly after cessation of ongoing military readiness activities. As a result, the No Action Alternative is not analyzed further within this section.

This section describes and evaluates how and to what degree the activities described in Chapter 2 and Section 3.0.3.3 would potentially affect public health and safety. Each public health and safety stressor is introduced and analyzed by alternative for military readiness activities. Table B-1 and Table B-2 in Appendix B show the warfare areas and associated stressors that were considered for analysis of public health and safety. The stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors applicable to public health and safety are:

- **underwater energy** (sonar and underwater explosions)
- **in-air energy** (high-energy lasers and microwaves)
- **physical interactions** (aircraft, vessels, underwater devices/targets, munitions, seafloor devices)

As discussed in Chapter 2, the majority of the military readiness activities that would be conducted under Alternatives 1 and 2 are the same as or similar to those currently being conducted or that have been conducted in the past.

The environmental impact analysis considers SOPs that would be implemented under Alternatives 1 or 2 of the Proposed Action. Relevant SOPs are detailed in Section 3.0.4.

As noted in Section 3.0.2, a significance determination is only required for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in 40 CFR 1501.3(d). None of the three stressors analyzed in this section would have reasonably foreseeable adverse effects on the human environment as discussed below. Stressors with no reasonably foreseeable adverse effects remain included in this Draft EIS/OEIS to document and support the analysis leading to this conclusion.

3.12.3.1 Underwater Energy

Active sonar, underwater explosions, air guns, pile driving, and vessel movements produce underwater acoustic energy; and during aircraft overflights, sound travels from air to water.

Underwater acoustic energy is generated from many of the proposed activities; however, not all would be considered in detail in this Draft EIS/OEIS in terms of their effect on public health and safety because the public safety risks from some activities are deemed to be negligible. The public might intermittently hear noise from ships if they are in the general vicinity of a training or testing event, but there would be no effect on public health and safety because of the infrequency and short duration of events. In addition, underwater air guns are used during some pierside testing activities, but public health and safety would not be put at risk because access to pierside locations by non-participants is controlled. Therefore, active sonar and underwater explosions are the only sources of underwater acoustic energy evaluated for potential effects on public health and safety.

The proposed activities that would result in underwater acoustic energy include activities such as amphibious warfare, surface warfare, anti-submarine warfare, mine warfare, sonar maintenance, pierside sonar testing, and unmanned underwater vehicle testing. A limited amount of active sonar would be used during transit between range complexes and military readiness activity's locations.

The effect of active sonar on humans varies with the frequency of sonar involved. Of the four types of sonar (very high-, high-, mid-, and low-frequency), mid-frequency and low-frequency sonar have the greatest potential to affect humans due to the range of human hearing capabilities.

Underwater explosives cause a physical shock front that compresses the explosive material, and the pressure wave then passes into the surrounding water. Generally, the pressure wave would be the primary cause of injury. The effects of an underwater explosion depend on several factors, including the size, type, and depth of the explosive charge and where it is in the water column.

The potential for the public to be exposed to these stressors would be limited to individuals who are underwater and within unsafe proximity to an event. Scuba diving is a popular recreational activity that is typically concentrated around known dive attractions, such as reefs and shipwrecks. The Professional Association of Diving Instructors, one of several scuba diving instruction organizations, suggests that certified open-water divers limit their dives to 60 ft. More experienced divers are generally limited to 100 ft.; in general, no recreational diver should exceed 130 ft. of depth (Professional Association of Diving Instructors, 2023). These depths typically limit this activity's distance from shore.

Military operations overlapping with recreational swimmers or divers would be unlikely. Recreational swimmers and divers are not precluded from operating in public boat lanes or adjoining areas near Navy pierside locations (which include shipyards); however, military operators are diligent in identifying recreational swimmers and divers to ensure that these would be avoided. Additionally, recreational divers would not be expected near naval ships at sea. The locations of popular offshore diving spots are well-documented, and dive boats (typically well-marked) and diver-down flags would be visible from the ships conducting the military readiness activities. The U.S. Navy Diving Manual (U.S. Department of the Navy, 2016) contains methodologies to determine appropriate safety distances associated with sonar use near Navy divers. These safety distances would also be used as safety buffers to protect public health and safety. If any unauthorized personnel are detected within the sonar activity safety buffer, the activity would be temporarily halted until the area is again cleared.

3.12.3.1.1 Effects from Underwater Energy

Training and Testing. A variety of vessels and underwater devices would be used throughout the Study Area during training and testing activities, as described in Section 3.0.3.3.4.1. Activities would typically involve one or two vessels or underwater devices and may last from one hour to multiple days. For this Draft EIS/OEIS, more vessel traffic and underwater devices use would occur in in the California portion than the Hawaii portion of the Study Area (Table 3.0-15).

The effects from vessels during training and testing activities would be minimal because activities involving underwater energy would not occur in the vicinity of recreational swimmers or divers. Established SOPs adequately control safety risks or improve the safety condition of military personnel and the general public.

Modernization and Sustainment of Ranges. Cables deployed on the seafloor during SOAR modernization, the California cable project, and two Hawaii cable projects, all generate an EMF. The EMF produced by the cable is less than that of the natural background magnetic force of the earth at distances beyond 0.6 cm (0.25 in.) from the cable. As electromagnetic energy dissipates exponentially by distance from the energy source, the magnetic field from the cable would be equal to 0.1 percent of the earth's at a distance of 6 m (20 ft.). The cables and nodes would be installed at the bottom of the ocean floor, in most cases at a minimum depth of 37 m (120 ft.). Given this depth, divers are unlikely to come into extended contact with cables or nodes and it is extremely unlikely that they would be affected by the magnetic field.

Conclusion. Military readiness activities would be conducted in accordance with SOPs and range guidelines listed above. Therefore, activities that involve underwater energy would not have reasonably foreseeable adverse effects on public health and safety.

3.12.3.2 In-Air Energy

In-air energy stressors include sources of electromagnetic energy and lasers. The sources of electromagnetic energy include radar and electronic warfare systems. These systems operate similarly to other navigational aids and radars at civilian airports and television weather stations throughout the United States. Electronic warfare systems emit electromagnetic energy similar to that from cell phones, handheld radios, commercial radio stations, and television stations. The military follows documented safety procedures to protect military personnel and the public from electromagnetic energy hazards. These procedures include setting the heights and angles of electromagnetic energy transmissions to avoid direct human exposure, posting warning signs, establishing safe operating levels, and activating warning lights when radar systems are operational. In-air electromagnetic energy would be widely dispersed throughout the Study Area, but more concentrated in portions of the Study Area near ports, naval installations, and range complexes. Because these stressors are operated at power levels, altitudes, and distances from people and animals to ensure that energy received is well below levels that could disrupt behavior or cause injury and because most in-air electromagnetic energy is reflected by water, in-air electromagnetic energy would not affect public health and safety and is not analyzed further in this section.

High-energy lasers are used as weapons to disable targets. The military would operate high-energy laser equipment in accordance with procedures defined in Chief of Naval Operations Instruction 5100.23H, *Navy Safety and Occupational Health Program* (U.S. Department of the Navy, 2020b). These high-energy light sources can cause eye injuries and burns. A comprehensive safety program exists for the use of lasers. Current military safety procedures protect individuals from the hazard of injuries caused by laser energy. Laser safety requirements for aircraft and vessels mandate verification that target areas are clear before commencement of an exercise. In the case of aircraft, during actual laser use, the aircraft run-in headings are restricted to preclude inadvertent lasing of areas where the public may be present.

Training activities involving low-energy lasers include air warfare, surface warfare, and mine warfare.

3.12.3.2.1 Effects from In-Air Energy

Training and Testing. A variety of vessels and aircraft would be used throughout the Study Area during testing and training activities, as described in Section 3.0.3.3.4.1 and Section 3.0.3.3.4.4. Most activities would involve one vessel or aircraft and may last from one hour to multiple days, but activities may occasionally use more than one vessel or aircraft. For this EIS/OEIS, more vessel and aircraft use would occur in the California portion than the Hawaii portion of the Study Area (Table 3.0-15).

The effects from vessels and aircraft during testing and training activities would be minimal because activities involving in-air energy would not occur in the vicinity of the general public. Established SOPs adequately control safety risks or improve the safety condition of military personnel.

Modernization and Sustainment of Ranges. Modernization and sustainment of ranges activities do not involve in-air energy use, therefore would result in no in-air energy effect on public health and safety.

Conclusion. Military readiness activities would be conducted in accordance with SOPs and range guidelines listed above. Therefore, activities that involve in-air energy would not have reasonably foreseeable adverse effects on public health and safety.

3.12.3.2.2 Effects from Physical Interactions

This section evaluates potential effects associated with the interaction of military aircraft, vessels, and equipment with the general public. Public health and safety could be affected by physical collisions between military assets and the public. As described in Section 3.0.3.3.4, military aircraft, vessels, targets, munitions, towed devices, seafloor devices, and military expended materials could be directly, physically encountered by recreational, commercial, institutional, and governmental aircraft, vessels, and individuals such as swimmers, divers, and anglers.

The analysis focuses on the potential for a direct physical interaction with aircraft, vessels, targets, or other expended materials. A vessel or aircraft transiting through the water or air (as would be involved in the vast majority of proposed activities) inherently involves the risk of collision with other vessels or aircraft. But this risk is greatly diminished by a shared set of international navigational rules for vessels and aircraft. The greatest potential for a physical interaction would be along the coast and near populated areas because that is where public activities are concentrated.

Training and Testing. The potential for a direct physical interaction between the public and aircraft, vessels, targets, or expended materials would remain as previously assessed in the 2018 HSTT and 2022 PMSR EIS/OEISs.

Four amphibious approach lanes have been added, providing California land access from the Northern California Range Complex and PMSR. Because of the proximity of these lanes to publicly accessed areas, there is a greater possibility of interaction between the military and the public during amphibious training activities. However, the military implements strict SOPs that protect public health and safety. These operating procedures include ensuring Amphibious Approach lanes are clear of non-participants prior to commencing training activities.

There would be no effect on public health and safety from physical interactions with testing and training activities, based on the military's implementation of strict SOPs that protect public health and safety. These SOPs include ensuring clearance of the area before commencing training activities involving physical interactions. Because of the military's established safety procedures, the proposed testing and training activities do not pose a potential risk for injury to military personnel or the general public, or cause damage to property. The analysis conclusions for physical interactions during testing and training activities under Alternative 1 are consistent with a negligible determination and therefore would result in an insignificant effect on public health and safety.

Modernization and Sustainment of Ranges. SUA (W-293 and W-294, which will be contiguous to and augment existing SUA in Southern California), is being proposed via an Airspace Proposal to create such SUA, from the Navy to the FAA. Airspace management procedures would be similar to current civilian-military aircraft deconfliction measures. Safety measures taken to ensure containment of Navy activities includes mandatory aircrew Course Rules Brief, mandatory local familiarization training and Range Operations Manual doctrine, pre-flight planning of airspace, route of flight, and deconfliction. Other modernization and sustainment of ranges activities would have the same or similar potentials for physical interactions as described for training and testing activities.

As noted in Section A.3.6 of Appendix A, underwater landing platforms are required to facilitate underwater vehicle pilot proficiency training in the SOCAL and Hawaii range complexes. The platform in SOCAL would be located just west of the SSTC boat lanes (Figure A-11), and the Hawaii installation would be south of the entrance to Pearl Harbor (Figure A-12). LNM would be published to provide marine safety information, such as the establishment and use of these underwater platforms. LNM are made available weekly by the USCG.

Conclusion. Military readiness activities would be conducted in accordance with SOPs and range guidelines listed above. Therefore, activities that involve potential physical interaction would not have reasonably foreseeable adverse effects on public health and safety.

3.12.3.3 Secondary Stressors (Sediment and Water Quality)

Secondary stressors are defined as those stressors that could pose indirect effects on public health and safety through degradation in water quality or changes to sediment and water quality stressors. These secondary stressors include explosives, explosive chemical byproducts, and other materials/debris potentially generated (marine markers, flares, chaff, targets, and miscellaneous components of other materials).

3.12.3.3.1 Effects from Secondary Stressors

Section 3.2 considers the effects on marine sediments and water quality from these stressors. The analysis therein determined that any effects on water quality would be temporary and minimal. No state or federal standards or guidelines would be violated. Consequently, military readiness activities would not result in reasonably foreseeable adverse effects on public health and safety associated with sediments and water quality.

3.12.4 Summary of Potential Effects on Public Health and Safety

3.12.4.1 Combined Effects of All Stressors

Activities described in this Draft EIS/OEIS that have potential to affect public health and safety include those that release underwater energy or in-air energy or those that result in physical interactions, as well as those that have indirect effects from changes to sediments and water quality. As described throughout this section, the military promotes a proactive and comprehensive safety program designed to reduce to the greatest extent practicable any potential effects on public health and safety from military readiness activities. Elements of this program include implementing strict navigation rules, coordinating and disseminating information on potentially hazardous activities, and the use of remote sensing technologies (e.g., radar, sonar) or trained Lookouts to ensure that military readiness activities areas are clear of non-participants. Military safety considerations are appropriate to the location and type of activity being conducted, no matter what number of activities are occurring concurrently; consequently, no elevated effects from the combined effect of all stressors are expected. The combined effects of all stressors on public health and safety is consistent with a less than significant determination.

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4 Cumulative Effects

4.1 Definition of Cumulative Effects

Cumulative effects are analyzed in accordance with the NEPA, CEQ regulations, and CEQ guidance. CEQ regulations (40 CFR sections 1500-1508) provide the implementing procedures for NEPA. The CEQ defines "effect or impacts" as "changes to the human environment from the proposed action or alternatives that are reasonably foreseeable" and include direct effects, indirect effects, and cumulative effects (40 CFR section 1508.1(i)). The regulations define "cumulative effects" 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. Cumulative effects can result from actions with individually minor but collectively significant effects taking place over a period of time.* (40 CFR 1508.1(i)(3)).

Per CEQ guidance on cumulative effects analysis in *Considering Cumulative Effects Under the National Environmental Policy Act* and in 40 CFR sections 1500-1508*,* the "levels of acceptable change used to determine the significance of effects will vary depending on the type of resource being analyzed, the condition of the resource, and the importance of the resource as an issue." (Council on Environmental Quality, 1997).

Furthermore, "this change is evaluated in terms of both the total threshold beyond which the resource degrades to unacceptable levels and the incremental contribution of the proposed action to reaching that threshold." In practice, "the analyst must determine the realistic potential for the resource to sustain itself in the future and whether the proposed action will affect this potential. Thus, for a proposed action to have a cumulatively significant effect on an environmental resource, two conditions must be met. First, the combined effects of all identified past, present, and reasonably foreseeable projects, activities, and processes on a resource, including the effects of the proposed action, must be significant. Second, the proposed action must make a measurable or meaningful contribution to that significant cumulative effect.

4.1.1 Scope of Cumulative Effects

The region of influence or geographic boundaries for the analyses of cumulative effects can vary for different resources and environmental media. CEQ guidance (Council on Environmental Quality, 1997) indicates that geographic boundaries for cumulative effects almost always should be expanded beyond those for the project-specific analyses. One method of evaluating geographic boundaries that is proposed by the CEQ guidance is to consider the distance an effect can travel and to identify potential cumulative assessment boundaries accordingly.

A region of influence for evaluating the cumulative effects of the Proposed Action is defined for each resource in Section 4.4 of the 2018 HSTT and 2022 PMSR EIS/OEISs[1]. The basic region of influence or geographic boundary for the majority of resources analyzed for cumulative effects in this EIS/OEIS is the entire HCTT Study Area (Figure 2-1). The geographic boundaries for cumulative effects analysis for some resources are expanded to include activities outside the Study Area that might affect migratory or wide-

[1] The 2018 HSTT and 2022 PMSR EIS/OEISs utilized the term "impact/impacts" to describe the cumulative effects analysis presented in Chapter 4. However, for purposes of this EIS/OEIS, "effects" is used in compliance with the May 2024 updates to the CEQ regulations.

ranging animals. Other activities potentially originating from outside the Study Area that are considered in this analysis include effects associated with maritime traffic (e.g., vessel strikes and underwater noise) and commercial fishing (e.g., bycatch and entanglement).

4.1.2 Past, Present, and Reasonably Foreseeable Future Actions

The 2018 HSTT and 2022 PMSR EIS/OEISs describe the process of analyzing cumulative effects associated with past, present, and reasonably foreseeable future actions. This process is consistent with and applicable to the cumulative analysis in the HCTT Study Area, which includes the extension of the SOCAL Range Complex, the inclusion of PMSR and NOCAL Range Complex, current studies, and updates to present and future projects within the Study Area.

The cumulative effects analysis makes use of the best available data, quantifying effects where possible and relying on qualitative description and best professional judgement where detailed measurement is unavailable. All likely future development or use of the region is considered to the greatest extent possible, even when a foreseeable future action is not planned in sufficient detail to permit complete analysis (Council on Environmental Quality, 1997). The cumulative effects analysis is not bounded by a specific future timeframe (e.g., five years). The Proposed Action includes general types of activities addressed by this EIS/OEIS that are expected to continue indefinitely, and the associated effects could occur indefinitely. While the training and testing requirements change over time in response to world events, it should be recognized that available information, uncertainties, and other practical constraints limit the ability to analyze cumulative effects for the indefinite future. New or supplemental environmental planning documents, including cumulative effects analyses, are prepared as needed, covering changes in military readiness activities in the Study Area.

Table 4-1 and Table 4-2 describe other actions that have had, continue to have, or would be expected to have some effect upon resources also affected by the Proposed Action within the Study Area and surrounding areas. Table 4-1 focuses on identifying past and reasonably foreseeable future actions (military mission, training, and testing; offshore energy development; ocean-dependent commercial industries; and research). Table 4-2 focuses on other major environmental stressors or trends that tend to be widespread and arise from routine human activities and multiple past, present, and future actions. For perspective of general project locations, please refer to Figure 2-1 and Figure 2-2 in Chapter 2, which depict the Study Area, boundaries of individual military readiness activity locations, and open-ocean areas within and adjacent to the Study Area.

4.2 Cumulative Effects on Environmental Resources

Since the information available on past, present, and reasonably foreseeable actions varies in quality and level of detail, effects of these actions were quantified where available data made it possible; otherwise, professional judgement and experience were used to make a qualitative assessment of effects. Due to the large scale of the Study Area and multiple activities and stressors interacting in the ocean environment (Table 4-1 and Table 4-2), the analysis for the incremental contribution to cumulative effects that the Proposed Action may have on a given resource is largely qualitative and speculative. Chapter 3 of the 2018 HSTT EIS/OEIS includes a robust discussion of the “general threats,” an analysis of aggregate project effects, and a broader-level analysis specific to areas where effects are concentrated (i.e., ranges/operating areas). Therefore, the Chapter 3 analysis of the 2018 HSTT EIS/OEIS is referenced and briefly summarized in Table 4-1 to provide context and perspective to the rationale for the conclusions that the Proposed Action would not contribute significantly to the cumulative stress experienced by these resources when specific past, present, and reasonably foreseeable future actions are added to the analysis.

Effects from actions that occurred beyond 10 years in the past are considered part of the existing conditions and thus will not be included in the cumulative effects analysis. Further, the analysis was not separated by Alternative because the cumulative effects analysis data was mostly qualitative in nature and, from a landscape-level perspective, these qualitative effects are expected to be generally similar. Under Alternative 1 or Alternative 2 of the Proposed Action, the Action Proponents would implement the mitigation measures detailed in Chapter 5 to avoid or reduce potential effects on biological, socioeconomic, and cultural resources in the Study Area.

Table 4-1: Past, Present, and Reasonably Foreseeable Actions

Action	Geographic Overlap	Project Timeline	Description
Past[1]			
Port of Hueneme Deepening Project	CA Study Area	Past	Deepened Port Hueneme by dredging to provide efficient accommodation of larger, deep-draft vessels; increase cargo efficiency of product delivery; and reduce overall transit costs. The project also provided beneficial uses for most of the dredged sediments as nourishment at Hueneme Beach. The project was completed in 2021.
Naval Base Point Loma Fuel Pier Replacement and Dredging (2013)	CA Study Area	Past	Replaced the existing fuel pier and dredged approximately 87,000 cubic yards of sediment to facilitate ongoing navigation in the vicinity of the pier (U.S. Department of the Navy, 2013). Dredge material was disposed in SSTC Boat Lanes as beach nourishment. The project was completed in 2018.
SCI Replacement of the Fuel Storage and Distribution System	CA Study Area	Past	Retirement in place and replacement of the aging underground JP-5 jet fuel tanks and improvement of fuel receipt, storage, and delivery capabilities on San Clemente Island (U.S. Department of the Navy, 2012). The project was completed in 2016.
Pier 12 Replacement and Dredging at Naval Base San Diego	CA Study Area	Past	Demolition and replacement of Pier 12 and associated pier utilities, dredging in berthing and approach for the new pier, dredged material disposal at an approved ocean disposal site and permitted upland landfill, and reuse of demolition concrete to create fish enhancement structures (artificial reefs). The Navy completed this project in 2016 (U.S. Department of the Navy, 2011b).
Pier 8 Replacement at Naval Base San Diego	CA Study Area	Past	Demolition of Pier 8 and construction of a new pier and associated utilities with the infrastructure necessary to support modern Navy ship classes. (U.S. Department of the Navy, 2015a). The project was completed in 2022.
Long-Range Strike Weapons Systems Evaluation Program at Pacific Missile Range Facility (PMRF)	HI Study Area	Past	Tests were conducted from 2017-2021 and included live and inert weapon systems deployed from aircraft for detonation in the air as well as at and below the water surface (U.S. Air Force, 2016b). The program evaluation was complete in 2021.
Energy Storage Systems at PMRF	HI Study Area	Past	Involved the leasing of Navy land to construct and operate a utility scale photovoltaic (PV) array and battery energy storage system (BESS) on approximately 170 acres at PMRF, Kauai. The project was completed in 2020.

Table 4-1: Past, Present, and Reasonably Foreseeable Actions (continued)

Action	Geographic Overlap	Project Timeline	Description
T-Pier Demolition at Kaneohe Bay, HI	HI Study Area	Past	Demolition of Facility 1662, the former Naval Ocean Systems Command Pier within Kaneohe Bay, to include removal of concrete decking, support pilings, and existing utility lines associated with the pier. Demolition was completed in 2022.
Naval Special Warfare Undersea Enterprise (NSWUE) Consolidation	HI Study Area	Past	Consolidation of the continental and Hawaii-based NSWUE units at JBPHH over 5-10 years from 2011. Adaptive reuse of historic properties provided additional working space and infrastructure.
United Launch Alliance Delta IV Rocket Program	CA Study Area	Past	The Delta IV rocket flew 45 missions since the first launch in 2002, 9 of which were from Vandenberg Air Force Base (now named Vandenberg Space Force Base [VSFB]). The launch system was available in three configurations, including the Delta IV Medium with two solid rocket motors, the Delta IV Medium with four solid rocket motors, and the Delta IV Heavy (United Launch Alliance, 2018). The Delta IV Heavy had its final west coast launch in September of 2022. There are currently no future Delta IV rocket launches scheduled to occur at VSFB.
Helicopter Realignment and Squadron Transition	CA Study Area	Past	Added four west coast helicopter squadrons, including three new squadrons and the relocation of one east coast squadron, to Naval Air Station North Island. The relocation of the squadrons was complete in 2016 and represented an increase in helicopter operations at Naval Air Station North Island (U.S. Department of the Navy, 2011a).
Hawaii-Southern California Training and Testing (HSTT) 2013 EIS/OEIS	HCTT Study Area	Past	The 2013 Phase II HSTT Final EIS/OEIS provided comprehensive analysis of the full geographic scope of areas where Navy training and testing activities have historically occurred as well as those projected for a 5-year range. It evaluated effects from past activities as well as present training and testing activities based on changing operational requirements, new platforms, and new systems. The Navy used these analyses to support incidental take authorizations under the Marine Mammal Protection Act (MMPA).
Submarine Drive-In Magnetic Silencing Facility	HI Study Area	Past	Completed in 2010, the project replaced existing submarine deperming piers and structures and constructed land-based support facilities for a new drive-in submarine silencing facility.

Table 4-1: Past, Present, and Reasonably Foreseeable Actions (continued)

Action	Geographic Overlap	Project Timeline	Description
Honolulu Harbor Dredging	HI Study Area	Past	Completed in 2018, the U.S. Army Corps of Engineers conducted maintenance dredging of the federal entrance channel, turning basin, access channel, and areas near Sand Island Bridge of Honolulu Harbor in Oahu, Hawaii.
P-8 aircraft removal from Kaneohe Bay	HI Study Area	Past	A P-8 aircraft ran off the runway at Marine Corps Base Kaneohe Bay in Hawaii in November of 2023. The aircraft was removed in December 2023 and an emergency EA was conducted. Following the extraction, the Hawaii Department of Land and Natural Resources Division of Aquatic Resources conducted an impact assessment and subsequent restoration efforts were carried out by the Division of Aquatic Resources, the Navy, and other agencies.
Present			
Falcon 9 Testing	CA Study Area	Present	The Falcon 9 rocket, designed and manufactured by SpaceX, is the first orbital class rocket capable for reflight and transports satellites into orbit (SpaceX, 2024). The First Stage rocket, tested out of VSFB, is 12 feet in diameter and 160 feet in height and includes nine engines and two tanks holding 662,250 pounds of aluminum liquid oxygen and 260,760 pounds of rocket propellant. There are several options for First Stage testing: (Hemery et al.) it is dropped into the Pacific Ocean and is non-recoverable; (2) it is boosted-back and lands on concrete padding at SLC-4W; (30th Space Wing Public Affairs) it is landed on an autonomous barge located at least 27 nautical miles offshore of Vandenberg Air Force Base; and (Nambu & Hajime Ishikawa) it is boosted-back and lands on an autonomous barge within the Iridium Landing Area (U.S. Air Force, 2016a). It has launched approximately 40 times from Vandenberg Air Force Base since the first flight in 2006.
Seal Beach Ammunition Pier	CA Study Area	Present	Constructed a replacement ammunition pier with associated waterfront facilities. Construction included dredging for the pier, access channel, and turning basin.
Wave Energy Test Site, Kaneohe Bay	HI Study Area	Present	The U.S. Navy's Wave Energy Test Site (WETS), the United States' first grid-connected wave energy test site, was expanded to three test berths in 2015. Through a cooperative effort between the Navy and the U.S. Department of Energy, with the support of Hawaii Natural Energy Institute and the Hawaii National Marine Renewable Energy Center, WETS hosts companies seeking to test their pre-commercial wave energy convertor devices in an operational setting, enabling them to advance their device transition readiness level. Hawaii Natural

Table 4-1: Past, Present, and Reasonably Foreseeable Actions (continued)

Action	Geographic Overlap	Project Timeline	Description
			Energy Institute provides performance analysis, numerical modeling of devices and moorings, wave measurement and forecasting, environmental monitoring (primarily acoustics), and logistics support to the Navy and the companies deploying at WETS.
JLOTS, Maritime Prepositioning Force, and Field Exercise Training	HCTT Study Area	Present	Would support up to twelve annual amphibious training activities, which consist of one Joint Logistics Over-the-Shore Training exercise every three years, one Maritime Prepositioning Force exercise every year, and up to 10 Field Exercise activities every year (U.S. Department of the Navy, 2015b). May be conducted jointly by the Navy, USMC, and Army.
Point Mugu Sea Range (PMSR) 2022 EIS/OEIS	CA Study Area	Present	Assesses the potential environmental consequences associated with continuing military readiness activities addressed in the March 2002 Naval Air Warfare Center Weapons Division PMSR EIS/OEIS, and Environmental Assessments completed at PMSR since 2002. In addition to consolidating previously analyzed actions, it also would address proposed increases in activity frequency.
Aircraft Transition at Fleet Logistics Centers	CA Study Area	Present	Would replace the C-2A Greyhound with the newer CMV-22B Osprey at either Naval Air Station North Island, California.
Hawaii-Southern California Training and Testing (HSTT) 2018 EIS/OEIS	HCTT Study Area	Present	The 2018 HSTT EIS/OEIS provides a comprehensive analysis of the full geographic scope of areas where Navy training and testing activities have historically occurred as well as those projected for a 5-year range. It assesses the effects from past activities as well as present training and testing activities based on changing operational requirements, new platforms, and new systems. The full breadth of activities, and their potential effects, of the 2018 Final HSTT EIS/OEIS, are similar in nature to those analyzed in the 2013 EIS/OEIS. The Navy used these analyses to support incidental take authorizations under the Marine Mammal Protection Act (MMPA).
Surveillance Towed Array Sensor System (SURTASS)	HCTT Study Area	Present	The Navy has been operating SURTASS Low-Frequency Active Sonar systems since 2002 in ocean areas largely outside of the Study Area, with the exception of part of the Hawaii Range Complex, and plans to continue the operation of systems for use in routine training, testing, and military operations (U.S. Department of the Navy, 2019) (U.S. Department of the Navy, 2016)

Table 4-1: Past, Present, and Reasonably Foreseeable Actions (continued)

Action	Geographic Overlap	Project Timeline	Description
U.S. Coast Guard (USCG)	HCTT Study Area	Present	The USCG performs maritime humanitarian, law enforcement, and safety services in estuarine, coastal, and offshore waters.
Introduction of Multi-Mission Maritime Aircraft into the U.S. Navy Fleet	HCTT Study Area	Present	Would provide facilities and operations to support the home basing of P-8A Mission Maritime Aircraft fleet and fleet replacement squadrons at NAS North Island and MCB Kaneohe Bay.
Basing of Aircraft Squadrons in Hawaii	HI Study Area	Present	Would base up to two Marine Medium Tiltrotor squadrons in MCB Kaneohe Bay to conduct aviation operations at training areas on the islands of Kauai, Oahu, Molokai, Maui, and Hawaii.
Cove Outdoor Recreation Center and Marina Improvements, and marine recreation in Kaneohe Bay	HI Study Area	Present	Would improve the Cove facilities to protect existing and proposed facilities and construction of additional onshore and offshore facilities (U.S. Marine Corps, 2010). Use of the recreational spaces within Kaneohe Bay would continue.
Naval Special Warfare Operations Training	HCTT Study Area	Present	Historical and proposed water and land based training activities for Special Operations forces.
Marine Recreation in Kaneohe Bay	HI Study Area	Present	Kaneohe Bay and marina provides recreational opportunities for marines and their guests, including various vessel and equipment rentals, water sports, and access to several beaches on base including North Beach, Pyramid Rock Beach, Hale Koa Beach, Pali Kilo Beach, and Ft. Hase Beach.
Oil and Gas Leasing Programs	CA Study Area	Present	Twenty-three oil and gas production facilities are located off the coast of California (Bureau of Ocean Energy Management, 2017). Activities include sonar surveys, exploration drilling, development and production wells, installation and operation of facilities, pipeline transport, and decommissioning.
Oil and Removal Operations	CA Study Area	Present	Decommissioning operations occur after lease expiration, when the well or facility is no longer deemed economically viable, or when the structure becomes unsafe or a navigation hindrance. It includes the explosive and non-explosive severing of structures and subsequent salvage and site-clearance operations (Minerals Management Service, 2005).
Maritime Traffic	HCTT Study Area	Present	Key ports in Hawaii and California facilitate the heavy commercial, recreational, and government marine traffic throughout the Study Area.

Table 4-1: Past, Present, and Reasonably Foreseeable Actions (continued)

Action	Geographic Overlap	Project Timeline	Description
Commercial Fishing	HCTT Study Area	Present	There are over 59 commercial fisheries throughout the Study Area that have the potential to affect the coastal economies and marine habitats.
Recreational Fishing	HCTT Study Area	Present	Recreational fishing contributes significantly to the tourism economies of Hawaii and California and the potential to affect the coastal economies and marine habitats.
Coastal Land Development and Tourism	HCTT Study Area	Present	Coastlines within the Study Area are heavily developed and include extensive tourism.
Undersea Communications Cables	HCTT Study Area	Present	Submarine cables provide the primary means of voice, data, and Internet connectivity between the mainland United States and the rest of the world. Over 550,000 mi. of cables currently exist in the world's oceans and are installed by burying the cables in shallow areas.
Aquaculture	HCTT Study Area	Present	Farming of aquatic organisms is one of the fastest growing form of food production. The first commercial-scale offshore aquaculture project in federal waters is proposed to occur within the Study Area.
Geological and Geophysical Oil and Gas Survey Activities	HCTT Study Area	Present	Offshore geological and geophysical research may include seismic air gun surveys and high resolution geophysical surveys supporting oil and gas, renewable energy, and marine minerals exploration (Bureau of Ocean Energy Management, 2014; University of California San Diego, 2024)
Academic Research	HCTT Study Area	Present	Wide-scale academic research is conducted in the study area by federal entities, such as the Navy and the NOAA/NMFS, as well as state and private entities and other partnerships.
Field Operations at National Marine Sanctuaries and Marine National Monuments	HCTT Study Area	Present	NOAA conducts field operations within Marine Sanctuaries and Monuments that primarily support resource protection, research, and education objectives of the National Marine Sanctuaries Act.
Pier 302 Replacement, Naval Base Point Loma	CA Study Area	Present	Would include the demolition of Pier 302 and construction of a new pier and associated utilities with the infrastructure necessary to support modern Navy ship classes.

Table 4-1: Past, Present, and Reasonably Foreseeable Actions (continued)

Action	Geographic Overlap	Project Timeline	Description
Naval Undersea Warfare Center Division Fixed Surface Ship Radiated Noise Measurement System, Barber's Point Oahu	HI Study Area	Present	Includes the installation and operation of a hydrophone array, undersea data transmission cable, and a shore station cable landing to measure underwater vessel noise (U.S. Department of the Navy, 2015c)
MQ-25A Stingray Home Basing	HCTT Study Area	Present	The Navy would establish facilities and operations, which include training and annual flight operations, of 20 Stingray CBUAS at NBVC Point Mugu.
Wind Energy	CA Study Area	Present	Development of offshore wind energy includes site characterization and assessment activities and installation activities. The Bureau of Ocean Energy Management (BOEM) auctioned its first West Coast leases in 2022; of the five total, three are within the HCTT Study Area off the coast of Morro Bay. The California State Lands Commission is currently working with the BOEM to develop a draft Programmatic EIS, anticipated in 2024. The steps following the environmental review and leasing include site characterization and assessment activities to inform project design, as well as construction and operations planning, environmental review, and implementation (California State Lands Commission, 2024).
	HI Study Area	Present	The BOEM received three unsolicited lease requests in 2014–2015 proposing the development of offshore floating wind energy facilities. In response, BOEM released a "Call for Information and Nominations" to investigate additional nominations from companies interested in floating offshore energy development within the call area and to solicit public feedback. The BOEM released a Notice of Intent to prepare an EA and solicited public comments on the proposed activities in 2016. In addition to funding resource studies to inform the development of offshore energy, the BOEM completed the Hawaii Floating Offshore Wind Regional Ports Assessment in 2024 that analyzed the compatibility of existing port infrastructure with offshore energy development requirements (Bureau of Ocean Energy Management, 2024a, 2024b).

Table 4-1: Past, Present, and Reasonably Foreseeable Actions (continued)

Action	Geographic Overlap	Project Timeline	Description
Construction and Operation of Dry Dock 5, Pearl Harbor	HI Study Area	Present	The construction, operation, and maintenance of a graving dry dock (Dry Dock 5), associate auxiliary facilities, crane type wight-handling system, and upgraded utilities. Dry Dock 5 will be replacing the existing Dry Dock 3, which is not operational. Construction related activities will include dredging, filling, pile driving, installing new temporary and permanent in-water structures, in addition to demolishing and installation of new landside facilities. The project is anticipated to be completed by January 2028.
Reasonably Foreseeable			
Training and Testing of the Extra Large Unmanned Undersea Vehicles (XLUUVs) and Unmanned Surface Vessels (USVs)	CA Study Area	Reasonably Foreseeable	Construction of approximately 123,000 square feet of permanent facilities to support administrative, maintenance, and training and testing needs of the unmanned systems. Construction of permanent facilities and pierside renovations are anticipated to begin no earlier than 2026. The project would also include training and testing of the XLUUVs and USVs in the Pacific Ocean waters nearshore and offshore to the west of NBVC Port Hueneme. There are no explosive ordnance or detonation events anticipated as part of training and testing.
Pacific Deep Electromagnetic Research Measurement Array (PACDERMA)	HI Study Area	Reasonably Foreseeable	The Navy proposes to construct underwater electromagnetic measurement system to characterize a submarine's submerged electric signature in the water offshore the Pacific Missile Range Facility on Kauai, HI.
Berth G Extension at USCG Base Honolulu	HI Study Area	Reasonably Foreseeable	Would extend Berth G at USCG Base Honolulu by constructing a fixed, pile-supported pier extending approximately 110 feet eastward from Berth G. This extension would allow for mooring of the second Seagoing Buoy Tender, including fenders, mooring hardware, and services. The USCG would also demolish and dispose of the existing floating dock (Berth F), to include removal of foundations and piles, but excluding the floating gangway which may be reused.
Haleiwa Small Boat Harbor Maintenance Dredging and Beach Restoration, Oahu	HI Study Area	Reasonably Foreseeable	US Army Corps of Engineers would conduct maintenance dredging of the Haleiwa Small Boat Harbor. The project would include the disposal and possible reuse of the dredged material to combat beach erosion.

Table 4-1: Past, Present, and Reasonably Foreseeable Actions (continued)

Action	Geographic Overlap	Project Timeline	Description
Homeport Facilities Improvements for Nimitz-Class Aircraft Carriers	CA Study Area	Reasonably Foreseeable	Updates to the carrier berths at NAS North Island would include routine pier-side maintenance activities and improved shoreside power infrastructure.
Extended Range Cannon Artillery II (ERCA), VSFB	HCTT Study Area	Reasonably Foreseeable	ERCA testing at Vandenberg Space Force Base (VSFB) would include firing projectiles over the Pacific Ocean from the shoreline of VSFB onto and over the PMSR.
Pacific Missile Range Facility (PMRF) Land-Based Training	HI Study Area	Reasonably Foreseeable	Land-based training and testing at PMRF would include firing projectiles over the Pacific Ocean from the shoreline of PMRF onto the HRC.
Marine Hydrokinetic	HCTT Study Area	Reasonably Foreseeable	No hydrokinetic development has occurred within the Study Area, however, significant research into the performance and applicability of water power technology is underway.

[1] Events categorized as "Past" in the table include actions from 2014 to present.

Notes: HCTT = Hawaii California Training and Testing, CBUAS = Carrier-Based Unmanned Aircraft System, UAS = Unmanned Aircraft System, NBVC = Naval Base Ventura County, USMC = U.S. Marine Corps, SSTC = Silver Strand Training Complex, SCI = San Clemente Island, NAS = Naval Air Station, MCB = Marine Corps Base, PMRF = Pacific Missile Range Facility, JBPHH = Joint Base Pearl Harbor Hickam, WETS = Wave Energy Test Site, NOAA = National Oceanic and Atmospheric Administration, NMFS = National Marine Fisheries Service

Table 4-2: Ocean Pollution and Ecosystem Alteration Trends

Stressor	Location	Description
Hypoxic zones	Global	Hypoxia, or low oxygen, is an environmental phenomenon where the concentration of dissolved oxygen in the water column decreases to a level that can no longer support living aquatic organisms. Hypoxia can occur from the rapid growth and decay of algal blooms in response to excess nutrient loading (primarily nitrogen and phosphorus from agriculture runoff, sewage treatment plants, bilge water, and atmospheric deposition), as well as waterbody stratification from differences in water salinity or temperature. Animals that encounter the Hypoxic Zones experience physiological stress, or suffocate. Hypoxic zones can be natural phenomena but are occurring in increasing size and frequency due to human-induced nonpoint source water pollution (National Oceanic and Atmospheric Administration, 2016, 2017).
	California	While the waters off coastal California are very productive, there is a varying degree of hypoxia along the California coast, mostly due to seasonal upwelling when deep oxygen-depleted waters replace warmer coastal waters due to changing seasonal factors.
Harmful algal blooms	Global	Elevated nutrient loading has also been identified as a potential contributing cause of the increased incidence of harmful algal blooms, proliferations of certain marine and freshwater toxin-producing algae (National Oceanic and Atmospheric Administration, 2016, 2017). Of the 5,000 known species of phytoplankton, there are about 100 species known to be toxic or harmful. Harmful algal blooms cause human illness and animal mortalities, including fish, bird, and marine mammals (Anderson et al., 2002; Corcoran et al., 2013; Sellner et al., 2003). Harmful algal blooms can be natural phenomena but are occurring in increasing size and frequency due to human-induced nonpoint source water pollution (National Oceanic and Atmospheric Administration, 2016, 2017). With the projection of warming ocean waters, these harmful blooms may become more prevalent beginning earlier, lasting longer, and covering larger geographic areas (Edwards, 2013; Moore et al., 2008).
	California	While no trend can be determined, algal bloom trends have been changing in the coastal waters and are known to be influenced by warmer water temperatures. Certain species of diatoms produce biotoxins that can significantly affect marine fisheries and wildlife.
	Hawaii	The most common causes of algae blooms in Hawaii include wastewater leaks, runoff containing agricultural fertilizer, or submarine groundwater discharge. Algae often grows faster and can outcompete corals on the surrounding coastal reefs. Lack of herbivores to control the growth of algae can also contribute to an algae overgrowth and causes a bloom.
Marine Invasive Species	Global	Species are considered invasive once enough individuals from an exotic species (those that are moved from their original location) establish and reproduce in a new area. Invasive species are pervasive throughout global waters and are most commonly found in areas that experience high vessel traffic, like ports. The introduction of invasive species can threaten and lead to the extinction of native species in an area through resource competition. As a result, the biodiversity and overall health of an ecosystem can be affected (National Oceanic and Atmospheric Administration, 2024).

Table 4-2: Ocean Pollution and Ecosystem Alteration Trends (continued)

Stressor	*Location*	*Description*
Marine Invasive Species (continued)	California	Invasive species documented within the California Study Area include Japanese seaweed (*Sargassum horneri*) and red algae (*Grateloupia turuturu*) in the California Bight, Mediterranean fanworm (*Sabella spallanzanii*) and clubbed tunicate (*Styela clava*) near the Channel Islands, as well as Asian kelp, or wakame (*Undaria pinnatifida*) along the California coastline (California Department of Fish and Wildlife, 2024b; National Oceanic and Atmospheric Administration, 2024). In coordination with the California State Lands Commission, the California Department of Fish and Wildlife monitors the introduction and management of invasive species throughout the state (California Department of Fish and Wildlife, 2024a).
	Hawaii	There are numerous invasive marine species within the Hawaii Study Area. Invasive octocoral species, such as stoloniferous fire coral (*Unomia stolonifera*), are known to outcompete and take over native coral species due to their quick reproduction. In 2023, 80 acres of stoloniferous fire coral were recorded in Pearl Harbor; 2024 surveys documented an increase to approximately 100 acres in 2024 (Hawaii Invasive Species Council, 2024b). Additional invasive marine species documented within the Hawaii Study Area include prickly seaweed (*Acanthophora spicifera*), hook weed (*Hypnea musciformis*), leather mudweed (*Avrainvillea lacerate*), gorilla ogo (*Gracilaria salicornia*), smothering seaweed (*Kappaphycus alvarezii and Echeumia spp.*), peacock grouper (*Cephalopholis argus*), upside-down jellyfish (*Cassiopea andromeda*), and keyhole sponge (*Mycale armata*) (Hawaii Department of Land and Natural Resources, 2024). The Hawaii Invasive Species Council was established in 2003 by the Hawaii State Legislature to provide policy-level coordination and planning among state and federal agencies to control current populations and prevent future introduction or invasive species (Hawaii Invasive Species Council, 2024a).
Major spill events	Global	Oil and other chemical spills related to oil and gas production activities have occurred along the Pacific coast of California.
	Pacific	There have been five major spills of the coast of California since 1969, resulting in approximately 5.5 million gallons of oil being spilled into the Pacific (California Coastal Commission, 2019). Environmental effects associated with oil spills include those that arise from direct exposure of marine life to oil and oil dispersants, habitat degradation, and disturbances caused by cleanup activities.
Marine Debris (Section 3.2.2.2.1)	Global	Marine debris is any anthropogenic object intentionally or unintentionally discarded, disposed of, or abandoned that enters the marine environment. An estimated 75% or more of marine debris consists of plastic (Hardesty & Wilcox, 2017). Approximately 80% of marine debris originates onshore and 20% from offshore sources. Marine debris is governed internationally by the 1972 London Convention and 1996 London Protocol and regulated in the United States through the Marine Protection, Research, and Sanctuaries Act. Marine debris has been discovered to be accumulating in gyres throughout the oceans, and two major accumulation zones exist in the Pacific Ocean and in the Atlantic east of Bermuda. Marine debris degrades marine habitat and water quality and poses ingestion and entanglement risks to marine life and birds (National Marine Fisheries Service, 2006).

Table 4-2: Ocean Pollution and Ecosystem Alteration Trends (continued)

Stressor	Location	Description
Coral Bleaching Events	Global	Coral bleaching occurs when coral polyps expel the algae that live within their tissue in response to environmental stressors such as changes in light, water temperature, or available nutrients. As a result, the coral's white calcium carbonate skeleton gets exposed, creating a "bleaching" effect. The bleaching of coral reefs across the globe is a response to higher water temperatures and carbon dioxide levels due to global warming, as well as increases in pollution and UV radiation, among others. While corals can survive a bleaching event, it does make them more susceptible to disease and starvation.
	Hawaii	There have been three major bleaching events in Hawaii since 2014, largely correlated with increased ocean temperatures. While prior bleaching events have occurred, there has been an increase in frequency within the past decade (National Oceanic and Atmospheric Administration, 2022)
Noise	Global	Ambient noise is the collection of ever-present sounds of both natural and human origin in the immediate surroundings of the receiver. Ambient noise in the ocean is generated by sources that are natural physical (earthquakes, rainfall, waves breaking, and lightning hitting the ocean); natural biological (snapping shrimp and the vocalizations of marine mammals), and anthropogenic (human-generated) sources. Anthropogenic sources have substantially increased ocean noise since the 1960s, and include commercial shipping, oil and gas exploration and production activities (including air gun, drilling, and explosive decommissioning), commercial and recreational fishing (including vessel noise, fish-finding sonar, fathometers, and acoustic deterrent and harassment devices), military (testing, training and mission activities), shoreline construction projects (including pile driving), recreational boating and whale watching activities, offshore power generation (including offshore windfarms), and research (including sound from air guns, sonar, and telemetry).
Climate Change	Global	Predictions of long-term negative environmental effects due to climate change include sea level rise; changes in ocean surface temperature, acidity/alkalinity, and salinity; changing weather patterns with increases in the severity of storms and droughts; changes to local and regional ecosystems (including the potential loss of species); shrinking glaciers and sea ice; thawing permafrost; a longer growing season; and shifts in plant and animal ranges, fecundity, and productivity. Anthropogenic greenhouse gas emissions (Section 3.1) have changed the physical and chemical properties of the oceans, including a 1 degree Celsius temperature rise, increased carbon dioxide absorption, decreased pH, alteration of carbonate chemistry, decline in dissolved oxygen, and disruption of ocean circulation (Poloczanska et al., 2016). Observations of species responses that have been linked to anthropogenic climate change are widespread, and trends include shifts in species distribution to higher latitudes and to deeper locations in the water column, earlier onset of spring and later arrival of fall, declines in calcification, and increases in the abundance of warm-water species. Climate change is likely to negatively affect the Study Area and would contribute added stressors to all resources in the Study Area (as noted in the discussion for each resource in the sections to follow).

Notes: % = percent; U.S. = United States

4.3 Resource-Specific Cumulative Effects

In accordance with CEQ guidance (Council on Environmental Quality, 1997), the following cumulative effects analysis focuses on effects that are "truly meaningful." The level of analysis for each resource is commensurate with the intensity of the effects identified in Chapter 3 or the level to which effects from the Proposed Action are expected to mingle with similar effects from existing activities.

4.3.1 Air Quality and Climate Change

The incremental contribution of the Proposed Action to cumulative effects would be low and would still be below applicable state, federal, and USEPA standards. The Proposed Action's contribution would not appreciably increase human health risks from hazardous air pollutant exposure in areas where sensitive receptors and/or public presence are expected, based on the analysis presented in Section 3.1 of this EIS/OEIS and the reasons summarized below.

- The Proposed Action would result in localized and temporarily elevated emissions, but criteria pollutant emissions in nonattainment or maintenance areas would not exceed *de minimis* thresholds. A signed Record of Non-Applicability is presented in Appendix G to document this determination.
- It is anticipated that the majority of emissions resulting from the Proposed Action would be released outside of state waters (outside 3 NM from shore) and would quickly disperse in the open ocean environment. Emissions released within state waters (within 3 NM of shore) would have a greater effect on areas where the public is present. However, since few activities are proposed to occur within state waters, the effect from emissions is expected to be minor.
- The military complies with the 0.5 percent sulfur cap on marine fuel emissions as established by the International Maritime Organization (IMO) in 2020 and the (International Maritime Organization, 2020). In addition, the military complies with the 2023 *IMO Strategy on Reduction of Greenhouse Gas Emissions from Ships,* which was adopted by the IMO in 2023 in accordance with agreed-upon follow up actions from a 2018 Initial Strategy to reduce greenhouse gas emissions from ships.
- The DoD has released multiple iterations of the Operational Energy Strategy: Implementation Plan, which will reduce demand, diversify energy sources, and integrate energy consideration into planning. The Navy has released an updated Operational Energy Strategy in 2012, 2016, and 2023 (U.S. Department of Defense, 2023). Improvement in fuel delivery systems, energy supply chains, and electrification of assets as outlined in the Operational Energy Strategy will result in more efficient military operations and a reduction in associated air emissions.

While emissions generated by military readiness activities alone would not be enough to cause global warming, in combination with past and future emissions from all other sources they would contribute incrementally to the global warming that produces the adverse effects of climate change. However, under the Proposed Action, the incremental additive effects from combined emissions, including greenhouse gases, occurring beyond state water boundaries would be minor, localized, intermittent, and unlikely to contribute to future degradation of the ocean atmosphere in a way that would harm ocean ecosystems or nearshore communities, or significantly contribute to global warming. Thus, based on the analysis presented in Section 3.1 and given the meteorology of the Study Area, the frequency and isolation of proposed military readiness activities, and the quantities of expected emissions, it is anticipated that the incremental contribution of the Proposed Action, when added to the effects of all other past, present and reasonably foreseeable future actions, would not result in measurable additional effects to air quality in the Study Area or beyond. A cumulative analysis of greenhouse gas emissions and climate change is provided in Section 3.1.

4.3.2 Sediments and Water Quality

The incremental contribution of the Proposed Action to cumulative effects would be low and would be below applicable state, federal, and USEPA standards and guidelines based on the analysis presented in Section 3.2 of this EIS/OEIS and the reasons summarized below.

- Military stressors are expected to be isolated and short term, with disturbed sediments and particulate matter quickly dispersing within the water column or settling to the seafloor and turbidity conditions returning to background levels.
- Sediment quality of the Study Area is generally rated “good” by the USEPA with most instances of lower quality in nearshore waters adjacent to population centers or areas that are geologically more enclosed.
- Analysis of decades-old munitions dump sites in multiple locations, including Hawaii, indicated that concentrations of chemical contaminants in sediments in the immediate vicinity of the dumpsites (identified as “affected”) were not substantially different from those found in non-affected sediments in the same general area. As such, munitions dumpsites have not had an appreciable effect on sediments.
- Most of the metals or chemicals that are not explosives that could affect sediments or water quality from munitions disposals are relatively benign, and those of potential concern make up a small percentage of expended munitions and other metal objects.
- Metals or chemicals from munitions that fail to explode are released through corrosion and would be diluted by currents or bound up and sequestered in adjacent sediment; any elevated concentrations of metals in sediments would be limited to the immediate area around the expended material.
- Practices, such as recovery of certain targets and associated items such as parachutes, would be implemented when practicable.
- The areas over which munitions and other metal or plastic components of military expended materials would be distributed are large; expended material are in relatively minute concentrations when compared to other materials found in the ocean (see Appendix C).

It is possible that stressors from military readiness activities would combine with non-military stressors, particularly in more heavily used nearshore areas and bays, such as Pearl Harbor and San Diego Bay, to exacerbate already affected water quality. Although effects may occur coincident with other stressors in areas with degraded existing conditions, the effects on water quality, such as increases in turbidity, are expected to be isolated and short term, with disturbed sediments and particulate matter quickly dispersing within the water column or settling to the seafloor and turbidity conditions returning to background levels. The Proposed Action could incrementally contribute to increases in persistent metal and plastic materials from military expended materials accumulating in the offshore marine environment. However, the relatively minute concentrations of stressors from military readiness activities are not likely to meaningfully contribute to sediment or water quality degradation. Based on the analysis in Section 3.2 and summarized above, it is anticipated that the incremental contribution of the Proposed Action when added to the effects of all other past, present, and reasonably foreseeable future actions would not result in measurable additional effects on sediments or water quality in the Study Area or beyond.

4.3.3 Vegetation

The incremental contribution of the Proposed Action to cumulative effects would be low and would still be below applicable USEPA standards and guidelines based on the analysis presented in Section 3.3 of this EIS/OEIS and the reasons summarized below.

- The coverage of seagrass in the Study Area has generally decreased over time; from 1879 to 2006 global seagrass coverage decreased by 75 percent (Waycott et al., 2009). However, there have been recent efforts to expand eelgrass coverage in certain areas, such as San Diego Bay. By comparison, algae includes a much greater diversity of species, forms, life histories, and environmental tolerances, and are thus resilient to stressors and able to rapidly recolonize disturbed environments (Levinton, 2009).
- Mitigation measures within the military's seafloor resource mitigation areas would avoid or reduce potential effects of the Proposed Action on vegetation species that are associated with shallow-water coral reefs, precious coral beds, live hard bottom, artificial reefs, and shipwrecks. Additionally, pre-activity observers monitor for the occurrence and avoidance of seagrasses, macroalgae, *Sargassum,* and detached (free-floating) kelp.
- The analysis presented in Section 3.3 indicates that effects on marine vegetation are limited to damage on individual plants; there would be no persistent or large-scale effects on the growth, survival, distribution, or structure of vegetation due to relatively fast growth, resilience, and abundance of the affected species in anticipated activity areas. Likewise, the short-term, localized nature of most activities further diminishes the potential effects on marine vegetation.

The effects of other past, present, and reasonably foreseeable actions on vegetation occur primarily in the coastal and nearshore waters and are associated with coastal development, maritime commerce/dredging, and the discharge of sediment and other pollutants. The Proposed Action is not expected to substantially contribute to losses of vegetation that would interfere with recovery in these regions. The incremental contribution of the Proposed Action would be insignificant as most of the proposed activities would occur in areas where seagrasses and other attached marine vegetation do not grow; effects would be localized; recovery would occur quickly; and the Proposed Action would not compound effects that have been historically significant to marine vegetation (loss of habitat due to development; nutrient loading; shading; turbidity; or changes in salinity, pH, or water temperature). Although vegetation is affected by stressors throughout the Study Area, the Proposed Action is not likely to incrementally contribute to population- or ecosystem-level changes in the resource, and it is anticipated that the incremental contribution of the Proposed Action, when added to the effects of all other past, present and reasonably foreseeable future actions, would not result in measurable additional effects on vegetation in the Study Area or beyond.

4.3.4 Invertebrates

The incremental contribution of the Proposed Action to cumulative effects would be low and would still be below applicable USEPA standards and guidelines based on the analysis presented in Section 3.4 of this EIS/OEIS and the reasons summarized below.

- Invertebrates are generally abundant and relatively short-lived. With the exception of sessile species located near areas of repeated military activities (e.g., pierside locations, established channels near large naval port facilities); few individuals would likely be affected repeatedly by the same event.

- With the exception of some species such as deep-water corals, invertebrates generally have high reproductive rates, short reproductive cycles, and resilient dispersal mechanisms; thus, local communities are likely to reestablish quickly.
- Most of the proposed activities would affect small, dispersed, deep water areas where marine invertebrates are more sparsely distributed. military activities may occur in the same general area (ranges), but do not occur at the same specific point each time and would therefore be unlikely to affect the same individual invertebrates.
- Marine invertebrates are not particularly susceptible to energy, entanglement, or ingestion stressors resulting from military activities, and none of the alternatives would result in or interact with effects that have been historically significant to marine invertebrates, such as overfishing, nutrient loading, disease, or the presence of invasive species.
- None of the alternatives would result in long-term or widespread changes in environmental conditions such as turbidity, salinity, pH, or water temperature that could affect marine habitats or interact with existing trends affecting these parameters.
- The military will not conduct certain activities within a specified distance of surveyed shallow-water coral reefs, precious coral beds, live hard bottom, artificial reefs, or shipwrecks. All features that have been identified are included in Chapter 5.

Although the aggregate effects of other non-military stressors in the ocean environment continue to have significant effects on some marine invertebrate species in the study area, particularly the effects of global climate change on corals, the Proposed Action is not likely to significantly incrementally contribute to population-level stress and decline of the resource. Due to the effects of global climate change, corals may be less resilient to additional stressors; however, it is not anticipated that direct effects to surveyed reef systems would occur. As effects would be isolated, localized, and indirect or not likely to overlap with other relevant stressors, it is anticipated that the incremental contribution of the Proposed Action, when added to the effects of all other past, present and reasonably foreseeable future actions, would not result in measurable additional effects on invertebrates in the Study Area or beyond.

4.3.5 Habitats

The incremental contribution of the Proposed Action to cumulative effects would be low and would still be below applicable USEPA standards and guidelines based on the analysis presented in Section 3.5 of this EIS/OEIS and the reasons summarized below.

Although some direct effects on habitats are expected, it is anticipated that the incremental contribution of the Proposed Action would be cumulatively insignificant for the following reasons:

- Most detonations would occur at or near the water surface and would not affect bottom habitats.
- Effects to soft bottom habitat from bottom-laid explosives would be confined to a limited area, and it is anticipated that soft bottom habitats would recover (fill in) quickly.
- Proposed Action activities are not likely to occur at the same time/place as other activities in the Study Area, including commercial fishing operations, which could potentially have a large effect on bottom habitats. Thus, it is likely that soft bottom habitats would have the opportunity to recover from the Proposed Action before effects from fishing or other operations could interact or compound additional stress to the ecosystems.
- The area of hard bottom potentially affected represents a negligible percentage in each of the range complexes (less than 0.1 percent) of the total hard bottom habitat in the Study Area.

Mitigation will be implemented to avoid or reduce potential effects from explosives, physical disturbance, and strike stressors on seafloor resources, including shallow-water coral reefs, live hard bottom, and artificial reefs, as described in Chapter 5. Potentially sensitive habitats such as artificial reefs, hard bottom, shallow water coral reefs, and shipwrecks are typically avoided. Services conducting military readiness activities are reminded of the presence of potentially sensitive areas through the PMAP program, which limits certain activities in these areas within the HCTT Study Area.

Although it is anticipated that damage to abiotic soft bottom habitat resulting from the Proposed Action would be limited and would recover, many other activities in the ocean are also affecting ocean bottom habitat. However, it is not likely that past, present, and future effects would overlap Proposed Action activities in place or time before the craters or other impressions in soft bottom substrate fill in. Likewise, hard bottom habitat would be avoided to the greatest extent possible. Based on the analysis presented in Section 3.5 and the reasons summarized above, it is anticipated that the incremental contribution of the Proposed Action, when added to the effects of all other past, present, and reasonably foreseeable future actions, would not result in measurable additional effects on habitats, including National Marine Sanctuaries, in the Study Area or beyond.

4.3.6 Fishes

The incremental contribution of the Proposed Action to cumulative effects would be low and would still be below applicable USEPA standards and guidelines based on the analysis presented in Section 3.6 of this EIS/OEIS and the reasons summarized below.

- While effects to a small number of individuals could occur as a result of military readiness activities, long-term effects on fish populations are unlikely because exposures from the majority of stressors are intermittent, transient, and unlikely to repeat over short periods.
- Military readiness activities are generally isolated from other activities in space and time and the majority of the proposed military readiness activities occur in well-known, previously established training range areas; are not generally concentrated in any one location for any extended period of time; have few stressor-producing elements; and are of a short duration.

Although it is possible that the Proposed Action could contribute incremental stressors to a small number of individuals, which would further compound effects on a given individual already experiencing stress, it is not anticipated that the Proposed Action has the potential to put additional stress on entire populations. Therefore, it is anticipated that the incremental contribution of the Proposed Action, when added to the effects of all other past, present, and reasonably foreseeable future actions, would not result in measurable additional significant effects on fishes in the Study Area or beyond.

4.3.7 Marine Mammals

In general, bycatch, vessel strikes, and entanglement are leading causes of injury and direct mortality to marine mammals throughout the region of influence, and, although mitigated to the greatest extent practicable, the Proposed Action could also result in injury and mortality to individuals of some marine mammal species from underwater explosions, vessel strikes, and potential auditory injury (i.e., permanent threshold shift) from sonar. Implementation of measures discussed in Chapter 5 would help avoid or reduce, but not absolutely eliminate, the risk for potential effects, and any incidence of injury and mortality that might occur under the Proposed Action could be additive to injury and mortality associated with other actions in the region of influence. While it is more likely that an individual of an abundant common stock or species would be affected, there is a chance that a less abundant stock could be affected.

The incremental contribution of the Proposed Action to cumulative effects would be low and would still be below applicable USEPA standards and guidelines based on the analysis presented in Section 3.7 of this EIS/OEIS and the reasons summarized below.

- Activities emitting noise that could result in acoustic effects are widely dispersed, the sound sources are intermittent, and mitigation measures would be implemented. Safety, security, and operational considerations would preclude some military readiness activities in the immediate vicinity of other actions, reducing the likelihood of simultaneous or overlapping exposure to acoustic stressors.
- The potential for effects relating to vessels strikes is reduced through implementation of the extensive standard operating procedures and mitigation, including a large whale aggregation notification system, in which personnel must issue real-time notifications to Navy vessels of aggregations of four or more whales within 1 NM of a Navy vessel within a certain geographic area.
- The regulatory process administered by NMFS, which includes Stock Assessments for all marine mammals and a 5-year review for all ESA-listed species, provides a backstop that informs decisions on take authorizations and Biological Opinions. MMPA take authorizations require that the proposed action have no more than a negligible effects on species or stocks, and that the proposed action imposes the least practicable adverse effects on the species.
- The majority of the proposed activities are unit level training and small testing activities, which are conducted in the open ocean. Unit level events occur over a small spatial scale (one to a few square miles) and with few participants (usually one or two) or short duration (the order of a few hours or less). Additionally, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individual marine mammal would be exposed to stressors from multiple military activities within a short timeframe.
- To date, the findings from research and monitoring (U.S. Department of the Navy, 2017) and the regulatory conclusions from previous analyses by NMFS (National Marine Fisheries Service, 2015; National Oceanic and Atmospheric Administration, 2013) are that the majority of military readiness activities are not expected to have deleterious effects on the fitness of any individuals or long-term consequences to populations of marine mammals.

In summary, the aggregate effects of past, present, and other reasonably foreseeable future actions continue to have significant effects on some marine mammal species in the Study Area. The Proposed Action could contribute incremental stressors to individuals, which would further compound effects on a given individual already experiencing stress. However, with the implementation of standard operating procedures reducing the likelihood of overlap in time and space with other stressors and the implementation of mitigation measures reducing the likelihood of effects, the incremental stressors anticipated from the Proposed Action are not anticipated to be significant. Additionally, the NMFS regulatory process includes Stock Assessments and five-year reviews for all ESA-listed species, which provides a backstop that informs decisions on take authorizations and Biological Opinions. Biological Opinions for federal and non-federal actions are grounded in status reviews and conditioned to avoid jeopardy and to allow continued progress toward recovery. This process helps to ensure that, through compliance with these regulatory requirements, the military's proposed actions have the least effect possible.

4.3.8 Reptiles

The fact that all five species of sea turtles occurring in the Study Area are ESA-listed provides a clear indication that the current aggregate effects of past human activities are significant for sea turtles. Due to standard operating procedures and mitigation measures most effects associated with the Proposed Action are not anticipated to interact with or increase similar stressors experienced throughout the region of influence. The incremental contribution of the Proposed Action to cumulative effects would be below applicable USEPA standards and guidelines based on the analysis presented in Section 3.8 of this EIS/OEIS and the reasons summarized below.

- Although sea turtles could be exposed to sound and energy from explosive detonations throughout the Study Area, the estimated effects on individual sea turtles are unlikely to affect populations. Contaminants and debris discharged into the marine environment are expected to be negligible and not persistent.
- The Proposed Action would not introduce significant light sources that would disorient nesting turtles or their hatchlings.
- Most individuals are not likely to experience long-term consequences from behavioral reactions because exposures would be intermittent and spatially distributed, allowing exposed individuals to recover. Since long-term consequences for most individuals are unlikely, long-term consequences for populations are not expected.
- Due to the wide dispersion of stressors and dynamic movement of many military readiness activities, it is unlikely that a sea turtle or sea snake would remain in the potential effect range of multiple sources or sequential exercises.
- The majority of the proposed activities are unit-level training and small testing activities, which occur over a small spatial scale (one to a few square miles) and with few participants (usually one or two) or short duration (the order of a few hours or less). Likewise, military readiness activities are generally separated in space and time in such a way that it would be unlikely that any individual sea turtle or sea snake would be exposed to stressors from multiple activities within a short timeframe.
- Ongoing research and monitoring efforts have included before, during, and after-event observations and surveys, data collection through conducting long-term studies in areas of military activity, occurrence surveys over large geographic areas, biopsy of animals occurring in areas of military activity, and tagging studies where animals are exposed to military stressors. To date, the findings from the research and monitoring and the regulatory conclusions from previous analyses by NMFS (National Marine Fisheries Service, 2015; National Oceanic and Atmospheric Administration, 2013) are that the majority of effects from military readiness activities are not expected to have deleterious effects on the fitness of any individuals or long-term consequences to populations of sea turtles.

In summary, the aggregate effects of past, present, and other reasonably foreseeable future actions continue to have significant effects on all reptile species in the Study Area. The Proposed Action could contribute incremental stressors to individuals, which would further compound effects on a given individual already experiencing stress. However, with the implementation of standard operating procedures reducing the likelihood of overlap in time and space with other stressors and the implementation of mitigation measures reducing the likelihood of effects, the incremental stressors anticipated from the Proposed Action are not anticipated to be significant. Additionally, the NMFS regulatory process, as described in 4.3.7, helps to ensure that, through compliance with regulatory requirements, the military's proposed actions have the least effect possible.

4.3.9 Birds

The incremental contribution of the Proposed Action to cumulative effects would be below applicable USEPA standards and guidelines based on the analysis presented in Section 3.9 of this EIS/OEIS and the reasons summarized below.

- The vast majority of effects are expected to be nonlethal: the most likely responses to military readiness activities are short-term behavioral or physiological, such as alert response, startle response, cessation of feeding, fleeing the immediate area, and a temporary increase in heart rate. Recovery from the effects of most stressor exposures that elicit such short-term behavioral or physiological responses would occur quickly.
- Projects in the Study Area, such as this EIS/OEIS, that affect protected species are subject to regulatory processes and permitting; as a result, agencies are able to assess the overall effects on a species resulting from various projects and address them accordingly.
- Most of the proposed activities would be widely dispersed in offshore areas where bird distribution is patchy and concentrations of individuals are often low; therefore, the potential for interactions between birds and military readiness activities is low. Likewise, for most stressors associated with the Proposed Action, effects would be short term and localized.
- It is unlikely that military readiness activities would influence nesting because most activities take place in water and away from nesting habitats on land.

Although other past, present, and reasonably foreseeable actions individually and collectively cause widespread disturbance and mortality of bird populations across the ocean landscape, the Proposed Action is not expected to substantially contribute to their diminishing abundance, induce widespread behavioral or physiological stress, or interfere with recovery from other stressors. It is anticipated that the incremental contribution of the Proposed Action, when added to the effects of all other past, present and reasonably foreseeable future actions, would not result in measurable additional effects on birds in the Study Area or beyond.

4.3.10 Cultural Resources

As discussed in Section 3.10, stressors, including explosive and physical disturbance and strike stressors, associated with the Proposed Action would not affect submerged prehistoric sites and submerged historic resources in accordance with Section 106 of the NHPA because mitigation measures have been implemented to protect and avoid these resources (Chapter 5). Furthermore, several Programmatic Agreements are in place between the Navy and State Historic Preservation Offices to address the protection and management of historic properties in specific areas of the Study Area. Further detail on these agreements can be found in Section 3.10.2.5.2 of this EIS/OEIS, as well as sections 3.10.2.5 of the 2018 HSTT EIS/OEIS and 3.10.3 of the 2022 PMSR EIS/OEIS.

The Proposed Action is not expected to result in effects on cultural resources in the Study Area and likewise would not contribute incrementally to cumulative effects on cultural resources. Therefore, further analysis of cumulative effects on cultural resources is not warranted.

4.3.11 Socioeconomic Resources and Environmental Justice

Socioeconomics. The incremental contribution of the Proposed Action to cumulative effects would be below applicable state, federal, and USEPA standards and guidelines based on the analysis presented in Section 3.11 of this EIS/OEIS and the reasons summarized below.

- Effects may occur from limits on accessibility to marine areas used by the public (e.g., for fishing and tourism); however, most limitations on accessibility are temporary and would be lifted upon completion of military readiness activities.
- The public may intermittently hear airborne noise from transiting ships or aircraft overflights if they are in the general vicinity of a training or testing activity. These occurrences would be of short duration (seconds to minutes) and infrequent, and other than transiting vessels and aircraft, most training and testing that generates airborne noise occurs farther from shore than most recreational and tourism activities.
- Most military readiness activities that pose a risk of a physical disturbance or strike (e.g., activities using munitions or military expended materials) occur farther from shore than most fishing or tourism activities. The military's standard operating procedures also require that an area is clear of non-participating vessels and aircraft before an activity using munitions or expended materials occurs.

Population-level effects on fishes, marine mammals, and invertebrates, which are the primary resources indirectly affecting socioeconomics in the Study Area, are not anticipated. No cumulative effects on commercial transportation and shipping are anticipated because commercial vessels and aircraft are primarily transiting through the Study Area along well-established navigable routes or air traffic corridors that are avoided by military vessels and aircraft conducting military readiness activities. Temporary limitations on accessibility to marine areas and the infrequent exposure to airborne noise would not result in a direct loss of income, revenue or employment, resource availability, or quality of experience. Short-term effects, should they occur, would not contribute incrementally to cumulative effects on the socioeconomic resources in the Study Area. Therefore, further analysis of cumulative effects on socioeconomic resources is not warranted.

Environmental Justice. Limited military readiness activities would be conducted within 3 NM, where most subsistence fishing would occur. Population-level effects on fishes and invertebrates, including species targeting by subsistence fishers, are not anticipated. Short-term effects, should they occur, would not contribute incrementally to cumulative effects on communities with environmental justice concerns that engage in subsistence fishing practices in the Study Area.

Based on emissions calculations in Section 3.1, limited military readiness activities conducted within 3NM nearshore of the Study Area would be below de minimis threshold levels in the San Diego Air Basin and South Coast Air Basin. The entire State of Hawaii is in attainment of the NAAQS for all criteria air pollutants. As a result, the Proposed Action would not contribute incrementally to cumulative effects on air quality in the Study Area.

As described in Section 3.1, the Proposed Action would not be enough to cause or contribute incrementally to contribute to climate change. However, in combination with past and future emissions from all other sources, military readiness activities would contribute incrementally to the global warming that produces the adverse effects of climate change. Although impacts are distributed at a global scale, communities with environmental justice concerns generally have a greater sensitivity to the effects of climate change and may lack the resources needed to adapt to changing environments.

4.3.12 Public Health and Safety

All proposed actions would be accomplished by technically qualified personnel and would be conducted in accordance with applicable military, state, and federal safety standards and requirements. The analysis presented in Section 3.12 indicates that the Proposed Action is not expected to result in effects on public health and safety and thus would not contribute incrementally to or combine with other effects on health and safety within the Study Area. Therefore, further analysis of cumulative effects on public health and safety is not warranted.

4.4 Summary of Cumulative Effects

The Proposed Action would contribute incremental effects on the ocean ecosystem, which is already experiencing and absorbing a multitude of stressors to a variety of receptors. In general, it is not anticipated that the implementation of the Proposed Action would have a meaningful contribution to the ongoing stress or cause significant collapse of any particular marine resource, but it would contribute minute effects on resources that are already experiencing various degrees of interference and degradation. The mitigation measures described in Chapter 5 will reduce the potential effects of the Proposed Action in such a way that they are avoided to the maximum extent practicable and to ensure that effects do not become cumulatively significant to any marine resource.

Marine mammals and sea turtles are the primary resources of concern for cumulative effects analysis; however, the incremental contributions of the Proposed Action are not anticipated to meaningfully contribute to the decline of these populations or affect the stabilization and recovery thereof. The military proposes to follow standard operating procedures that reduce the likelihood of overlap of military stressors in time and space with non-military stressors, and mitigation measures as described in Chapter 5 reduce the risk of direct effects of the Proposed Action to individual animals. The aggregate effects of past, present, and other reasonably foreseeable future actions (Table 4-1 and Table 4-2) have resulted in significant effects on some marine mammal and all sea turtle species in the Study Area. However, the decline of these species is chiefly attributable to other non-military stressors in the environment, including the synergistic effect of bycatch, entanglement, vessel traffic, ocean pollution, recreation and tourism, and coastal zone development. The analysis presented in this chapter and Chapter 3 indicates that the incremental contribution of the Proposed Action to cumulative effects on air quality, sediments and water quality, vegetation, invertebrates, habitats, fishes, birds, cultural resources, socioeconomic resources and environmental justice, and public health and safety would not significantly contribute to cumulative stress on those resources.

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5 MITIGATION

5.1 Introduction

The terms "mitigation" and "mitigation measures" mean actions taken to completely avoid, partially reduce, or minimize the potential for a stressor to impact a resource. This chapter describes and assesses mitigation the Action Proponents will implement under Alternatives 1 or 2 of the Proposed Action. The Action Proponents developed mitigation separate from, and after, the NEPA alternatives development process described in Chapter 2 (Description of the Proposed Action and Alternatives). Mitigation was designed to be implemented under every action alternative carried forward, an approach supported by NEPA regulations that allows agencies to "include appropriate mitigation measures not already included in the Proposed Action or alternatives" (40 Code of Federal Regulations [CFR] section 1502.14(e)). In addition to developing mitigation pursuant to NEPA, the Action Proponents developed mitigation in coordination with regulators and cooperating agencies, including the National Marine Fisheries Service (NMFS). Mitigation is designed to achieve one or more of the following overarching benefits:

- ensure that the Proposed Action has a negligible impact on marine mammal species and stocks, and effects the least practicable adverse impact on marine mammal species or stocks and their habitat (as required under the MMPA
- ensure that the Proposed Action does not jeopardize the continued existence of endangered or threatened species, or result in destruction or adverse modification of critical habitat (as required under the ESA
- avoid or minimize adverse effects on Essential Fish Habitat and habitats that provide critical ecosystem functions (as required under the Magnuson-Stevens Fishery Conservation and Management Act)
- avoid adversely impacting historic shipwrecks (as required under the Abandoned Shipwreck Act and National Historic Preservation Act)

For requirements under the MMPA, NMFS has supported the position that the reduction of impacts on marine mammal stocks and species (e.g., impacts on reproductive success or survivorship) may accrue through the application of mitigation that limits impacts on individual animals (National Marine Fisheries Service, 2023). Mitigation developed for the following types of impacts is thought to have greater value in reducing the likelihood or severity of adverse effects on marine mammal populations (National Marine Fisheries Service, 2023):

- avoiding injury or mortality
- limiting interruption of known feeding, breeding, mother/young, or resting behaviors
- minimizing abandonment of important habitat (temporally and spatially)
- minimizing the number of individuals subjected to these types of disruptions
- limiting degradation of habitat

NMFS has also described species-correlated factors that may (alone, or in combination) result in mitigation having a greater benefit towards reducing potential impacts on marine mammal species or stocks: (1) the stock is known to be decreasing or status is unknown, but believed to be declining; (2) the known annual mortality (from any source) is approaching or exceeding the potential biological removal level (as defined in section 3(20) of the MMPA); (3) the species or stock is a small, resident population; or (4) the stock is involved in an unusual mortality event or has other known vulnerabilities, such as recovering from an oil spill. Activity-based mitigation and geographic mitigation (which can include year-round or seasonal measures to reduce impacts on marine mammals or their prey and physical habitat), particularly within feeding, breeding, mother/young, migration, and resting areas (National Marine Fisheries Service, 2023), are relevant to achieving the mitigation goals described above. Using this guidance from NMFS, the Action Proponents considered the potential benefits of mitigation for marine mammals in terms of the degree, likelihood, and context of the anticipated avoidance of impacts to individuals (and how many individuals), and within the context of the species-correlated factors. Similar considerations were applied to mitigation developed for ESA-listed species, including sea turtles, fish, birds, and corals.

The Navy standardizes its mitigation across the Atlantic, Hawaii-California, Mariana Islands, Northwest, and Gulf of Alaska Study Areas to the maximum extent practical. Mitigation is tailored to each Study Area as needed and appropriate based on the following:

- the Proposed Action
- best available science on species occurrence and potential impacts from the Proposed Action
- expected mitigation benefits
- operational practicality assessments
- consultations and coordination with regulatory agencies or departments, such as NMFS, the National Oceanic and Atmospheric Administration, the U.S. Fish and Wildlife Service (USFWS), state Coastal Zone Management program offices, and State Historic Preservation Officers
- consultations and coordination with Alaska Native federally recognized tribes, Native Hawaiian organizations, and Native American Tribes, nations, and tribal organizations
- suggestions received through public comments during scoping and on the Draft EIS/OEIS

Mitigation was initially developed for Phase I of at-sea environmental planning (2009 to 2014) and subsequently revised for Phase II (2013 to 2018) and Phase III (2018 to 2025 for the HSTT EIS/OEIS, and 2022 to 2029 for the PMSR EIS/OEIS). This Draft EIS/OEIS (which represents Phase IV) uses mitigation from the 2018 HSTT and 2022 PMSR EIS/OEISs as the baseline for refining mitigation specific to the Proposed Action. For additional information about the at-sea environmental planning process, see Chapter 1 (Purpose and Need).

The Action Proponents analyzed potential mitigation measures individually and then collectively as a holistic mitigation package to determine if mitigation would meet the appropriate balance between being environmentally beneficial and practical to implement. Mitigation measures are expected to have some degree of impact on the military readiness activities that implement them. The Action Proponents are willing to accept a certain level of impact on their military readiness activities to implement mitigation that is expected to be sufficiently beneficial (i.e., effective) at avoiding specific impacts from the Proposed Action. To determine if mitigation measures would be practical to implement, operational communities from each Action Proponent conducted a comprehensive assessment to determine how and to what degree each individual measure and the iterative and cumulative impact of all potential measures would be compatible with planning, scheduling, and conducting military readiness activities under the Proposed Action. Mitigation was considered practical to implement if it met all three criteria discussed in Table 5-1.

Table 5-1: Practicality Assessment Criterion

Criterion	*Description of Practicality Assessment Criterion*
Criterion 1. Safety: Implementing mitigation must be safe	• Assessments considered if mitigation would increase safety risks to personnel, equipment, or the public through: – increased fatigue of pilots or other personnel – accelerated fatigue-life of vessels, aircraft, and other systems or platforms – increased distance to aircraft emergency landing fields, critical medical facilities, and search and rescue capabilities – exceedance of aircraft fuel restrictions (e.g., lengthened event duration, increased distance to refueling stations) – exceedance of space restrictions on visual observation platforms – decreased ability to de-conflict sea space or airspace conflicts (e.g., ensuring military readiness activities do not impact each other, avoiding interaction with established commercial air traffic routes, commercial vessel shipping lanes, and areas used for energy exploration or alternative energy development) – decreased ability for Lookouts to safely and effectively maintain situational awareness while observing the mitigation zones during typical activity conditions – decreased ability for Lookouts to safely perform other assigned job responsibilities – decreased proficiency in the use of sensors and weapon systems, or reduced ability to complete shipboard maintenance, repairs, or testing prior to at-sea use (which would result in a significant risk to personnel or equipment safety during training, testing, and real-world missions) – increased administrative burden that would significantly distract from safe conduct of primary mission objectives
Criterion 2. Sustainability: Implementing mitigation must be sustainable for the duration of the Proposed Action	• Assessments considered if mitigation would be unsustainable for the duration of the Proposed Action by: – requiring personnel to spend an inordinate amount of time on station or away from their homeport – requiring the use or obligation of additional resources (i.e., personnel and equipment) in excess of what is available – requiring expenditure of additional funding for increased operational costs associated with higher fuel consumption, additional maintenance of existing equipment, or acquisition of new equipment – reducing efficiency in travel time and associated costs by increasing distance between activities and homeports, home bases, associated training ranges, testing facilities, air squadrons, and existing infrastructure (e.g., instrumented underwater ranges)
Criterion 3. Mission: Implementing mitigation must allow for the Action Proponents to continue meeting mission objectives and statutory mandates	• Assessments considered if mitigation would modify military readiness activities in a way that would prevent them from meeting mission objectives, and the implications for the ability to continue meeting statutory mandates. Example barriers to meeting mission objectives and statutory mandates include: – degraded training or testing realism – decreased ready access to ranges, operating areas (OPAREAs), airspace, or sea space with a variety of realistic tactical oceanographic and environmental conditions (e.g., variations in bathymetry, topography, surface fronts, and sea surface temperatures) that are extensive enough to allow for completion of activities without physical or logistical obstructions, to provide personnel the ability to develop competence and confidence in their capabilities across multiple types of weapons and sensors, and the ability to train to communicate and operate in a coordinated fashion as required during real-world missions and to avoid observation by potential adversaries – decreased proficiency, erosion of capabilities, or reduction in perishable skills related to the use of sensors or weapon systems – decreased ready access to facilities, range support structures, or systems command support facilities that provide critical infrastructure support and technical expertise necessary to conduct testing – reduced ability to meet individual training and testing schedules, pre-deployment certification requirements, deployment schedules, and to deploy on time (factoring in variables such as maintenance and weather when scheduling event locations and timing) with the required level of skill and flexibility to accomplish any tasking by Combatant Commanders, national command authorities, or other national security tasking, including responding to national emergencies or emerging national security challenges – reduced ability to conduct accurate oceanographic or acoustic research to meet research objectives, validate acoustic models, and conduct accurate engineering tests of acoustic sources, signal processing algorithms, and acoustic interactions – reduced ability to ensure the safety, functionality, and accuracy of systems, platforms, and components through maintenance, repairs, or testing prior to use at sea as needed or required by acquisition milestones – reduced ability to effectively test systems, platforms, and components before full-scale production or delivery in order to validate whether they perform as expected and determine whether they are operationally effective, suitable, survivable, and safe for their intended use by the fleet – increased administrative burden that would significantly distract from efficient and effective conduct of primary mission objectives – increased national security concerns related to providing advance notification of specific times and locations of platforms, such as those using active sonar – measures that extend outside of the Action Proponents' legal authority to implement

The Action Proponents' Senior Leadership has reviewed, determined the practicality of, and approved all mitigation measures included in this Draft EIS/OEIS. Through the mitigation development and assessment processes, the Action Proponents will ultimately commit to the maximum level of mitigation that is both beneficial and practical to implement under the Proposed Action. The Records of Decision, MMPA Regulations and Letters of Authorization, ESA Biological Opinion, and other associated consultation documents will detail the mitigation to be implemented under the Proposed Action. Should the Action Proponents require a change in how they implement mitigation based on national security concerns, evolving readiness requirements, or other factors (e.g., significant changes in best available science), they will engage the appropriate agencies and reevaluate their mitigation or verify that potential impacts are adequately addressed in the EIS/OEIS and consultation documents through the appropriate consultations or Adaptive Management (as described in Section 5.5, Monitoring, Research, and Adaptive Management). Mitigation measures that were considered but eliminated because they did not meet the appropriate balance between being environmentally beneficial and practical to implement are discussed in Section 5.9 (Mitigation Considered but Eliminated).

5.2 Mitigation Dissemination

The Action Proponents will publish, broadcast, disseminate, or distribute mitigation instructions through pre-event briefs, governing instructions, broadcast messages, the Protective Measures Assessment Protocol, or other established internal processes. The Protective Measures Assessment Protocol is a software program accessed by appointed personnel during pre-event planning (see Figure 5-1). The program provides operators with notification of the required mitigation measures applicable to a particular training or testing event, as well as a visual display of the planned event location overlaid with relevant environmental data. Its text and mapping data will be updated to align with best available science and the final mitigation that results from this EIS/OEIS and associated consultation documents.

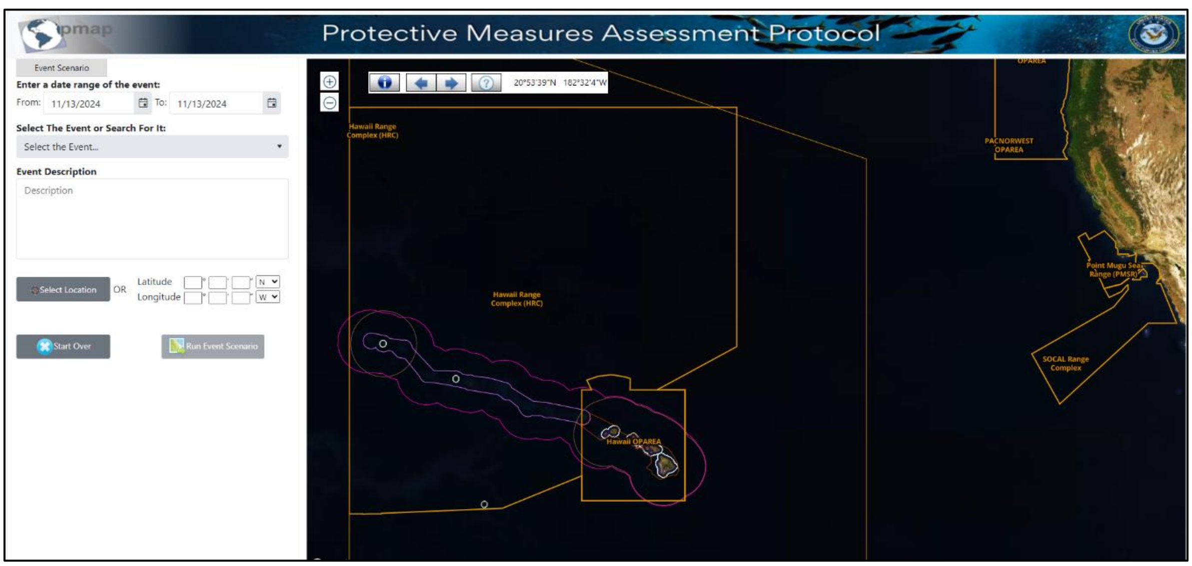

Figure 5-1: Protective Measures Assessment Protocol Home Screen

Mitigation requirements are mandatory for the Action Proponents when conducting activities under the Proposed Action. In furtherance of national security objectives, foreign militaries may participate in multinational training and testing events in the Study Area. Foreign military participation is not part of the federal action unless the U.S. military exercises substantial control and responsibility over those foreign military activities. Foreign military vessels operate pursuant to their own national authorities and have independent rights under customary international law, embodied in the principle of sovereign immunity, to engage in various activities on the world's oceans and seas. During U.S.-led training events within the U.S. territorial seas (0 to 12 nautical miles [NM] from shore), the Action Proponents will request a foreign military unit's voluntary compliance with the applicable mitigations. When a foreign military unit participates in a training event with the Action Proponents beyond the U.S. territorial seas but within the U.S. Exclusive Economic Zone (12 to 200 NM from shore), the Action Proponents will encourage that unit's voluntary compliance with the mitigation when practical.

5.3 Personnel Training

As described in Section A.2.7 (Standard Operating Procedures) underway surface ships operated by or for the Action Proponents have personnel assigned to stand watch at all times (day and night) for safety of navigation, collision avoidance, range clearance, and man-overboard precautions. Personnel on underway small boats (e.g., crewmembers responsible for navigation) fulfill similar watch standing responsibilities to those positioned on surface ships. To qualify to stand watch as a Lookout, personnel undertake a training program that includes computer-based training, on-the-job instruction, and a formal qualification program. Lookouts are trained in accordance with the *U.S. Navy Lookout Training Handbook* or equivalent to use correct scanning procedures while monitoring assigned sectors, to estimate the relative bearing, range, position angle, and target angle of sighted objects, and to rapidly communicate accurate sighting reports. The *U.S. Navy Lookout Training Handbook* was updated in 2022 to include a more robust chapter on environmental compliance, mitigation, and marine species observation tools and techniques (NAVEDTRA 12968-E). Environmental awareness and education training is also provided to personnel through the Afloat Environmental Compliance Training program (described below) or equivalent. Training is designed to help personnel gain an understanding of their personal environmental compliance roles and responsibilities (including mitigation implementation). Upon reporting aboard and annually thereafter, appointed personnel must complete training identified in their career path training plan.

- **Introduction to Afloat Environmental Compliance.** Developed in 2014, the introduction module provides information on at-sea environmental laws, regulations, and compliance roles.
- **Marine Species Awareness Training.** This module was developed by civilian marine biologists employed by the Navy and was reviewed and approved by NMFS. It provides information on marine species sighting cues, visual observation tools and techniques, and sighting notification procedures. It is a video-based complement to the *U.S. Navy Lookout Training Handbook* or equivalent. Since 2007, this module has been required for commanding officers, executive officers, equivalent civilian personnel, and personnel who will stand watch as a Lookout.
- **Protective Measures Assessment Protocol.** This module provides information on how personnel should access and operate the Protective Measures Assessment Protocol. Since 2014, this module has been required for personnel tasked with generating mitigation reports.
- **Sonar Positional Reporting System and Marine Mammal Incident Reporting.** This module provides information on sonar reporting requirements and marine mammal incident reporting procedures, which are described in Section 5.4 . Since 2014, this module has been required for personnel tasked with preparing, approving, or submitting applicable reports.

5.4 Reporting

Reporting requirements are designed to track compliance with MMPA and ESA authorizations. They also provide the Action Proponents and regulators sufficient information to consider if changes to mitigation, monitoring, or reporting requirements might be appropriate. Report content and submission details will be included in the NMFS MMPA Regulations and Letters of Authorization. The Navy developed a classified data repository known as the Sonar Positional Reporting System to maintain internal records of in-water sound source use and to facilitate reporting pursuant to its MMPA Regulations and Letters of Authorization. Applicable data will be provided to the NMFS Office of Protected Resources with annual reports describing the level of training and testing conducted in the Study Area and the special reporting mitigation areas described in Section 5.7. The reports will include additional information for major training exercises, and the Sinking Exercise (SINKEX), such as records of individual marine mammal sightings for when mitigation was implemented during the events. The Action Proponents will also submit an annual report to NMFS on monitoring conducted under the U.S. Navy Marine Species Monitoring Program (described in Section 5.5. Unclassified reports submitted to NMFS are available on the NMFS Office of Protected Resources (https://www.fisheries.noaa.gov/about/office-protected-resources) and U.S. Navy's Marine Species Monitoring Program (https://www.navymarinespeciesmonitoring.us) webpages.

As needed, the Action Proponents will follow established internal communication methods directed by Office of Chief of Naval Operations Instruction 3100.6 (series) if reportable incidents applicable to their activities are observed. Further, the Action Proponents will:

- Notify the appropriate regulatory agency, which may include NMFS or the USFWS, immediately (or as soon as operational security considerations allow) if a vessel strike, injury, or mortality of a marine mammal or sea turtle occurs that is (or may be) attributable to activities conducted under the Proposed Action. The notification will include relevant information pertaining to the incident, including, but not limited to, vessel speed or event type.
- Comply with the communication protocol for incidents involving marine mammals under NMFS' jurisdiction as outlined in the Notification and Reporting Plan, which will be publicly available on the NMFS Office of Protected Resources webpage.
- Comply with the reporting requirements for incidents involving ESA-listed species under NMFS' jurisdiction as outlined in the NMFS Biological Opinion.
- Comply with the reporting and response requirements for incidents involving ESA-listed species under USFWS' jurisdiction as outlined in the USFWS consultation documents.
- Commence consultation with the appropriate State Historic Preservation Officer or Tribal Historic Preservation Officer in accordance with 36 Code of Federal Regulations section 800.13(b)(3) in the event a submerged historic property (e.g., archaeological resource) is found to have been incidentally impacted during a training or testing event.

5.5 Monitoring, Research, and Adaptive Management

The Navy is one of the nation's largest sponsors of scientific research on, and monitoring of, protected marine species (Marine Mammal Commission, 2023). Details about the U.S. Navy Marine Species Monitoring Program, Living Marine Resources Program, and U.S. Navy Office of Naval Research is provided in Section 3.0.1.1 (Marine Species Monitoring and Research Programs). Through the Action Proponents' environmental offices and programs, the U.S. Navy Marine Species Monitoring Program, the Living Marine Resources Program, and the Office of Naval Research, the Action Proponents have been sponsoring research and monitoring for over 30 years in areas where they conduct military readiness activities. Additionally, the Coast Guard spends tens of millions of dollars annually protecting living marine resources through its maritime response, prevention, and law enforcement missions, which have a direct and positive impact on the maritime environment.

Thanks in part to advancements in science from these programs, the understanding of military readiness activity impacts on protected marine species continues to evolve. The programs have also made significant advancements in research on and development of emergent mitigation technologies, such as thermal detection systems, infrared systems, radar systems, passive acoustic range instrumentation, and autonomous and unmanned platforms with automated passive acoustic detection capabilities. Technological advancements are also being made through research conducted by private industry (e.g., commercial off-the-shelf products). While these technologies have not reached the level of performance needed for deployment during military readiness activities, the Action Proponents plan to continue researching, testing, and developing them. If mitigation technologies mature to the state where they are determined to be sufficiently effective at mitigating marine mammal impacts when considering the range of environmental conditions analogous to where the Action Proponents train and test, the species that could co-occur in space and time with the activities, and the characteristics of the sound sources and platforms used during the activities, then the Action Proponents will assess their compatibility with military readiness applications. This would include a practicality assessment of the budget and acquisition process (including costs associated with designing, building, installing, maintaining, and manning equipment), the logistical and physical considerations for retrofitting platforms with the appropriate equipment and their associated maintenance, repairs, or replacements (e.g., conducting engineering studies to ensure compatibility with existing shipboard systems), the resource considerations for training personnel to effectively operate the equipment, and the potential security and classification issues.

The Action Proponents will continue to host marine species monitoring technical review meetings with NMFS, to include researchers and the Marine Mammal Commission. Additionally, routine Adaptive Management meetings will continue to be held with NMFS and the Marine Mammal Commission as a systematic approach to help account for advancements in science and technology made after the issuance of MMPA Regulations and Letters of Authorization. The Action Proponents will provide information about the status and findings of sponsored mitigation technology research and any associated practicality assessments at these meetings. Through Adaptive Management, decisions, policies, or actions can be adjusted as the science and outcomes from management actions become better understood over time (Williams et al., 2009).

5.5.1 Current Video and Audio Monitoring for San Nicolas Island during Vehicle Launch Events

The Navy shall continue to implement the current monitoring plan initially detailed in the 2022 PMSR EIS/OEIS for beaches exposed to launch noise with the goal of assessing baseline pinniped distribution/abundance and potential changes in pinniped use of these beaches after launch events. Marine mammal monitoring shall include multiple surveys (e.g., time-lapse photography) during the year that record the species, number of animals, general behavior, presence of pups, age class, gender and reactions to launch noise or other natural or human caused disturbances, in addition to environmental conditions that may include tide, wind speed, air temperature, and swell. In addition, video and acoustic monitoring of up to three pinniped haulout areas and rookeries will be conducted during launch events that include missiles or targets that have not been previously monitored using video and acoustic recorders for at least three launch events.

Monitoring will need to factor in the practicality and compatibility of implementing the monitoring procedures based on planning, scheduling, and conducting vehicle launch activities to meet mission objectives.

5.6 Activity-based Mitigation

Activity-based mitigation was referred to as "Procedural Mitigation" in the 2018 HSTT and 2022 PMSR EIS/OEISs. Activity-based mitigations are fundamentally consistent across stressors; however, there are activity-specific variations to account for differences in platform configurations, event characteristics, and stressor types. These mitigations have a primary objective of reducing overlap of individual marine mammals and sea turtles (and in some instances, ESA-listed fish and birds) in real time with stressors that have the potential to cause injury or mortality.

Observations for "indicator species" are also conducted to offer an additional layer of protection for marine mammals and sea turtles. Floating vegetation can be an indicator of potential marine mammal or sea turtle presence because these animals have been known to seek shelter in, feed on, or feed among concentrations of floating vegetation. For example, young sea turtles have been known to hide from predators and eat the algae associated with floating concentrations of floating vegetation. For mitigation purposes, the term "floating vegetation" refers to floating concentrations of detached kelp paddies or other floating vegetation. For events with the largest net explosive weights (NEW; described in pounds [lb.]), indicator species also include other prey species or co-feeding species, such as jellyfish aggregations, large schools of fish, or flocks of seabirds, depending on the event and observation platforms involved.

Visual observations will be conducted by trained Lookouts. For mitigation purposes, the minimum number of Lookouts required is provided in Table 5-2 through Table 5-5. Some events may have additional personnel (beyond the minimum number of required Lookouts) who are already standing watch in or on the platform conducting the event or additional participating platforms and would have eyes on the water for all or part of an event. For example, Bridge Watch Teams on underway surface ships typically include numerous personnel on the bridge, bridge wings, and aft deck. These additional personnel will serve as members of the "Lookout Team" for all acoustic, explosive, and physical disturbance and strike stressor mitigation categories. While performing their primary duties, the Lookout Team will perform ad hoc visual observations before, during, or after events as a secondary task when doing so is compatible with, and does not compromise, safety and primary duty performance.

Lookouts may be positioned on surface vessels, aircraft, piers, or the shore. Lookouts positioned on U.S. Navy surface vessels (including surfaced submarines) will be solely dedicated to visually observing their assigned sectors. Lookouts on vessels with limited crew may fulfill additional duties. For example, a Lookout on a small boat may also be responsible for navigation or personnel supervision. A Lookout in an aircraft is typically an existing crewmember such as a pilot or Flight Officer whose primary duty is navigation or other mission-essential tasks. Observation platforms will be positioned according to safety, mission, and environmental conditions. For example, small boats observing explosive mine events would always be positioned outside of the detonation plume and human safety zone.

Lookouts will employ standard visual search techniques using naked-eye scanning, potentially in combination with the use of handheld binoculars, high-powered "big-eye" binoculars mounted on the deck of a surface ship (depending on the event and observation platform), and night search techniques (e.g., the use of night vision devices) if events occur after sunset or prior to sunrise. Lookouts will be advised that personal use of polarized sunglasses, when available, may help reduce sea surface glare, which could improve the sightability of marine resources. Prior to the start of an event (or use of a stressor) and throughout the duration of the event (or stressor use), Lookouts will observe a "mitigation zone" and the sea space surrounding the mitigation zone; within the direct path of underway vessels, unmanned surface or underwater vehicles that are already being escorted and operated under positive control by manned surface vehicles, or towed in-water devices; and throughout the range of visibility (e.g., to the horizon, depending on weather and observation platform characteristics). Mitigation zones are distances from a stressor (typically a radius measured in yards [yd]), as specified in Table 5-2 through Table 5-5. The specified mitigation zones are the largest areas Lookouts can reasonably be expected to observe during typical activity conditions and that are practical to implement from an operational standpoint. Lookouts may be responsible for observing multiple mitigation zones. For example, a Lookout positioned on a surface ship during an explosive large-caliber gunnery event may be responsible for observing both the weapon firing noise mitigation zone and the mitigation zone around the intended detonation location.

Lookouts will immediately relay relevant sightings information (e.g., animal or indicator species type, bearing, distance, direction of travel or drift, position relative to the mitigation zone) to the appropriate watch station through established communication methods. Lookouts will continue to observe for new sightings while maintaining situational awareness of the originally sighted animal or indicator species' position relative to the mitigation zone (to the extent possible). Lookouts will immediately relay any relevant new or updated information to the watch station. The watch station will disseminate relevant information to other participating assets as needed for their situational awareness. When passive acoustic devices are already being used in an event, sonar technicians will relay information about any passive acoustic detections of marine mammals to Lookouts prior to or during an event (when applicable, as indicated in Table 5-2 and Table 5-3) using established communication methods. Lookouts will use the information received to help inform their visual observation of mitigation zones.

5.6.1 Mitigation Specific to Acoustic Stressors, Explosives, and Non-Explosive Ordnance

The mitigation measures described below will be implemented (as appropriate) in response to an applicable sighting within or entering the relevant mitigation zone for acoustic stressors, explosives, and non-explosive practice munitions:

- Prior to the initial start of an event (or stressor use), the Action Proponents will: (1) relocate the event to a location where applicable species are not observed, or (2) delay the initial start of the event (or stressor use) until one of the "Mitigation Zone All-Clear Conditions" has been met.
- During the event (i.e., during use of a stressor), the Action Proponents will (until one of the Mitigation Zone All-Clear Conditions has been met): (1) power down or shut down active acoustic transmissions, (2) cease air gun use, (3) cease pile driving or pile removal, (4) cease weapon firing or ordnance deployment, or (5) cease explosive detonations or fuse initiations.

Mitigation Zone All-Clear Conditions indicate that the mitigation zone is determined to be free of applicable species. The conditions include: (1) a Lookout observes the applicable species exiting the mitigation zone, (2) a Lookout determines the applicable species has exited the mitigation zone based on its observed course and speed relative to the mitigation zone, (3) a Lookout affirms the mitigation zone has been clear from additional sightings for an applicable "wait period," or (4) for mobile events, the stressor has transited a distance equal to double the mitigation zone size beyond the location of the last sighting. Wait periods were established because events cannot be delayed or ceased indefinitely for the purpose of mitigation due to impacts on safety, sustainability, and the ability to meet mission requirements. Wait periods are designed to allow animals the maximum amount of time practical to resurface (i.e., become available to be observed) before activities resume. The assumption that mitigation may need to be implemented more than once was factored when developing wait period durations. Wait periods are 10 minutes, 15 minutes, or 30 minutes depending on the fuel constraints of the platform and feasibility of implementation as indicated in Table 5-2.

5.6.1.1 Additional Details for Acoustic Stressors

Additional details on the activity-based mitigation requirements for acoustic stressors are described in Table 5-2. Activity-based mitigation will not apply to:

- sources not operated under positive control
- sources used for safety of navigation
- sources used or deployed by aircraft operating at high altitudes
- sources used, deployed, or towed by unmanned platforms except when escort vessels are already participating in the event and have positive control over the source
- sources used by submerged submarines
- *de minimis* sources
- long-duration sources, including those used for acoustic and oceanographic research
- vessel-based, unmanned vehicle-based, or towed in-water sources when marine mammals (e.g., dolphins) are determined to be intentionally swimming at the bow or alongside or directly behind the vessel, vehicle, or device (e.g., to bow-ride or wake-ride)
- sources above 2 kilohertz (kHz) for sea turtles (based on their hearing capabilities)

5.6.1.2 Additional Details for Explosives

Additional details on the activity-based mitigation requirements for explosives are described in Table 5-3 Mitigation will not apply to explosives (1) deployed by aircraft operating at high altitudes, (2) deployed by submerged submarines, except for explosive torpedoes, (3) deployed against aerial targets, (4) during vessel- or shore-launched missile or rocket events, (5) used at or below the *de minimis* threshold, and (6) deployed by unmanned platforms except when escort vessels are already participating in the event and have positive control over the explosive. Post-event observations are intended to aid incident reporting requirements for marine mammals and sea turtles. Practicality and the duration of post-event observations will be determined on site by fuel restrictions and mission-essential follow-on commitments.

5.6.1.3 Additional Details for Non-Explosive Ordnance

Additional details on the activity-based mitigation requirements for non-explosive ordnance are described in Table 5-4. Explosive aerial-deployed mines do not detonate upon contact with the water surface and are therefore considered non-explosive when mitigating the potential for a mine shape to strike a marine mammal or sea turtle at the water surface. Mitigation for the explosive component of aerial-deployed mines is described in Table 5-3. Mitigation does not apply to non-explosive ordnance deployed: (1) by aircraft operating at high altitudes, (2) against aerial targets and land-based targets, (3) during vessel- or shore-launched missile or rocket events, and (4) by unmanned platforms except when escort vessels are already participating in the event and have positive control over ordnance deployment.

Table 5-2: Activity-based Mitigations for Acoustic Stressors

Mitigation Category	*Mitigation Zones*	*Lookouts*	*Mitigation Requirement Timing*	*Wait Period*
Active Acoustic Sources				
• Active acoustic sources with power down and shut down capabilities: – Low-frequency active sonar ≥200 dB – Mid-frequency active sonar sources that are hull mounted on a surface ship (including surfaced submarines) – Broadband and other active acoustic sources >200 dB	• 200 yd from active acoustic sources (shut down) • 500 yd from active acoustic sources (power down of 10 dB total) • 1,000 yd from active acoustic sources (power down of 6 dB total)	• One Lookout in/on one of the following: – Aircraft – Pierside, moored, or anchored vessel – Underway vessel with space/crew restrictions (including small boats) – Underway vessel already participating in the event that is escorting (and has positive control over sources used, deployed, or towed by) an unmanned platform • Two Lookouts on an underway vessel without space/crew restrictions • Lookouts would use information from passive acoustic detections to inform visual observations when passive acoustic devices are already being used in the event	• Immediately prior to the initial start of using active acoustic sources (e.g., while maneuvering on station) for: – Marine mammals – Sea turtles (for sources <2 kHz) – Floating vegetation • During use of active acoustic sources for: – Marine mammals – Sea turtles (for sources <2 kHz)	• 10 or 30 minutes (depending on fuel constraints of the platform)
• Active acoustic sources with shut down (but not power down) capabilities: – Low-frequency active sonar <200 dB – Mid-frequency active sonar sources that are not hull mounted on a surface ship (e.g., dipping sonar, towed arrays) – High-frequency active sonar – Air guns – Broadband and other active acoustic sources <200 dB	• 200 yd from active acoustic sources (shut down)			
Pile Driving and Pile Removal				
• Vibratory and impact pile driving and removal	• 100 yd from piles being driven or removed (cease pile driving or removal)	• One Lookout on one of the following: – Shore – Pier – Small boat	• 15 minutes prior to the initial start of pile driving or pile removal for: – Marine mammals – Sea turtles – Floating vegetation • During pile driving or removal for: – Marine mammals – Sea turtles	• 15 minutes

Table 5-2: Activity-based Mitigations for Acoustic Stressors (continued)

Mitigation Category	*Mitigation Zones*	*Lookouts*	*Mitigation Requirement Timing*	*Wait Period*
Weapon Firing Noise				
• Explosive and non-explosive large-caliber gunnery firing noise (surface-to-surface and surface-to-air)	• 30 degrees on either side of the firing line out to 70 yd from the gun muzzle (cease fire	• One Lookout on a vessel	• Immediately prior to the initial start of large-caliber gun firing (e.g., during target deployment) for: — Marine mammals — Sea turtles — Floating vegetation • During large-caliber gun firing for: — Marine mammals — Sea turtles	• 30 minutes

Table 5-3: Activity-based Mitigations for Explosives

Mitigation Category	Mitigation Zones	Lookouts	Mitigation Requirement Timing	Wait Period
Explosive Bombs				
• Any NEW	• 2,500 yd from the intended target (cease fire)	• One Lookout in an aircraft	• Immediately prior to the initial start of bomb delivery (e.g., when arriving on station) for: – Marine mammals – Sea turtles – Floating vegetation • During bomb delivery for: – Marine mammals – Sea turtles • After the event, when practical, observe the detonation vicinity for incidents involving: – Marine mammals – Sea turtles	• 10 minutes
Explosive Gunnery				
• Air-to-surface medium-caliber	• 200 yd from the intended impact location (cease fire)	• One Lookout on a vessel or in an aircraft	• Immediately prior to the initial start of gun firing (e.g., while maneuvering on station) for: – Marine mammals – Sea turtles – Floating vegetation • During gunnery firing for: – Marine mammals – Sea turtles • After the event, when practical, observe the detonation vicinity for incidents involving: – Marine mammals – Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)
• Surface-to-surface medium-caliber	• 600 yd from the intended impact location (cease fire)			
• Surface-to-surface large-caliber	• 1,000 yd from the intended impact location (cease fire)			
Explosive Underwater Demolition Multiple Charge – Mat Weave and Obstacle Loading				
• Any NEW	• 700 yd from the detonation site (cease fire)	• Two Lookouts: one on a small boat and one on shore from an elevated platform	• For 30 min. prior to the first detonation, the Lookout positioned on a small boat will observe for: – Marine mammals – Sea turtles – Floating vegetation • For 10 min. prior to the first detonation, the Lookout positioned on shore will use binoculars to observe for: – Marine mammals – Sea turtles • During detonations, both Lookouts will observe for: – Marine mammals – Sea turtles • After the event, observe the detonation vicinity for 30 minutes for incidents involving: – Marine mammals – Sea turtles	• 10 minutes (determined by the shore observer)

Table 5-3: Activity-based Mitigations for Explosives (continued)

Mitigation Category	*Mitigation Zones*	*Lookouts*	*Mitigation Requirement Timing*	*Wait Period*
Explosive Mine Countermeasure and Neutralization (No Divers)				
• 0.1–5 lb. NEW	• 600 yd from the detonation site (cease fire)	• One Lookout on a vessel or in an aircraft	• Immediately prior to the initial start of detonations (e.g., while maneuvering on station; typically, 10 or 30 minutes depending on fuel constraints) for: — Marine mammals — Sea turtles — Floating vegetation • During detonations or fuse initiation for: — Marine mammals — Sea turtles — Concentrations of seabirds or individual foraging seabirds • After the event, observe the detonation vicinity for 10 or 30 minutes (depending on fuel constraints), for incidents involving: — Marine mammals — Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)
• >5 lb. NEW	• 2,100 yd from the detonation site (cease fire)	• Two Lookouts: one in a small boat and one in an aircraft		
Explosive Mine Neutralization (With Divers)				
• 0.1–20 lb. NEW (positive control)	• 500 yd from the detonation site (cease fire)	• Two Lookouts in two small boats (one Lookout per boat), or one small boat and one rotary-wing aircraft (with one Lookout each), and one Lookout on shore for shallow-water events	• Time-delay devices will be set not to exceed 10 minutes • Immediately prior to the initial start of detonations or fuse initiation for positive control events (e.g., while maneuvering on station) or for 30 minutes prior for time-delay events for: — Marine mammals — Sea turtles — Floating vegetation • During detonations or fuse initiation for: — Marine mammals — Sea turtles — Concentrations of seabirds or individual foraging seabirds in the water during shallow-water events: A shore-based Lookout will survey the mitigation zone with binoculars before and after each detonation. If events involve multiple detonations, the second (or third, etc.) detonation will occur immediately after the preceding detonation (i.e., within 10 seconds), or after 30 min. — Hammerhead sharks within the Southern California Range Complex: Divers will notify the support boat or Range Safety Officer of sightings (of any hammerhead, due to difficulty in differentiating species). Detonations will cease if divers sight a hammerhead when setting charges and will recommence when it is no longer observed. • When practical based on mission, safety, and environmental conditions: — Boats will observe from the mitigation zone radius mid-point — When two are used, boats will observe from opposite sides of the mine location — Platforms will travel a circular pattern around the mine location — Boats will have one Lookout observe inward toward the mine location and one observe outward toward the mitigation zone perimeter — Divers will be part of the Lookout Team • After the event, observe the detonation vicinity for 30 minutes for incidents involving: — Marine mammals — Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)
• 0.1–29 lb. NEW (time-delay) • >20–60 lb. NEW (positive control)	• 1,000 yd from the detonation site (cease fire)	• Four Lookouts in two small boats (two Lookouts per boat), and one additional Lookout in an aircraft if used in the event		

Table 5-3: Activity-based Mitigations for Explosives (continued)

Mitigation Category	*Mitigation Zones*	*Lookouts*	*Mitigation Requirement Timing*	*Wait Period*
Explosive Missiles and Rockets				
• 0.6–20 lb. NEW (air-to-surface)	• 900 yd from the intended impact location (cease fire)	• One Lookout in an aircraft	• Immediately prior to the initial start of missile or rocket delivery (e.g., during a fly-over of the mitigation zone) for: — Marine mammals — Sea turtles — Floating vegetation • During missile or rocket delivery for: — Marine mammals — Sea turtles • After the event, when practical, observe the detonation vicinity for incidents involving: — Marine mammals — Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)
• >20–500 lb. NEW (air-to-surface)	• 2,000 yd from the intended impact location (cease fire)			
Explosive Sonobuoys and Research-Based Sub-Surface Explosives				
• Any NEW of sonobuoys • 0.1–5 lb. NEW for other types of sub-surface explosives used in research applications	• 600 yd from the device or detonation site (cease fire)	• One Lookout on a small boat or in an aircraft • Lookouts would use information from passive acoustic detections to inform visual observations when passive acoustic devices are already being used prior to the initial start of detonations	• Immediately prior to the initial start of detonations (e.g., during sonobuoy deployment, which typically lasts 20 to 30 minutes) for: — Marine mammals — Sea turtles — Floating vegetation • During detonations for: — Marine mammals — Sea turtles • After the event, when practical, observe the detonation vicinity for incidents involving: — Marine mammals — Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)
Explosive Torpedoes				
• Any NEW	• 2,100 yd from the intended impact location (cease fire)	• One Lookout in an aircraft • Lookouts would use information from passive acoustic detections to inform visual observations when passive acoustic devices are already being used prior to the initial start of detonations	• Immediately prior to the initial start of detonations (e.g., during target deployment) for: — Marine mammals — Sea turtles — Floating vegetation — Jellyfish aggregations • During torpedo launches for: — Marine mammals — Sea turtles — Jellyfish aggregations • After the event, when practical, observe the detonation vicinity for incidents involving: — Marine mammals — Sea turtles	10 or 30 minutes (depending on fuel constraints of the platform)

Table 5-3: Activity-based Mitigations for Explosives (continued)

Mitigation Category	*Mitigation Zones*	*Lookouts*	*Mitigation Requirement Timing*	*Wait Period*
Ship Shock Trials				
• Any NEW	• 3.5 NM from the target ship hull (cease fire)	• On the day of the event, 10 observers (Lookouts and third-party observers combined), spread between aircraft or multiple vessels as specified in the event-specific mitigation plan	• The Navy will develop a detailed event-specific monitoring and mitigation plan in the year prior to the event and provide it to NMFS for review • Beginning at first light on days of detonation until the moment of detonation (as allowed by safety measures), for: — Marine mammals — Sea turtles — Floating vegetation — Jellyfish aggregations — Large schools of fish — Flocks of seabirds • If an incident involving a marine mammal or sea turtle is observed after an individual detonation, the Navy will follow established incident reporting procedures and halt any remaining detonations until the Navy can consult with NMFS and review or adapt the event-specific mitigation plan, if necessary • During the 2 days following the event at a minimum and up to 7 days at a maximum, and as specified in the event-specific mitigation plan, observe the detonation vicinity for incidents involving: — Marine mammals — Sea turtles	• 30 minutes
SINKEX				
• Any NEW	• 2.5 NM from the target ship hull (cease fire)	• Two Lookouts: one on a vessel and one in an aircraft • Lookouts would use information from passive acoustic detections to inform visual observations when passive acoustic devices are already being used during weapon firing	• During aerial observations for 90 minutes prior to the initial start of weapon firing for: — Marine mammals — Sea turtles — Floating vegetation — Jellyfish aggregations • From the vessel during weapon firing, and from the aircraft and vessel immediately after planned or unplanned breaks in weapon firing of more than 2 hours for: — Marine mammals — Sea turtles • Observe the detonation vicinity for 2 hours after sinking the vessel or until sunset, whichever comes first, for incidents involving: — Marine mammals — Sea turtles	• 30 minutes

Table 5-4: Activity-based Mitigations for Non-Explosive Ordnance

Mitigation Category	*Mitigation Zones*	*Lookouts*	*Mitigation Requirement Timing*	*Wait Period*
Non-Explosive Aerial-Deployed Mines and Bombs				
• Non-explosive aerial-deployed mines • Non-explosive bombs	• 1,000 yd from the intended target (cease fire)	• One Lookout in an aircraft	• Immediately prior to the initial start of mine or bomb delivery (e.g., when arriving on station) for: — Marine mammals — Sea turtles — Floating vegetation • During mine or bomb delivery for: — Marine mammals — Sea turtles	• 10 minutes
Non-Explosive Gunnery				
• Non-explosive surface-to-surface large-caliber ordnance • Non-explosive surface-to-surface and air-to-surface medium-caliber ordnance • Non-explosive surface-to-surface and air-to-surface small-caliber ordnance	• 200 yd from the intended impact location (cease fire)	• One Lookout on a vessel or in an aircraft	• Immediately prior to the initial start of gun firing (e.g., while maneuvering on station) for: — Marine mammals — Sea turtles — Floating vegetation • During gunnery firing for: — Marine mammals — Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)
Non-Explosive Missiles and Rockets				
• Non-explosives (air-to-surface)	• 900 yd from the intended impact location (cease fire)	• One Lookout in an aircraft	• Immediately prior to the start of missile or rocket delivery (e.g., during a fly-over of the mitigation zone) for: — Marine mammals — Sea turtles — Floating vegetation • During missile or rocket delivery for: — Marine mammals — Sea turtles	• 10 or 30 minutes (depending on fuel constraints of the platform)

5.6.2 Mitigation Specific to Vessels, Vehicles, Deployment of Nets, and Towed In-Water Devices

Additional details on the activity-based mitigation requirements for vessels, unmanned vehicles, deployment of nets, and towed in-water devices are described in Table 5-5. For ship classes required to maintain more than one Lookout, the specific requirement is subject to change over time in accordance with the applicable navigation instruction, such as the Surface Ship Navigation Department Organization and Regulations Manual (U.S. Department of the Navy, 2021). The Action Proponents will notify NMFS should their Lookout policies change, including in the Surface Ship Navigation Department Organization and Regulations Manual. Mitigation will be implemented to the maximum extent practical based on the prevailing circumstances, including consideration of safety of vessels, unmanned vehicles, towing platforms, and crews, as well as maneuverability restrictions. Mitigation will not be implemented (1) by submerged submarines, (2) by unmanned vehicles except when escort vessels are already participating in the event and have positive control over the unmanned vehicle movements, (3) when marine mammals (e.g., dolphins) are determined to be intentionally swimming at the bow, alongside the vessel or vehicle, or directly behind the vessel or vehicle (e.g., to bow-ride or wake-ride), (4) when pinnipeds are hauled out on man-made navigational structures, port structures, and vessels, (5) by manned surface vessels and towed in-water devices actively participating in cable laying during Modernization & Sustainment of Ranges activities, and (6) when impractical based on mission requirements (e.g., during certain aspects of amphibious exercises).

Table 5-5: Activity-based Mitigations for Vessels, Vehicles, Towed In-Water Devices, and Net Deployment

Mitigation Category	*Lookouts*	*Mitigation Zones and Requirements*
Manned Surface Vessels		
• Manned surface vessels, including surfaced submarines	• One or more Lookouts on manned underway surface vessels in accordance with the most recent navigation safety instruction	• Immediately prior to manned surface vessels getting underway and while underway, the Lookout(s) will observe for: — Marine mammals — Sea turtles • Underway manned surface vessels will maneuver themselves (which may include reducing speed) to maintain the following distances as mission and circumstances allow: — 500 yd from whales — 200 yd from other marine mammals — Vicinity of sea turtles
Unmanned Vehicles		
• Unmanned Surface Vehicles and Unmanned Underwater Vehicles already being escorted (and operated under positive control) by a manned surface support vessel	• One Lookout on a surface support vessel that is already participating in the event, and has positive control over the unmanned vehicle	• Immediately prior to unmanned vehicles getting underway and while underway, the Lookout will observe for: — Marine mammals — Sea turtles • A surface support vessel that is already participating in the event, and has positive control over the unmanned vehicle, will maneuver the unmanned vehicle (which may include reducing its speed) to ensure it maintains the following distances as mission and circumstances allow: — 500 yd from whales — 200 yd from other marine mammals — Vicinity of sea turtles

Table 5-5: Activity-based Mitigations for Vessels, Vehicles, Towed In-Water Devices, and Net Deployment (continued)

Mitigation Category	*Lookouts*	*Mitigation Zones and Requirements*
Towed In-Water Devices		
• In-water devices towed by an aircraft, a manned surface vessel, or an Unmanned Surface Vehicle or Unmanned Underwater Vehicle already being escorted (and operated under positive control) by a manned surface vessel	• One Lookout on the manned towing vessel, or on a support vessel that is already participating in the event and has positive control over an unmanned vehicle that is towing an in-water device	• Immediately prior to and while in-water devices are being towed, the Lookout will observe for: — Marine mammals — Sea turtles • Manned towing platforms, or support vessels already participating in the event that have positive control over an unmanned vehicle that is towing an in-water device, will maneuver itself or the unmanned vehicle (which may include reducing speed) to ensure towed in-water devices maintain the following distances as mission and circumstances allow: — 250 yd from marine mammals — Vicinity of sea turtles
Net Deployment		
• Nets deployed for testing of an Unmanned Underwater Vehicle	• One Lookout on the support vessel	• For 15 min prior to the deployment of nets and while nets are deployed, the Lookout will observe for: — Marine mammals — Sea turtles • If a marine mammal or sea turtle is sighted within 500 yd of the deployment location, the support vessel will: — Delay deployment of nets until the mitigation zone has been clear for 15 minutes — Recover nets if they are deployed • Nets will be deployed during daylight hours only

5.6.3 Visual Observation Effectiveness

Oedekoven and Thomas (2022) evaluated the effectiveness of Navy Lookout Teams at detecting marine mammals before they entered a defined set of mitigation zones (i.e., 200, 500, and 1,000 yd). The study analyzed sighting data collected by the Navy over 27 embarks from 2010 to 2019. Results indicated that the effectiveness of Navy Lookout Teams was generally less than that of trained biologist observer teams, and varied by sighted species, group size, and distance. The Navy reviewed the same dataset used by Oedekoven and Thomas (2022), plus sonar use data, and found that sonar status (i.e., on versus off) was an important factor in evaluating how species availability may influence the prevalence of marine mammal sightings for Navy Lookouts and biologists alike. Sighting rates near vessels using hull-mounted active sonar were lower when sonar was on versus off, suggesting that a portion of marine mammals were not available to be sighted when the sonar was on (due to changed surfacing behavior or avoiding close exposures to sonar) (Navy, 2023). Table 5-6 provides a summary of the factors that could potentially influence the real-time effectiveness of the Action Proponents' visual observations (Barlow, 2015; Jefferson et al., 2015; Navy, 2023; Oedekoven & Thomas, 2022). As described in Appendix E (Acoustic and Explosives Impacts Analysis), the quantitative analysis for this Draft EIS/OEIS does not reduce model-estimated impacts to account for activity-based mitigation.

Table 5-6: Potential Factors Influencing Visual Observation Effectiveness

<table>
<tr><th>Factor</th><th>Description of Influence on Sightability</th></tr>
<tr><td>Species dive behavior</td><td rowspan="2">Long-duration and deep-diving species are not at the surface often or for long periods of time, which limits the amount of time they are available to be seen by Lookouts. Group size also influences sightability. Species that travel in groups or large pods (e.g., delphinids, sperm whales, fin whales) are generally easier to detect than solitary individuals or pairs. Information on dive behaviors and group sizes for species that occur in the Study Area is provided in the technical reports titled Dive Distribution for Marine Species Occurring in the U.S. Navy's Atlantic and Hawaii and California Training and Testing Study Areas and the U.S. Navy Marine Species Density Database Phase IV for the Atlantic Fleet Training and Testing Study Area.</td></tr>
<tr><td>Species group size</td></tr>
<tr><td>Species physical traits and surface behaviors</td><td>Larger-bodied species (e.g., baleen and sperm whales) or species with tall dorsal fins (e.g., killer whales) would generally be easier to detect relative to small-bodied species and species without dorsal fins (e.g., pinnipeds, sea turtles). Similarly, species with highly conspicuous surface-active behaviors (e.g., breaching, leaping, bow-riding) are generally easier to detect than cryptic species. For example, whales that fluke regularly (e.g., humpback and North Atlantic right whales) or variably (e.g., blue and fin whales) before they dive may be easier to detect than those that fluke rarely (e.g., sei, common minke, and Bryde's whales). Similarly, species that are active at the surface (e.g., bottlenose and spinner dolphins) or remain at the surface for extended periods of time as they forage or socialize (e.g., sperm and North Atlantic right whales) would be easier to detect than cryptic species that surface inconspicuously (e.g., harbor porpoises, beaked whales, dwarf and pygmy sperm whales, sea turtles). Prominent blows, such as those exhibited by many species of baleen whales (e.g., humpback whales) are easier to detect than small or less visible blows (e.g., Bryde's and common minke whales). Some species do not exhibit a blow when they surface to breathe (e.g., pinnipeds, sea turtles).</td></tr>
<tr><td>Observation conditions</td><td>Weather conditions, such as clear daytime skies, low sea states, low winds (i.e., low prevalence of white caps), and low glare are optimal for marine species observations. Animal sightability generally declines as viewing conditions decline.</td></tr>
<tr><td>Observation area and platform</td><td>Marine mammal and sea turtle sightability may be influenced by the mitigation zone size, observation platform, and distance between the two. Aircraft (when not operating at high altitudes) generally have the best vantage point for observing throughout an entire mitigation zone due to their height and speed over the water, and ability to conduct close-approach flyovers (depending on the event). Aircraft Lookouts are typically existing crewmembers responsible for other essential tasks (e.g., navigation), and some types of aircraft may have windows that are small or positioned in a way that partially obstruct views of the sea space directly beneath the aircraft. Due to their low vantage point on the water, Lookouts in small boats may be more likely to detect animals in close proximity to the boat or that display conspicuous visual cues (e.g., blows, splashes, flukes, travel in groups) than animals at further distances (e.g., near a mitigation zone perimeter) or that display inconspicuous visual cues (e.g., solitary sea turtles surfacing without a splash). The bridges of surface ships offer a higher vantage point relative to small boats. For certain events, such as hull-mounted active sonar, the mitigation zone is located directly around the hull of the ship on which the Lookout is positioned. Species sightability would generally decrease with distance, particularly for mitigation zones located far from the observation platform (e.g., a gunnery mitigation zone several NM down range). The use of hand-held or big-eye binoculars can help compensate for the difficulty of sighting animals at distance (depending on the event).</td></tr>
</table>

5.7 Geographic Mitigation

Designated portions of the Study Area where the Action Proponents will implement geographic mitigation for physical habitats, marine species habitats, or cultural resources are referred to as "mitigation areas" (see Figure 5-2 and Figure 5-3). As described in Chapter 2, Section 2.1, the HCTT Study Area includes additional areas including the PMSR and the NOCAL Range Complex. Due to the addition of these areas and the consideration of best available science, there will be new mitigation areas evaluated and implemented, which is detailed in Appendix K. The remainder of this section provides the geographic mitigation requirements and a qualitative discussion of their environmental benefits. Mitigation areas apply year-round unless specified otherwise, and do not apply to *de minimis* sources. Detailed descriptions of important seafloor habitats (e.g., for corals), marine mammal habitats, and cultural resources (e.g., shipwrecks), as well as maps depicting how these features overlap the mitigation areas, are provided in Appendix H or Sections 3.5, 3.7, and 3.10.

If there should be any need to modify the geographic mitigation described in this section during the conduct of training or testing, event participants will be required to obtain permission from the appropriate designated point of contact (e.g., Naval Command Authority) prior to commencement of the applicable event. The Action Proponents would provide NMFS with advance notification and include relevant information about the event (e.g., sonar hours, use of explosives) in their annual training and testing activity reports.

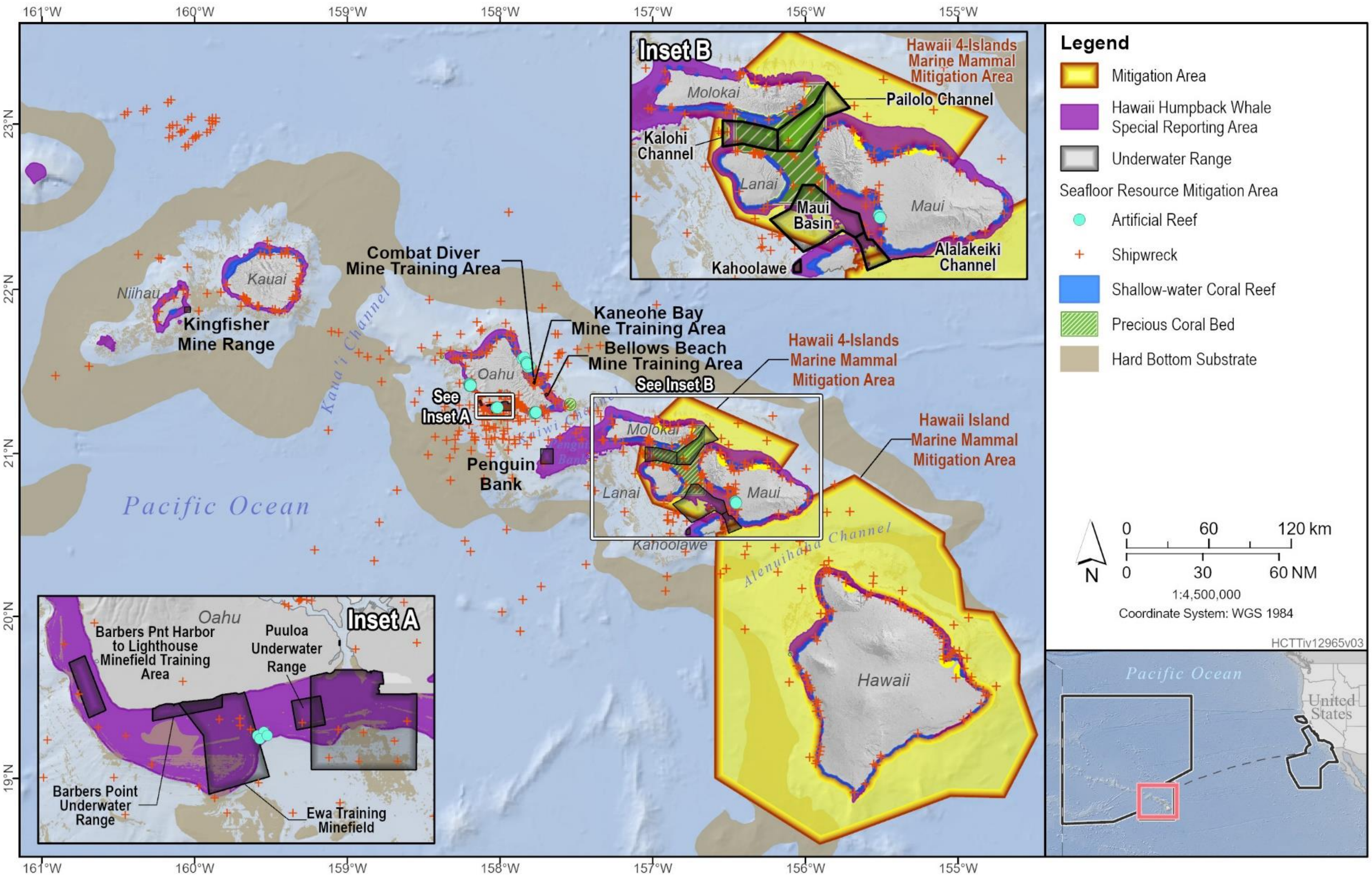

Figure 5-2: Mitigation Areas in the Hawaii Portion of the Study Area

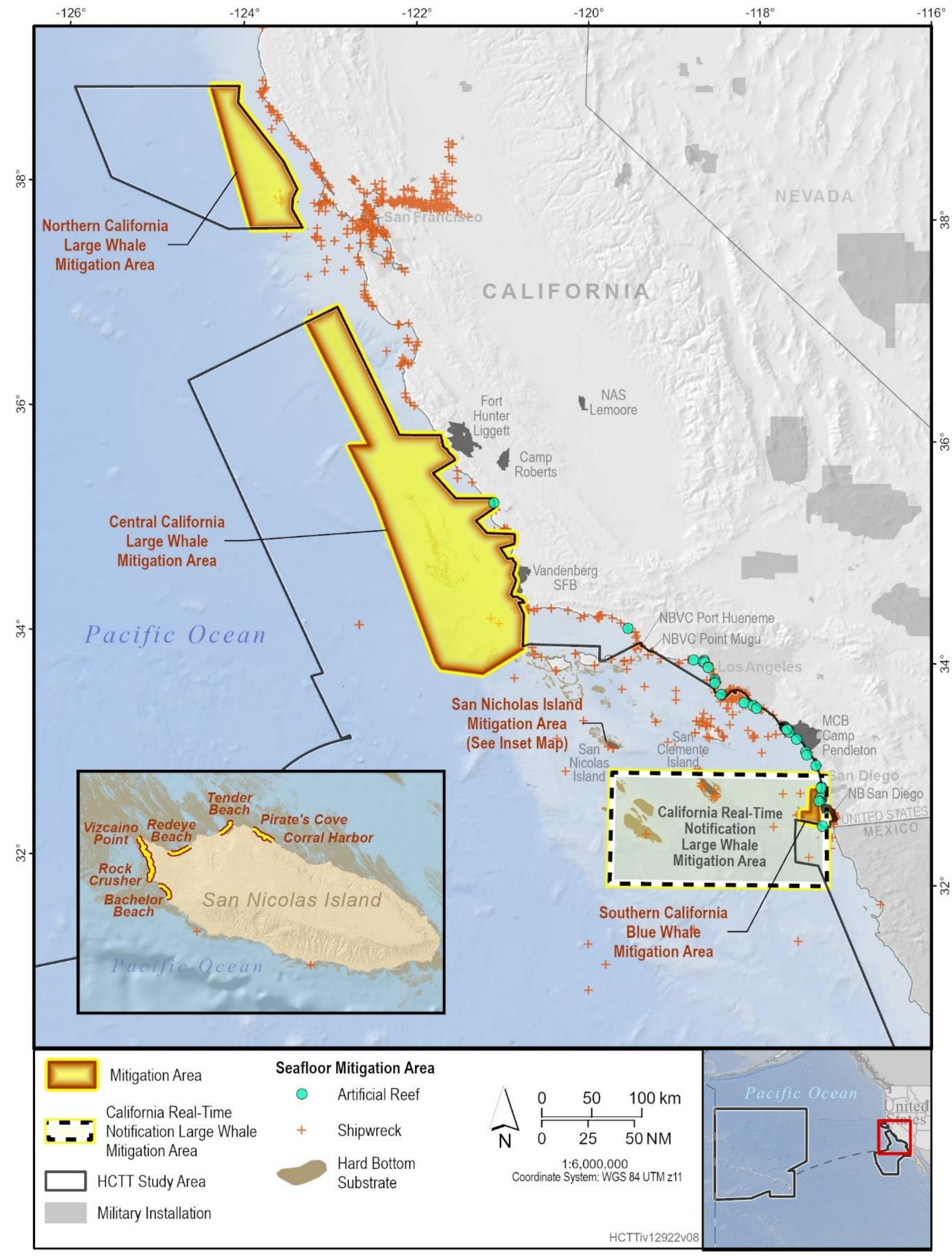

Figure 5-3: Mitigation Areas in the California Portion of the Study Area

5.7.1 Shallow-Water Coral Reef and Precious Coral Bed Mitigation Areas

Table 5-7 details geographic mitigation designed to avoid potential impacts from explosives and physical disturbance and strike stressors on shallow-water coral reefs and precious coral beds, as well as their critical ecosystem functions and socioeconomic value. Mitigation will also help avoid potential impacts on organisms (e.g., invertebrates, fishes, sea turtles) that use these habitats for sheltering, resting, feeding, or other important life processes. The mitigation is a continuation from the 2018 HSTT EIS/OEIS. The overall effectiveness of the mitigation areas would be correlated with the quality (e.g., accuracy) of the underlying mapping data, as discussed in *Phase IV Hawaii California Training and Testing EIS/OEIS: Marine Benthic Habitat Database Technical Report* (U.S. Department of the Navy, 2024).

Table 5-7: Shallow-Water Coral Reef and Precious Coral Bed Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Explosives	• The Action Proponents will not detonate any in-water explosives (including underwater explosives and explosives deployed against surface targets) within a horizontal distance of 350 yd from shallow-water coral reefs and precious coral beds (except in designated areas of the Hawaii and California OPAREAs, such as the nearshore areas of San Clemente Island and in the Silver Strand Training Complex, where these features will be avoided to the maximum extent practical).	• The 350-yd mitigation area radius for in-water explosives was conservatively designed to be several times larger than the impact footprint (e.g., crater and expelled material radius) of the largest bottom-laid explosive used in the Study Area. As described in Appendix I, that explosive is a 650-lb. NEW mine with an estimated impact footprint radius of 22.7 yd. The 350-yd mitigation area radius is 11 times larger than the maximum estimated explosive impact footprint radius, and is even more conservatively sized when compared to the impact footprints of smaller explosives. Therefore, the mitigation will prevent direct impacts (and some level of indirect impacts) from explosives on shallow-water coral reefs and precious coral beds in the Study Area.
Physical disturbance and strike	• The Action Proponents will not set vessel anchors within the anchor swing circle radius from shallow-water coral reefs and precious coral beds (except in designated anchorages). • The Action Proponents will not place non-explosive seafloor devices or deploy non-explosive ordnance against surface targets (including aerial-deployed mine shapes) within a horizontal distance of 350 yd from shallow-water coral reefs and precious coral beds (except in designated areas in the Hawaii and California OPAREAs, such as the nearshore areas of San Clemente Island and in the Silver Strand Training Complex, where these features will be avoided to the maximum extent practical).	• The anchor swing circle mitigation will ensure that vessel anchors do not come into contact with shallow-water coral reefs and precious coral beds when factoring in environmental conditions that could affect anchoring position, such as winds, currents, and water depth. • For ease of implementation, the 350-yd mitigation area radius for explosives was also adopted for seafloor devices and non-explosive ordnance deployed against surface targets. This mitigation area radius is even more conservative when compared to the small impact footprints of these non-explosive stressors. Therefore, the mitigation will prevent direct impacts (and some level of indirect impacts) from seafloor devices and non-explosive ordnance deployed against surface targets on shallow-water coral reefs and precious coral beds.

5.7.2 Artificial Reef, Hard Bottom Substrate, and Shipwreck Mitigation Areas

Table 5-8 details geographic mitigation for explosives and physical disturbance and strike stressors near artificial reefs, hard bottom substrate, and shipwrecks. For mitigation, the term "hard bottom substrate" is defined as substrate in the marine environment which could support a covering of biotic features (e.g., seaweed, sponges, hard corals). Mitigation will also help avoid potential impacts on organisms (e.g., invertebrates, fishes, sea turtles) that use these seafloor resources for sheltering, resting, feeding, or other important life processes. The mitigation is a continuation from the 2018 HSTT and 2022 HSTT Essential Fish Habitat consultation reinitiation, except for an extension of the precisely placed non-explosive seafloor device requirements to artificial reefs and shipwrecks. The overall effectiveness of the mitigation would be correlated with the quality (e.g., accuracy) of the underlying mapping data, as discussed in *Phase IV Hawaii California Training and Testing EIS/OEIS: Marine Benthic Habitat Database Technical Report* (U.S. Department of the Navy, 2024).

Table 5-8: Artificial Reef, Hard Bottom Substrate, and Shipwreck Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Explosives	• The Action Proponents will not detonate explosives on or near the seafloor (e.g., explosive bottom-laid or moored mines) within a horizontal distance of 350 yd from artificial reefs, hard bottom substrate, and shipwrecks (except in designated areas in the Hawaii California OPAREAs, such as the nearshore areas of San Clemente Island and in the Silver Strand Training Complex, where these features will be avoided to the maximum extent practical).	• The 350-yd mitigation area radius will prevent direct impacts (and some level of indirect impacts) from explosives on artificial reefs, hard bottom substrate, and shipwrecks for the reasons described in Section 5.7.1 (Shallow-Water Coral Reef and Precious Coral Bed Mitigation Areas).
Physical disturbance and strike	• The Action Proponents will not set vessel anchors within the anchor swing circle radius from artificial reefs, hard bottom substrate, and shipwrecks (except in designated anchorages). • The Action Proponents will not place non-explosive seafloor devices (that are not precisely placed) within a horizontal distance of 350 yd from artificial reefs, hard bottom substrate, and shipwrecks (except as described in the bullet above for vessel anchors, the bullet below for precisely placed seafloor devices, and in designated areas of the Hawaii and California OPAREAs, such as the nearshore areas of San Clemente Island and in the Silver Strand Training Complex, where these features will be avoided to the maximum extent practical). • The Action Proponents will not position precisely placed non-explosive seafloor devices directly on artificial reefs, hard bottom substrate, or shipwrecks. • The Action Proponents will avoid positioning precisely placed non-explosive seafloor devices near these resources by the largest distance that is practical to implement based on mission requirements.	• Mitigation ensures that vessel anchors do not come into contact with artificial reefs, hard bottom substrate, and shipwrecks, when factoring in environmental conditions that could affect anchoring position, such as winds, currents, and water depth. • For ease of implementation, the 350-yd mitigation area radius for explosives was also adopted for seafloor devices (that are not precisely placed), and is even more conservative when compared to the small impact footprints of non-explosive seafloor devices. • Mitigation specific to precisely placed seafloor devices was first developed and coordinated with NMFS for live hard bottom habitats during the 2022 HSTT Study Area's Essential Fish Habitat consultation reinitiation (U.S. Department of the Navy, 2022). That mitigation is being included in this document, and applied to the whole mitigation area category of hard bottom substrate as well as artificial reefs and shipwrecks, for consistency and practicality of implementation. Because precisely placed seafloor devices are deployed with a high degree of placement accuracy, the original intent of the mitigation (i.e., preventing direct physical strike and disturbance) will continue to be achieved. Therefore, the mitigation for seafloor devices that are either precisely placed or not precisely placed will collectively prevent direct impacts (and some level of indirect impacts) from seafloor devices on artificial reefs, hard bottom substrate, and shipwrecks.

5.7.3 Hawaii Island Marine Mammal Mitigation Area

Table 5-9 details geographic mitigation related to the use of active sonar and explosives off Hawaii Island. The mitigation is a continuation from the 2018 HSTT EIS/OEIS.

Table 5-9: Hawaii Island Marine Mammal Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic	• The Action Proponents will not use more than 300 hours of MF1 surface ship hull-mounted mid-frequency active sonar or 20 hours of helicopter dipping sonar (a mid-frequency active sonar source) annually within the mitigation area.	• Mitigation is designed to reduce exposure of numerous small and resident marine mammal populations (including Blainville's beaked whales, bottlenose dolphins, Goose-beaked whales, dwarf sperm whales, false killer whales, melon-headed whales, pantropical spotted dolphins, pygmy killer whales, rough-toothed dolphins, short-finned pilot whales, and spinner dolphins), humpback whales within important seasonal reproductive habitat, and Hawaiian monk seals within critical habitat, to levels of sound that have the potential to cause injurious or behavioral impacts.
Explosives	• The Action Proponents will not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) within the mitigation area.	• Mitigation is designed to prevent exposure of the species discussed above to explosives that have the potential to cause injury, mortality, or behavioral disturbance.

5.7.4 Hawaii 4-Islands Marine Mammal Mitigation Area

Table 5-10 details geographic mitigation related to the use of active sonar and explosives off Molokai, Maui, Lanai, and Kahoolawe Islands. The mitigation is a continuation from the 2018 HSTT EIS/OEIS.

Table 5-10: Hawaii 4-Islands Marine Mammal Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic	• From November 15 – April 15, the Action Proponents will not use MF1 surface ship hull-mounted mid-frequency active sonar within the mitigation area.	• Mitigation is designed to minimize exposure of humpback whales in high-density seasonal reproductive habitats (e.g., north of Maui and Molokai) and Main Hawaiian Islands insular false killer whales in high seasonal occurrence areas to levels of sound that have the potential to cause injurious or behavioral impacts.
Explosives	• The Action Proponents will not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) within the mitigation area (year-round).	• Mitigation is designed to prevent exposure of humpback whales in high-density seasonal reproductive habitats (e.g., north of Maui and Molokai), Main Hawaiian Islands insular false killer whales in high seasonal occurrence areas, and numerous small and resident marine mammal populations that occur year-round (including bottlenose dolphins, pantropical spotted dolphins, and spinner dolphins, and Hawaiian monk seals) to explosives that have the potential to cause injury, mortality, or behavioral disturbance.

5.7.5 Hawaii Humpback Whale Special Reporting Mitigation Area

Table 5-11 details special reporting requirements related to the use of active sonar off all eight main Hawaiian Islands as well as some submerged features (e.g., Middle Bank). The mitigation is a continuation from the 2018 HSTT EIS/OEIS with a modified geographic extent based on based available science.

Table 5-11: Hawaii Humpback Whale Special Reporting Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic	• The Action Proponents will report the total hours of MF1 surface ship hull-mounted mid-frequency active sonar used December 15 – April 15 in the mitigation area in their training and testing activity reports submitted to NMFS.	• Special reporting requirements are designed to aid NMFS' and the Action Proponents' analysis of potential impacts in the mitigation area, which contains the Humpback Whale National Marine Sanctuary plus a 5-kilometer sanctuary buffer (excluding the Pacific Missile Range Facility).

5.7.6 Hawaii Humpback Whale Awareness Messages

Table 5-12 details awareness message requirements for the Hawaii Range Complex. The mitigation is a continuation from the 2018 HSTT EIS/OEIS.

Table 5-12: Hawaii Humpback Whale Awareness Message Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic, Explosives, Physical disturbance and strike	• The Action Proponents will broadcast awareness messages to alert applicable assets (and their Lookouts) transiting and training or testing in the Hawaii Range Complex to the possible presence of concentrations of humpback whales from November through April. • Lookouts will use that knowledge to help inform their visual observations during military readiness activities that involve vessel movements, active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or the deployment of non-explosive ordnance against surface targets in the Hawaii Range Complex.	• Mitigation is designed to minimize potential humpback whale vessel interactions and exposure to acoustic, explosive, and physical disturbance and strike stressors that have the potential to cause mortality, injury, or behavioral disturbance during the reproductive season. • The Hawaii Humpback Whale Awareness Messages apply to the entire Hawaii Range Complex; therefore, the mitigation described in Table 5-9, Table 5-10, and Table 5-11 is in addition to the requirements described for this overlapping area.

5.7.7 Northern California Large Whale Mitigation Area

Table 5-13 details geographic mitigation related to the use of active sonar off the California coast, generally extending from Point Arena to an area west of The Farallon Islands. The mitigation is new for this Draft EIS/OEIS.

Table 5-13: Northern California Large Whale Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic	• From June 1 – October 31, the Action Proponents will not use more than 300 hours of MF1 surface ship hull-mounted mid-frequency active sonar (excluding normal maintenance and systems checks) total during training and testing within the combination of this mitigation area, the Central California Large Whale Mitigation Area, and the Southern California Blue Whale Mitigation Area.	• Mitigation to limit use of MF1 active sonar is designed to reduce exposure of blue whales, fin whales, gray whales, and humpback whales in important seasonal foraging, migratory, and calving habitats to levels of sound that have the potential to cause injurious or behavioral impacts.

5.7.8 Central California Large Whale Mitigation Area

Table 5-14 details geographic mitigation related to the use of active sonar off the California coast, generally extending from Monterey Bay to San Miguel Island. The mitigation is new for this Draft EIS/OEIS.

Table 5-14: Central California Large Whale Mitigation Area Requirements

Category	Mitigation Requirements	Mitigation Benefits
Acoustic	• From June 1 – October 31, the Action Proponents will not use more than 300 hours of MF1 surface ship hull-mounted mid-frequency active sonar (excluding normal maintenance and systems checks) total during training and testing within the combination of this mitigation area, the Northern California Large Whale Mitigation Area, and the Southern California Blue Whale Mitigation Area.	• Mitigation to limit use of MF1 active sonar is designed to reduce exposure of blue whales, fin whales, gray whales, and humpback whales in important seasonal foraging, migratory, and calving habitats to levels of sound that have the potential to cause injurious or behavioral impacts.

5.7.9 Southern California Blue Whale Mitigation Area

Table 5-15 details geographic mitigation related to the use of active sonar and explosives off San Diego, California. The mitigation is a continuation from the 2018 HSTT EIS/OEIS with a modified geographic extent based on best available science.

Table 5-15: Southern California Blue Whale Mitigation Area Requirements

Category	Mitigation Requirements	Mitigation Benefits
Acoustic	• From June 1 – October 31, the Action Proponents will not use more than 300 hours of MF1 surface ship hull-mounted mid-frequency active sonar (excluding normal maintenance and systems checks) total during training and testing within the combination of this mitigation area, the Northern California Large Whale Mitigation Area, and the Central California Large Whale Mitigation Area.	• Mitigation to limit use of MF1 active sonar is designed to reduce exposure of blue whales within important seasonal foraging habitats to levels of sound that have the potential to cause injurious or behavioral impacts.
Explosives	• From June 1 – October 31, the Action Proponents will not detonate in-water explosives (including underwater explosives and explosives deployed against surface targets) during large-caliber gunnery, torpedo, bombing, and missile (including 2.75” rockets) training and testing.	• Mitigation to limit the use of in-water explosives is designed to reduce exposure of blue whales within important seasonal foraging habitats to explosives that have the potential to cause injury, mortality, or behavioral disturbance.

5.7.10 California Large Whale Awareness Messages

Table 5-16 details awareness message requirements for the California Study Area. The mitigation is a continuation from the 2018 HSTT EIS/OEIS with an updated geographic extent consistent with the expanded California Study Area.

Table 5-16: California Large Whale Awareness Message Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Acoustic, Explosives, Physical disturbance and strike	• The Action Proponents will broadcast awareness messages to alert applicable assets (and their Lookouts) transiting and training or testing off the U.S. West Coast to the possible presence of concentrations of large whales, including gray whales (November–March), fin whales (November–May), and mixed concentrations of blue, humpback, and fin whales that may occur based on predicted oceanographic conditions for a given year (e.g., May–November, April–November). Awareness messages may provide the following types of information which could vary annually: — While blue whales tend to be more transitory, some fin whales are year-round residents that can be expected in nearshore waters within 10 NM of the California mainland and offshore operating areas at any time. — Fin whales occur in groups of one to three individuals, 90 percent of the time, and in groups of four or more individuals, 10 percent of the time. — Unique to fin whales offshore southern California (including the Santa Barbara Channel and PMSR area), there could be multiple individuals and/or separate groups scattered within a relatively small area (1–2 NM) due to foraging or social interactions. — When a large whale is observed, this may be an indicator that additional marine mammals are present and nearby, and the vessel should take this into consideration when transiting. — Lookouts will use that knowledge to help inform their visual observations during military readiness activities that involve vessel movements, active sonar, in-water explosives (including underwater explosives and explosives deployed against surface targets), or the deployment of non-explosive ordnance against surface targets in the California Study Area.	• Mitigation to broadcast awareness messages to applicable assets, and to use that information to inform visual observations, is designed to minimize potential blue whale, gray whale, and fin whale vessel interactions and exposure to acoustic stressors, explosives, and physical disturbance and strike stressors that have the potential to cause mortality, injury, or behavioral disturbance during the foraging and migration seasons, and to resident whales.

5.7.11 California Real-Time Notification Large Whale Mitigation Area

Table 5-17 details real-time notification requirements for a designated area within the SOCAL Range Complex. The mitigation is a continuation from the NMFS 2024 HSTT BO Reinitiation.

Table 5-17: California Real-Time Notification Large Whale Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
Physical disturbance and strike	• The Action Proponents will issue real-time notifications to alert Action Proponent vessels operating in the vicinity of large whale aggregations (four or more whales) sighted within 1 NM of an Action Proponent vessel within an area of the Southern California Range Complex (between 32–33 degrees North and 117.2–119.5 degrees West). — The four whales that make up a defined "aggregation" would not all need to be from the same species, and the aggregation could consist either of a single group of four (or more) whales, or any combination of smaller groups totaling four (e.g., two groups of two whales each or a group of three whales and a solitary whale) within the 1 NM zone. — Lookouts will use the information from the real-time notifications to inform their visual observations of applicable mitigation zones. If Lookouts observe a large whale aggregation within 1 NM of the event vicinity within the area between 32–33 degrees North and 117.2–119.5 degrees West, the watch station will initiate communication with the designated point of contact to contribute to the Navy's real-time sighting notification system.	• The real-time notification area encompasses the locations of recent (2009, 2021) vessel strikes, and historic strikes where precise latitude and longitude were known.

5.7.12 San Nicolas Island Pinniped Haulout Mitigation Area

Table 5-18 details geographic mitigation related to in-air vehicle launch noise and associated monitoring for pinniped haulout locations on San Nicolas Island, California. The mitigation is an adaptation of procedural mitigation from the 2022 PMSR EIS/OEIS.

Table 5-18: San Nicolas Island Pinniped Haulout Mitigation Area Requirements

Category	*Mitigation Requirements*	*Mitigation Benefits*
In-air vehicle launch noise	• Navy personnel shall not enter pinniped haulout or rookery areas. Personnel may be adjacent to pinniped haulouts and rookery prior to and following a launch for monitoring purposes. • Missiles shall not cross over pinniped haulout areas at altitudes less than 305 m (1,000 ft.). • The Navy may not conduct more than 10 launch events at night annually. • Launch events shall be scheduled to avoid the peak pinniped pupping seasons from January through July, to the maximum extent practicable. • The Navy shall implement a monitoring plan using video and acoustic monitoring of up to three pinniped haulout areas and rookeries during launch events that include missiles or targets that have not been previously monitored for at least three launch events.	• Mitigation is designed to minimize in-air launch noise and physical disturbance to pinnipeds hauled out on beaches, as well as to continue assessing baseline pinniped distribution/abundance and potential changes in pinniped use of these beaches after launch events.

5.8 Summary of New or Modified Mitigation Requirements

Table 5-19 summarizes new mitigation measures and substantive modifications to existing measures.

Table 5-19: Summary of New or Modified Mitigation Requirements

Category	*Changes in Mitigation Requirements for this Draft EIS/OEIS*
Activity-based Mitigation	
Lookout Teams	This Draft EIS/OEIS includes a requirement for additional personnel on the platform conducting the event, or on additional participating platforms, to serve as part of the Lookout Team for all acoustic, explosive, and physical disturbance and strike stressor mitigation categories. In the 2018 HSTT and 2022 PMSR EIS/OEISs, additional personnel were required to assist Lookouts for explosive events only. The Action Proponents have also been, in practice, implementing this for active sonar and non-explosive events, and are now formalizing their current practice as a requirement. Additionally, the *U.S. Navy Lookout Training Handbook was* updated in 2022 to include a more robust chapter on environmental compliance, mitigation, and marine species observation tools and techniques (NAVEDTRA 12968-E). These changes are collectively designed to improve the effectiveness of activity-based mitigation.
Broadband and Other Active Acoustic Sources	For this Draft EIS/OEIS, a 200-yd shut down mitigation zone would apply to broadband and other active acoustic sources less than 200 dB, while the tiered 1,000-yd power down/500-yd power down/200-yd shut down mitigation zones would apply to those sources greater than or equal to 200 dB. This requirement is meant to encompass new acoustic sources (e.g., sources used for oceanographic and acoustic research) that use a range of frequencies. Broadband source mitigation zones were not specified in the 2018 HSTT and 2022 PMSR EIS/OEISs.
Air Guns	For this Draft EIS/OEIS, the air gun mitigation zone size has been increased from 150 yd to 200 yd for consistency with other active acoustic sources.
High-Altitude Aircraft	This Draft EIS/OEIS clarifies that aircraft operating at high altitudes (e.g., Maritime Patrol Aircraft) are exempt from requirements to conduct activity-based mitigation. When operating at high altitudes, observations for marine mammals or sea turtles would not be effective.
Vessel Movements	This Draft EIS/OEIS clarifies that one or more Lookouts will be posted in accordance with the most recent navigation guidance, which is subject to change over time. The 2018 HSTT and 2022 PMSR EIS/OEISs required one Lookout on underway vessels.

Table 5-19: Summary of New or Modified Mitigation Requirements (continued)

Category	*Changes in Mitigation Requirements for this Draft EIS/OEIS*
Unmanned Vehicles	This Draft EIS/OEIS includes new activity-based mitigation requirements for applicable events that involve Unmanned Surface Vehicles and Unmanned Underwater Vehicles (and the sources they use, tow, or deploy) that are already being escorted and operated under positive control by a manned surface vessel. In the 2018 HSTT and 2022 PMSR EIS/OEISs, activity-based mitigations were not required for unmanned vehicles or sources they used, towed, or deployed.
Research-Based Sub-Surface Explosives	This Draft EIS/OEIS includes requirements for "research-based sub-surface explosives" to account for new explosive events with research applications e.g., (oceanographic and acoustic research) that would use 0.1 to 5-lb. NEW. These requirements are grouped within the explosive sonobuoy mitigation category because of their similarities between the charge sizes, detonation locations within the water column, and platforms that would be conducting activity-based mitigation.
Pile Driving	This Draft EIS/OEIS includes updated requirements to account for site-specific conditions at the Port Hueneme training location covered under this document. The 30 minute wait time in the 2018 HSTT EIS/OEIS would be impractical to implement during the training event due to pinniped presence and is adjusted to 15 minutes for this Draft EIS/OEIS. Ceasing activity for 30 minutes each time a pinniped enters the mitigation zone would result in schedule delays, degraded realism of training, and impact the Navy's ability to become proficient at this activity.
Net Deployment	This Draft EIS/OEIS includes requirements to account for new activities that involve the deployment and recovery of nets during Unmanned Underwater Vehicle testing. A 500 yd mitigation zone was established to delay deployment of and recover nets if a marine mammal or sea turtle is sighted by the Lookout on a support vessel.
Geographic Mitigation	
Artificial Reef, Hard Bottom Substrate, and Shipwreck Mitigation Areas	This Draft EIS/OEIS includes new mitigation for precisely placed seafloor devices developed for hard bottom substrate during the 2022 Hawaii-Southern California Training and Testing Study Area's Essential Fish Habitat consultation reinitiation (U.S. Department of the Navy, 2022). For this Draft Supplemental EIS/OEIS, that mitigation is being applied to the whole mitigation area category of hard bottom substrate as well as artificial reefs, submerged aquatic vegetation, and shipwrecks, for consistency and practicality of implementation.
San Nicolas Island Pinniped Haulout Mitigation Area	This Draft EIS/OEIS includes a new mitigation area for in-air vehicle launch noise and associated monitoring of pinniped haulout locations which was adapted from procedural mitigations in the 2022 Point Mugu Sea Range EIS/OEIS.
Northern California Large Whale Mitigation Area	This Draft EIS/OEIS includes a new mitigation area for blue whales, fin whales, gray whales, and humpback whales related to the use of active sonar off the northern California coast.
Central California Large Whale Mitigation Area	This Draft EIS/OEIS includes a new mitigation area for blue whales, fin whales, gray whales, and humpback whales related to the use of active sonar off the central California coast.
Southern California Blue Whale Mitigation Area	This Draft EIS/OEIS modifies the geographic extent of the 2018 HSTT EIS/OEIS California Blue Whale Mitigations Areas based on best available science. The mitigation area continues the requirements related to the use of active sonar and explosives.
California Large Whale Real-Time Notification Mitigation Area	This Draft EIS/OEIS includes a new mitigation area for issuing notifications about aggregations of large whales in an area that encompasses recent and historical vessel strikes.
Hawaii Humpback Whale Special Reporting Mitigation Area	This Draft EIS/OEIS expands the geographic extent of the 2018 HSTT EIS/OEIS Hawaii Humpback Whale Special Reporting Mitigation Area based on best available science. The mitigation area continues the requirements related to reporting the use of active sonar hours to NMFS.

5.9 Mitigation Considered but Eliminated

Mitigation measures that were considered but eliminated for not meeting the appropriate balance between being environmentally beneficial and practical to implement are described in Table 5-20.

Table 5-20: Mitigation Considered but Eliminated

Mitigation Considered	*Not Sufficiently Beneficial*	*Impractical*			*Assessment Summary*
		Criterion 1: Safety	*Criterion 2: Sustainability*	*Criterion 3: Mission*	
1. Mitigating for navigation sonar		X			Shutting down or powering down active sonar used for safety of navigation would present unacceptable safety risks to personnel and equipment.
2. Activity-based Mitigations for long-duration acoustic sources			X		Long-duration active sonar sources, such as the low-level sources used by the Office of Naval Research for acoustic and oceanographic research, are deployed in remote locations for long time spans (e.g., 1 year). Adding visual observers would require substantial additional resources (i.e., personnel and equipment) in excess of what is available, and associated increases in operational costs.
3. Activity-based Mitigations for acoustic sources not under positive control				X	Activity-based mitigations for active sonar sources not under positive control would not be effective because these types of sources could not be powered down or shut down in response to a sighting after they are deployed. Maintaining positive control throughout the duration of the training or testing activity could result in degraded realism or a reduced ability to meet pre-deployment certification requirements.
4. Activity-based Mitigations from high-altitude aircraft			X	X	Visual observations by Lookouts positioned in aircraft operating at high altitudes would not be effective due to the vertical distance between the mitigation zone and observation platform. Additional maneuvering to lower altitudes where visual observations are effective would degrade training or testing realism and result in increased operational cost associated with higher fuel consumption.
5. Activity-based Mitigations from manned escort vessels for all use of unmanned platforms			X		Unmanned platforms are remotely controlled or designed to operate independently, oftentimes in remote locations or for long time spans. Adding escort vessels (when they are not already participating in an event) for the purpose of activity-based mitigation would require substantial additional resources (i.e., personnel and equipment) in excess of what is available, and an associated increase in operational costs.
6. Adding third-party marine species observers to conduct visual observations that inform mitigations for additional event types		X	X	X	Adding third-party visual observers to observe additional event types (i.e., beyond ship shock trials) would require substantial additional resources in excess of what is available (i.e., berthing and space availability), and an associated increase in operational costs. The use of third-party observers presents security clearance issues, as well as national security concerns due to the requirement to provide advance notification of specific times and locations of platform movements and activities (e.g., vessels using active sonar). Events may occur simultaneously and in various locations throughout the Study Area, and some may last for a long period of time (e.g., weeks). Event timetables may be based on free-flow development of tactical situations and cannot be precisely fixed to accommodate arrival of third-party aircraft or vessels. Pre-event surveys to clear areas prior to an event begins would be ineffective for the purpose of real-time mitigation (e.g., the location of a moving animal in proximity to the mitigation zone would change, animals could move in or out of the event area after surveys have been completed). For offshore events, the length of time observers would spend on station would be limited due to aircraft fuel restrictions. Increased safety risks would be associated with offshore surveys and the presence of civilian aircraft or vessels in the vicinity of events (e.g., sea space conflicts, airspace conflicts, proximity to explosives).

Table 5-20: Mitigation Considered but Eliminated (continued)

Mitigation Considered	*Not Sufficiently Beneficial*	*Impractical*			*Assessment Summary*
		Criterion 1: Safety	*Criterion 2: Sustainability*	*Criterion 3: Mission*	
7. Requiring active sonar mitigation for marine mammals swimming at the bow, alongside the vessel, or directly behind the vessel	X			X	Marine mammals (e.g., dolphins) intentionally bow-riding, swimming alongside to wake-ride, or pursuing underway vessels would be out of the main active sonar transmission axis. Furthermore, implementing mitigation for animals persistently located within an active sonar mitigation zone (due to their intentional pursuit of underway vessels) would have the same types of impacts on mission requirements as increasing the mitigation zone size, which is described in row 15 of this table.
8. Adding additional Lookouts or observation platforms		X	X	X	The number of required Lookouts and observation platforms is based on resource availability (i.e., crews, platforms, and equipment) safety considerations (i.e., space restrictions, sea space or airspace conflicts), and duty assignments (e.g., requiring additional personnel or reassigning duties). Adding vessels or aircraft to observe a mitigation zone would result in sea space or airspace conflicts with the event participants. For explosives, weapon firing, or ordnance deployment, this would increase safety risks due to the presence of additional vessels or aircraft within the vicinity of explosives, intended impact locations, or projectile paths. Sea space and airspace conflicts would either require participating platforms to modify their flight plans or vessel movement tracks (which would reduce event realism) or force the added observation platforms to position themselves a safe distance away from the activity area (which would not be effective). However, additional personnel on platforms conducting the events, or on additional participating platforms, will serve as part of the Lookout Team for all acoustic, explosive, and physical disturbance and strike stressor mitigation categories as described in Section 5.6 (Activity-based Mitigation).
9. Developing additional weapon firing mitigation zones	X				Weapon firing noise from weapon systems other than large caliber guns (which are deck-mounted on surface ships with a muzzle that extends over the water) would not expose marine mammals or sea turtles to potentially injurious levels of underwater sound.
10. Developing a mitigation zone for non-explosive vessel-deployed mines	X				Mitigation zones for non-explosive vessel-deployed mines is not warranted because of the extremely low potential for physical strike of a marine mammal or sea turtle from a mine deployed so close to the water surface (by vessels that are implementing vessel movement mitigation for marine mammals and sea turtles), or below the surface for submarine-deployed mines.
11. Developing mitigation zones around aerial targets	X				Mitigation zones for explosive and non-explosive weapon firing is not warranted for ordnance fired against air targets because there is no potential for direct impact because the detonations occur in air, and the potential for projectile fragments to co-occur in space and time with a marine mammal or sea turtle at or near the surface is extremely low.
12. Developing mitigation zones for surface-to-surface and shore-to-surface missiles and rockets	X		X	X	Mitigation zones apply to missiles and rockets deployed from aircraft because aircraft can fly over the intended impact area prior to commencing firing. Mitigation would not be effective for vessel- or shore-deployed missiles and rockets (without requiring additional observation platforms) because of the distance between the firing platform and target location. It would not be possible for vessels to conduct close-range observations due to the length of time (and associated operational costs and event delays) it would take to complete observations and then transit back to the firing position (typically around 15 or 75 NM each way, depending on the event).
13. Establishing a minimum pre-event or post-event observation duration for additional events			X	X	Some events have established minimum time requirements for observations prior to the initial start of an event or after completion of an event, while the time requirements for other events must remain more general to accommodate dynamic event schedules or other operational factors. Requiring minimum pre-event or post-event observation durations would have the same types of impacts on mission requirements as increasing the mitigation zone size as described in row 15 of this table.

Table 5-20: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical: Criterion 1: Safety	Impractical: Criterion 2: Sustainability	Impractical: Criterion 3: Mission	Assessment Summary
14. Using developmental mitigation technologies for mitigation	X				As described in Section 5.5 (Monitoring, Research, and Adaptive Management), the Action Proponents plan to continue investing in research on and development of mitigation technologies, such as infrared, thermal detection, unmanned aerial vehicles, passive acoustic range instrumentation, and automated detection software or sensors. The development of any associated mitigation measures will be undertaken in coordination with NMFS through the adaptive management process.
15. Increasing mitigation zone sizes, or extending the post-sighting wait periods beyond 10 or 30 minutes		X	X	X	Increasing mitigation zone sizes or post-sighting wait periods would potentially increase the number of instances and the total length of time activities would be ceased or delayed. This would significantly diminish realism in a way that would prevent activities from meeting intended objectives and decrease the ability to complete events as required and on time. This would have implications for fuel restrictions (e.g., need for aircraft to go off station to refuel), personnel fatigue, range scheduling (e.g., sea space and air space conflicts), and operational costs. Multiple refueling events could double (or more) event length, which would decrease the ability for Lookouts to safely and effectively maintain situational awareness of the event area. For events with multiple participants, degrading the training or testing value of one event element degrades the value of all other elements. For active sonar events, requiring additional or lengthier power downs or shutdowns would create fundamental differences in how active sonar would be used in training versus real-world missions. For example, additional power downs or shutdowns would prevent sonar operators from developing and maintaining awareness of the tactical picture. Without realistic training in conditions analogous to real-world missions, sonar operators cannot become proficient in effectively operating active sonar. Sonar operators, vessel crews, and aircrews would be expected to operate sonar during real-world missions in a manner inconsistent with how they were trained. Diminishing proficiency or eroding capabilities presents significant risk to personnel safety during real-world missions and impacts the ability to deploy with required levels of readiness necessary to accomplish tasking by Combatant Commanders or other national security tasking. For events involving explosives, weapon firing, or ordnance deployment, requiring additional or lengthier delays or shut downs would cause a significant loss of training or testing time, reduce the number of opportunities crews have to fire or deploy ordnance on a target, decrease realism, impede the ability for crews to train and become proficient in using weapons or systems, prevent development of the ability to react to changes in the tactical situation or respond to incoming threats, cause significant delays to training or testing schedules, prevent units from meeting individual training and certification requirements, prevent units from deploying with the level of readiness necessary to accomplish their missions, and impede the ability of program managers and weapons system acquisition programs to meet testing requirements per required acquisition milestones or on an as-needed basis to meet operational requirements. For SINKEX, events involving explosive sonobuoys deployed in a large field, explosive torpedo events, and medium- or large caliber gunnery events, visual observations within the margin of increased mitigation zone size would be unsafe and ineffective unless additional observation platforms were allocated. Mission-essential safety protocols require all event participants (including Lookouts) to maintain focus on the activity area for safety of the public, personnel, and equipment. Mitigation zone sizes are correlated with the activity area; therefore, an increase in mitigation zone size would not meet the safety criteria. For example, when air-to-surface medium-caliber gunnery events involve fighter aircraft descending on a target, or rotary-wing aircraft flying a racetrack pattern and descending on a target using a forward-tilted firing angle, maintaining focused attention on the activity area is paramount to aircraft safety. Vessel movement mitigation for marine mammals is based on guidance from NMFS and the USFWS. A mitigation zone size is not specified for sea turtles to allow flexibility based on vessel type and mission requirements (e.g., small boats operating in a narrow harbor). For towed in-water devices, mission and safety requirements determine the operational parameters (e.g., course) for towing platforms. Because these devices are towed and not self-propelled, they generally have limited maneuverability and are unable to make immediate course corrections. For example, a high degree of pilot skill is required when rotary-wing aircraft are deploying in-water devices, safely towing them at relatively low speeds and altitudes, and recovering them. The aircraft can safely alter course to shift the route of the towed device in response to a sighted marine mammal or sea turtle up to a certain extent (i.e., up to the size of the mitigation zone) while still

Table 5-20: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical: Criterion 1: Safety	Impractical: Criterion 2: Sustainability	Impractical: Criterion 3: Mission	Assessment Summary
					maintaining the parameters needed for stable towing. However, the aircraft would be unable to further alter its course to more drastically course-correct the towed device without decreasing towing stability, which would have implications for safety of personnel and equipment.
16. Implementing mandatory vessel speed restrictions		X	X	X	As described in Section 5.6.2 (Mitigation Specific to Vessels, Vehicles, and Towed In-Water Devices), vessel movement mitigation involves maneuvering to maintain a specified distance from marine mammals and sea turtles, which may include reducing speed. As described in Section A.2.7 (Standard Operating Procedures), vessels used under the Proposed Action are required to operate in accordance with applicable navigation rules. In addition, vessels transit at speeds that are optimal for fuel conservation, to maintain schedules, and to meet mission requirements. Vessel captains use the totality of the circumstances to ensure the vessel is traveling at appropriate speeds in accordance with navigation rules. Depending on the circumstances, this may involve adjusting speeds during periods of reduced visibility or in certain locations (e.g., locations with other vessel traffic). For training, mandatory vessel speed restrictions would be impractical to implement because vessel operators need to train to operate vessels safely and proficiently as they realistically would during real-world missions, including being able to react to changing tactical situations and evaluate system capabilities. For example, during training activities involving flight operations from an aircraft carrier, the vessel must maintain a certain wind speed over the deck to launch or recover aircraft. Depending on wind conditions, the aircraft carrier itself must travel at a certain speed to generate the wind required to launch or recover aircraft. Additionally, operating vessels at speeds that are not optimal for fuel conservation or mission requirements would be unsustainable due to increased time on station and operational costs. Seasonal vessel speed restrictions would result in vessels being unable to meet all of their requirements during their limited time available to be underway based on the complex logistical considerations involved with maintaining individual vessel and deployment schedules. For testing and research, the Action Proponents need to test the full range of their vessels and vessel-deployed system capabilities to ensure safety and functionality in conditions analogous to real-world missions, and before full-scale production or delivery to the fleet. For example, the Action Proponents conduct propulsion testing specifically to test the functionality of vessel propulsion systems, including maneuvering, full-power runs, and endurance runs. During this event, vessels must operate across the full spectrum of capable speeds to accomplish the primary testing objectives.
17. Additional geographic mitigation for active sonar in areas with certain bathymetric features				X	The Action Proponents select locations for certain active acoustic activities based on water depths that are ideal for acoustic propagation research, seafloor types, or bathymetric phenomena (e.g., seamounts) that are of particular interest for ocean acoustic research and realism of military readiness activities. Shifting events to alternative or sub-ideal locations to avoid certain bathymetric features (e.g., shelf breaks, underwater canyons) would preclude ready access to the environmental and oceanographic conditions needed to meet mission objectives.
18. Restrictions on the location or timing of major training exercises		X		X	Major training exercises may require large areas of the littorals, open ocean, and nearshore areas for realistic and safe anti-submarine warfare training. Exercise locations may have to change during an exercise or during exercise planning based on assessments of unit performance or other conditions, such as weather and mechanical issues, which precludes the ability to develop restrictions on event location or timing within the Study Area.

Table 5-20: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical: Criterion 1: Safety	Impractical: Criterion 2: Sustainability	Impractical: Criterion 3: Mission	Assessment Summary
19. Restricting training activities to certain established locations		X		X	Modern sensing technologies make training on a large scale without observation more difficult. A foreign military's continual observation of U.S. military training in predictable geographic areas and timeframes would enable foreign nations to gather intelligence and subsequently develop techniques, tactics, and procedures to potentially and effectively counter U.S. military operations. Other activities may be conducted on a smaller and more localized scale, with training or testing at discrete locations that are critical to certain aspects of readiness. Threats to national security are constantly evolving, and the Action Proponents require the ability to adapt training to meet these emerging threats. Restricting access to broad-scale areas of water would impact the ability for training to evolve as threats evolve. Eliminating opportunities to train in myriad at-sea conditions would put U.S. forces at a tactical disadvantage during real-world missions. This would also present a risk to national security if potential adversaries were to be alerted to the environmental conditions within which training has been prohibited.
20. Restrictions on explosives and non-explosive stressor use near additional types of seafloor resources				X	Implementing additional mitigation for other activities or types of seafloor resources would not allow the Action Proponents to continue meeting their mission requirements to successfully accomplish readiness objectives due to restrictions on ready access to a significant portion of the Study Area.
21. Prohibiting activities in areas with low historic use for training or testing				X	The frequency at which an area is used for training or testing does not necessarily equate to its level of importance for meeting an activity objective or collectively contributing to meeting mission requirements. Some infrequently used areas are critical for a particular event.
22. Additional seasonal restrictions for training and testing based on species occurrence or density		X	X	X	Training and testing schedules are based on national tasking, the Optimized Fleet Response Plan and other training plans, Department of Homeland Security strategic goals, evolving geopolitical world events, forecasting of future testing requirements, deployment schedules, maintenance schedules, acquisition schedules, and emerging requirements. The Action Proponents require flexibility in the timing of their use of active sonar and explosives in order to meet mission and deployment schedules. Vessels, aviation squadrons, and testing programs have a limited amount of time available for training and testing. Variables such as maintenance and weather must be accounted for when scheduling event locations and timing. Event locations may have to change during an event or during pre-event planning based on assessments of unit performance or other conditions, such as inclement weather (e.g., hurricanes) and mechanical issues. This precludes the ability to completely prohibit events from occurring seasonally within areas delineated by marine species occurrence or seasonal densities.
23. Restricting active sonar based on time of day or visibility (e.g., weather conditions)				X	Although the majority of active sonar use occurs during the day, the Action Proponents may have a nighttime training requirement for some systems. Training in both good visibility (e.g., daylight, favorable weather conditions) and low visibility (e.g., nighttime, inclement weather conditions) is vital because environmental differences between day and night and varying weather conditions affect sound propagation and the detection capabilities of sonar. Temperature layers that move up and down in the water column and ambient noise levels can vary significantly between night and day. This affects sound propagation and could affect how sonar systems function and are operated.

Table 5-20: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical: Criterion 1: Safety	Impractical: Criterion 2: Sustainability	Impractical: Criterion 3: Mission	Assessment Summary
24. Blanket geographic restrictions within certain regions or areas (e.g., distances from shore)		X	X	X	Blanket expansions on the scope or size of mitigation areas would encroach upon the primary water space where military readiness activities are scheduled to occur. The Action Proponents select locations for their events based on proximity to training ranges, available airspace, unobstructed sea space, aircraft emergency landing fields, target storage and deployment locations, systems command support facilities, and areas of historical use that provide critical known bathymetric features and consistency for comparative data collection. Requiring the Action Proponents to shift activities to alternative locations or farther offshore would have significant impacts on safety, sustainability, and the ability to meet mission requirements within limited available timeframes. For example, certain surface-to-surface and air-to-surface small, medium, and large caliber gunnery activities and missile and rocket activities, must be conducted in proximity to the target storage depots because the associated targets (e.g., remotely controlled jet ski targets) are limited by how far offshore they can safely be employed and controlled based on distance, weather, and sea state. Certain training activities, such as deployment certification exercises that involve integration with multiple warfare components, require large areas of the littorals and open ocean for realistic and safe training. Similarly, the testing community is required to install and test systems on platforms at the locations where those platforms are stationed. Testing associated with new construction ships must occur in locations close to the shipbuilder facilities for reasons associated with construction schedule, proximity to testing ranges and facilities, and safety. Additionally, the testing community has a need for rapid development to quickly resolve tactical deficiencies within locations supported by existing infrastructure and support facilities. Logistical support of range testing can only efficiently and effectively occur when the support is co-located with the testing activities. Some types of pierside and at-sea testing must occur in proximity to naval shipyards or contractor shipyards. Nearshore areas also serve as critical training and testing locations for certain explosive activities. For example, the explosive ordnance disposal training location at the Silver Strand Training Complex is vital due to its existing target setup, ideal bottom structure, and good bottom depth to safely train divers with explosives. Explosive ordnance disposal teams can be required to deploy with a 3-week notice, which presents a need to constantly train to maintain readiness for real-world missions. Relocating this activity to a location without these features would increase safety risks and diminish the effectiveness of training events.
25. Implementing active sonar ramp-up	X			X	Implementing active sonar ramp-up procedures during training or testing under the Proposed Action would not be representative of real-world missions and would significantly impact realism. For example, during an anti-submarine warfare exercise using active sonar, ramp-ups would alert opponents (e.g., target submarines) to the transmitting vessel's presence. This would defeat the purpose of the training by allowing the target submarine to detect the searching unit and take evasive measures, thereby denying the sonar operator the opportunity to learn how to locate the submarine. Additionally, based on the source levels, vessel speeds, and sonar transmission intervals that will be used during typical active sonar activities under the Proposed Action, ramp-up would likely be an ineffective mitigation measure for the active sonar activities conducted under the Proposed Action.

Table 5-20: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical: Criterion 1: Safety	Impractical: Criterion 2: Sustainability	Impractical: Criterion 3: Mission	Assessment Summary
26. Reducing annual active sonar hours, replacing active sonar with passive sonar, or modifying active sonar sources for training				X	Passive sonar and other available sensors are used in concert with active sonar to the maximum extent practical. Training with active sonar is essential to national security. Active sonar is the only reliable technology for detecting and tracking potential enemy diesel-electric submarines. Equipment power levels are set consistent with mission requirements. Active sonar signals are designed explicitly to provide optimum performance at detecting underwater objects (e.g., submarines) in a variety of acoustic environments. The ability to effectively operate active sonar is a highly perishable skill that must be repeatedly practiced during realistic training. The Action Proponents must train in the same mode and manner in which they conduct real-world missions. Anti-submarine warfare training typically involves the periodic use of active sonar to develop the "tactical picture," or an understanding of the battle space (e.g., area searched or unsearched, identifying false contacts, and understanding the water conditions). This can take from several hours to multiple days and typically occurs over vast areas with varying physical and oceanographic conditions (e.g., bathymetry, topography, surface fronts, and variations in sea surface temperature). Sonar operators train to avoid interference and sound-reducing clutter from varying ocean floor topographies and environmental conditions, practice coordinating their efforts with other sonar operators in a strike group, develop skill proficiency in detecting and tracking submarines and other threats, and practice the focused endurance vital to effectively working as a team in shifts around the clock until the conclusion of the event. The Action Proponents use active sonar only when it is essential to the mission. For example, as described in Section 2.4.2.1 (Training), for this Draft EIS/OEIS, the Action Proponents are using a representative level of activity (rather than a maximum tempo of training activity in every year), which has reduced the amount of mid-frequency active sonar hours estimated to be necessary to meet training requirements relative to the 2018 HSTT and 2022 PMSR EIS/OEISs.
27. Replacing active sonar training with synthetic activities (e.g., computer simulated training)				X	The Action Proponents currently use, and will continue to use, computer simulation to augment training whenever possible. Simulators and synthetic training are critical elements that provide early skill repetition and enhance teamwork; however, they cannot replicate the complexity and stresses faced during real-world missions to which the Action Proponents train under the Proposed Action (e.g., anti-submarine warfare training using surface ship hull-mounted mid-frequency active sonar). Just as a pilot would not be ready to fly solo after simulator training, operational Commanders cannot allow personnel to engage in real-world missions based merely on simulator training.
28. Restricting active sonar training during surface ducting conditions				X	Surface ducting occurs when water conditions, such as temperature layers and lack of wave action, result in little sound energy penetrating beyond a narrow layer near the surface of the water. Submarines have long been known to take advantage of the phenomena associated with surface ducting to avoid being detected by active sonar. Training with active sonar in these conditions is a critical component of readiness because sonar operators need to learn how sonar transmissions are altered due to surface ducting, how submarines may take advantage of them, and how to operate sonar effectively under these conditions. Avoiding military readiness activities during surface ducting conditions, reducing power, shutting down active sonar based on environmental conditions, or implementing other sonar modification techniques (e.g., sound shielding) for the purpose of mitigation would affect a Commander's ability to develop the tactical picture. It would also prevent sonar operators from training in conditions analogous to those faced during real-world missions, which is described in row 15 of this table. The ocean conditions contributing to surface ducting change frequently, and surface ducts lack uniformity, may or may not extend over a large geographic area and can be of varying duration, making it difficult to determine where to reduce power and for how long. As noted by the U.S. Supreme Court in *Winter v. Natural Resources Defense Council Inc.*, 555 U.S. 7 (2008), because surface ducting conditions occur relatively rarely and are unpredictable, it is especially important for the Action Proponents to be able to train under these conditions when they occur.

Table 5-20: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical: Criterion 1: Safety	Impractical: Criterion 2: Sustainability	Impractical: Criterion 3: Mission	Assessment Summary
29. Requiring use of active acoustic monitoring devices		X	X	X	During Surveillance Towed Array Sensor System low-frequency active sonar (which is not part of the Proposed Action), the Navy uses a specially designed adjunct high-frequency marine mammal monitoring active sonar, or "HF/M3." HF/M3 can only be towed at slow speeds and operates like fish finders used by fishermen. Installing the HF/M3 adjunct system on the tactical sonar ships used under the Proposed Action would have implications for safety and mission requirements due to impacts on speed and maneuverability, as well as excessive additional operating costs.
30. Requiring mitigation based on passive acoustic detections of marine mammals			X	X	When platforms with passive acoustic monitoring capabilities are already participating in an event, sonar technicians will alert Lookouts to passive acoustic detections of marine mammals as described in Section 5.6 (Activity-based Mitigation). Significant logistical constraints (e.g., personnel and equipment availability, operational costs) would make diverting equipped platforms or constructing and maintaining new passive acoustic monitoring systems impractical. The fluidity and nature of military readiness activities (e.g., fast-paced and mobile readiness evolutions) make it impractical for passive acoustic devices to be used as precise real-time indicators of marine mammal location for the purposes of implementing mitigation (e.g., active sonar power downs or shutdowns, ceasing use of explosives) without an accompanying visual sighting. Implementing mitigation for animals located outside of the mitigation zone (which could occur due to imprecise localizations or relative movements of animals and the mitigation zone) would have the same types of effects on mission requirements as increasing the mitigation zone size, which is described in row 15 of this table.
31. Reducing explosive counts or NEW, or substituting with non-explosives				X	Activities that involve explosives are inherently different from those that involve non-explosive ordnance. For example, critical components of an explosive Bombing Exercise Air-to-Surface include the assembly, loading, delivery, and assessment of the explosive bomb. Explosive bombing training exercises start with ground personnel, who must practice the building and loading of explosive munitions. Training includes the safe handling of explosive material, configuring munitions to precise specifications, and the loading of munitions onto aircraft. Aircrew must then identify a target and safely deliver fused munitions, discern if the bomb was assembled correctly, and determine bomb damage assessments based on how and where the explosive detonated. An air-to-surface bombing exercise using non-explosive ordnance can train aircrews on valuable skills to locate and accurately deliver munitions on a target; however, it cannot effectively replicate the critical components of an explosive activity in terms of assembly, loading, delivery, and assessment of an explosive bomb. Reducing the counts or sizes of explosives would impede the ability for the Action Proponents to train and become proficient in using explosive weapon systems (which would result in a significant risk to personnel safety during real-world missions), and would ultimately prevent units from meeting individual training and certification requirements (which would prevent them from deploying with the required level of readiness necessary to accomplish missions) and impede the ability to certify forces to deploy to meet national security tasking. For testing, the Action Proponents need to test the full range of their platforms, weapon systems, and components to ensure safety and functionality in conditions analogous to real-world missions, and before full-scale production or delivery to the fleet.
32. Adopting mitigation implemented by foreign military units				X	Mitigation is carefully developed for and assessed by each individual unit based on their own assessment of mitigation benefits and practicality of implementation. Readiness considerations differ based on each nation's strategic reach, global mission, country-specific legal requirements, and geographic considerations. The Action Proponents will implement mitigation that has been determined to be effective at avoiding impacts from the Proposed Action and practical to implement. Many of these measures are the same as, or comparable to, those implemented by foreign navies. For example, most navies implement some form of mitigation to cease certain activities if a marine mammal is visually observed in a mitigation zone (Dolman et al., 2009). Some navies also implement geographic mitigation. The Action Proponents will implement several mitigation measures and environmental compliance initiatives that are not implemented by foreign navies, such as providing extensive support for scientific monitoring and research and complying with stringent reporting requirements.

Table 5-20: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical: Criterion 1: Safety	Impractical: Criterion 2: Sustainability	Impractical: Criterion 3: Mission	Assessment Summary
33. Additional reporting requirements		X	X	X	The Action Proponents developed their reporting requirements in conjunction with NMFS to be consistent with mission requirements and balance the usefulness of the information to be collected with the practicality of collecting it. The Action Proponents' activity reports and incident reports are designed to verify implementation of mitigation; comply with current permits, authorizations, and consultation requirements; and improve future environmental analyses. Additional reporting would be ineffective as mitigation because it would not result in modifications to training activities or further avoidance or reductions of potential impacts. Lookouts are not trained to make species-specific identification and would not be able to provide detailed scientific data if more detailed marine species observation reports were to be required. Furthermore, the Action Proponents do not currently maintain a record management system to collect, archive, analyze, and report every marine species observation or all vessel speed data for every event and all vessel movements. For example, the speed of Action Proponent vessels can fluctuate an unlimited number of times during training or testing events. Developing and implementing a record management system of this magnitude would be unduly cost prohibitive and place a significant administrative burden on vessel operators and activity participants. Burdening operational Commanders, vessel operators, and event participants with requirements to complete additional administrative reporting would distract them from focusing on mission-essential tasks. Additional reporting requirements would draw event participants' attention away from the complex tactical tasks they are primarily obligated to perform, such as driving a warship or engaging in a gunnery event, which would adversely impact personnel safety, public health and safety, and the ability to meet mission objectives.
34. Developing mitigation outside the Action Proponent's legal authority				X	The Action Proponents did not develop mitigation outside their legal authority to implement. For example, the Action Proponents do not have legal authority to develop Marine Protected Areas to restrict commercial or recreational fishing, which is a recommendation received through public comments on previous EIS/OEISs.
35. Expansion of existing geographic mitigation to the full extent of newly identified biologically important areas			X	X	Updated science was recently published (Harrison et al. 2023, Calambokidis et al., 2024) describing areas in which biologically important life processes occur for marine mammals either year-round or for part of the year (depending on the species). The Action Proponents examined these areas and determined it would be impractical based on sustainability and mission requirements to expand certain species-specific existing geographic mitigation areas to the full extent of the newly identified areas. This analysis is detailed in Appendix K. The Action Proponents did however modify and expand existing geographic mitigation areas (e.g., California Blue Whale Mitigation Area, Hawaii Humpback Whale Special Reporting Area) from the HSTT 2018 EIS/OEIS. Some of the newly identified areas overlap with the majority of the SOCAL Range Complex. Rrequiring vessels to transit from their homeport to conduct training and testing activities while avoiding these areas as geographic mitigation (e.g., a prohibition on explosives, a limit on sonar use, etc.) would result in reduced efficiency in travel time and associated costs by increasing distance between activities and homeports, home bases, associated training ranges, testing facilities, air squadrons, and existing infrastructure (e.g., instrumented underwater ranges). It would also result in the expenditure of additional funding for increased operational costs associated with higher fuel consumption. Additionally, expanding geographic mitigation areas to match these extents would result in decreased ready access to ranges, operating areas, (OPAREAs), airspace, or sea space with a variety of realistic tactical oceanographic and environmental conditions (e.g., variations in bathymetry, topography, surface fronts, and sea surface temperatures) that are extensive enough to allow for completion of activities without physical or logistical obstructions, to provide personnel the ability to develop competence and confidence in their capabilities across multiple types of weapons and sensors, and the ability to train to communicate and operate in a coordinated fashion as required during real-world missions and to avoid observation by potential adversaries.

Table 5-20: Mitigation Considered but Eliminated (continued)

Mitigation Considered	*Not Sufficiently Beneficial*	*Impractical* *Criterion 1: Safety*	*Impractical* *Criterion 2: Sustainability*	*Impractical* *Criterion 3: Mission*	*Assessment Summary*
36. Additional pile driving mitigation				X	The Action Proponents determined it would be impractical based on mission requirements to implement visibility-based mitigation from the Incidental Harassment Authorization Incidental to Pile Driving Training Exercises at Naval Base Ventura County, Port Hueneme. Limiting activities in this Draft EIS/OEIS due to weather conditions (e.g., rain, fog, snow, etc.) would degrade training realism and impact the Navy's ability to become proficient at this activity.
37. Vessel movement mitigation for cable laying vessels performing Modernization & Sustainment of Ranges activity		X		X	The Action Proponents determined it would be impractical based on safety and mission requirements to implement mitigation for manned surface vessels and towed in-water devices actively conducting cable laying during Modernization & Sustainment of Ranges activities. The vessels performing these activities move very slowly through the water column (e.g., 2-3 kts) to facilitate a gradual, controlled rate of descent to minimize risk of damage to the cable. Additionally, vessels are required to follow a prescribed route based on ROV surveys to ensure the cable is laid on its intended route, predominantly sandy bottom habitat avoiding rocky areas, to minimize damage to the cable. Deviating from this route or slowing to a near stop once cable laying has commenced would present risk of damage to cable laying equipment and personnel operating it.
38. Geographic mitigation for hauled out Hawaiian monk seals at PMRF	X				In this Draft EIS/OEIS, The Action Proponents are requesting behavioral takes for hauled-out Hawaiian monk seals on beaches adjacent to PMRF related to in-air noise from missile launches and artillery firing. As part of this process, a range-to-effects (RTE) analysis was performed to determine the range to injurious levels and these ranges were then used to inform the development of geographic mitigation. The ranges to injury that resulted from this analysis ultimately did not extend to any of the beaches from the established launch/firing sites. The RTE analysis is detailed in Appendix E.1. Since behavioral takes are being requested and injury is unlikely, the Action Proponents determined it is not sufficiently beneficial to develop geographic mitigation areas for these activities.

Table 5-20: Mitigation Considered but Eliminated (continued)

Mitigation Considered	Not Sufficiently Beneficial	Impractical			Assessment Summary
		Criterion 1: Safety	Criterion 2: Sustainability	Criterion 3: Mission	
39. Requiring NMFS Protected Species Observer (PSO) certification for Navy Lookouts	X		X	X	Requiring NMFS PSO certification for Navy Lookouts would be impractical and not sufficiently beneficial. To become a NMFS-certified PSO, NOAA states that one should meet educational, experiential, and training requirements, including a background in biological sciences. These requirements are very much at odds with those for being a Navy Lookout. Furthermore, serving as a Lookout is only one part of these individuals' responsibilities. They must maintain proficiency in both general seamanship and rate-specific skills. A requirement for a background in biological sciences would significantly limit the pool of personnel on Navy vessels who would be eligible for certification. Requiring Lookouts to hold PSO certification would present an administrative burden and significant challenges in meeting Lookout manning requirements. Within the action area, the Navy operates numerous large ships (e.g., destroyers, aircraft carriers) and other support craft and small vessels; Lookouts assigned to vessels are frequently rotating duty stations. Each vessel has a pool of lookouts to allow for normal watch rotation, reduce eye fatigue, and ensure vigilance, which would increase the number of personnel requiring certification and further complicate manning efforts. Similarly, reliance on the NMFS PSO application process may present delays in certification that are incompatible with Navy manning and readiness requirements. Current PSO training curricula varies in frequency, cost, length, focal activity, and focal geography. It is generally conducted by third-party providers. If Navy established an independent PSO training program for Lookouts, fitting this additional requirement into the challenging Optimized Fleet Response Plan would be unsustainable and have a direct effect on Navy readiness. Lastly, Navy Lookouts already must complete Lookout Training, which includes marine resource sighting cues and observation techniques, as well as the roles and responsibilities of Lookouts and the official in charge of an activity. In addition to this training, Lookouts complete NMFS-approved Marine Species Awareness Training. Finally, the Lookout Training Handbook was updated in 2022 with a thorough Marine Resources chapter covering topics from identifying indicator species to determining direction of travel. The goal of PSO certification is to ensure that PSOs have the appropriate training to safely and effectively perform their required duties to meet the needs of a particular project. The Navy's Lookout training and qualification program already achieves that goal for Navy's at-sea activities. Therefore, the Navy has determined that PSO certification and/or PSO-specific training would not provide sufficient benefit to outweigh the risk to Navy readiness.

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6 Regulatory Considerations

Consistent with CEQ regulations for implementing NEPA, federal agencies shall, to the fullest extent possible, integrate the requirements of NEPA with other planning and environmental review procedures required by law or by agency practice so that all such procedures run concurrently rather than consecutively. This chapter summarizes environmental compliance for the Proposed Action, consistency with other federal, state, and local plans, policies, executive orders, and regulations not considered in Chapter 3; the relationship between short-term effects and the maintenance and enhancement of long-term productivity in the affected environment; irreversible and irretrievable commitments of resources; and energy conservation.

6.1 Consistency with Regulatory Considerations

When implemented, the Proposed Action for the HCTT EIS/OEIS would comply with applicable federal, state, and local laws; regulations; and executive orders. Regulatory agency consultations are underway and will be completed prior to implementing the Proposed Action ensuring all legal requirements are met. Table 6-1 summarizes the additional environmental compliance requirements not specifically assessed in the resource chapters. Section 1.6 provides brief descriptions of NEPA and EO 12114 compliance that form the regulatory framework for the resource evaluations in Chapter 3. Regulatory agency consultation and coordination documents are provided in Appendix J.

Table 6-1: Summary of Environmental Compliance for the Proposed Action

Laws, Executive Orders, International Standards, and Guidance	Status of Compliance
Laws	
Abandoned Shipwreck Act (43 U.S.C. sections 2101–2106)	For abandoned shipwrecks in United States (U.S.) Territorial Waters, the federal government asserts title to the resource. See Section 3.10 for assessment and conclusion that the Proposed Action is consistent with the Act.
Act to Prevent Pollution from Ships (33 U.S.C. sections 1901–1915)	The Act to Prevent Pollution from Ships applies to U.S. vessels worldwide and implements the requirements of annexes I (Oil Pollution), II (Noxious Liquid Substances Carried in Bulk), V (Ship-Generated Garbage), and VI (Air Pollution) of the International Convention for the Prevention of Pollution from Ships (MARPOL) for the United States. Act to Prevent Pollution from Ships excludes warships and naval auxiliaries from the preventive measures in annexes I, II, and VI. For annex V, Act to Prevent Pollution from Ships requires Navy ships and submarines to comply fully with discharge restrictions applicable outside of "special areas" designated under annex V and places limitations on Navy ship discharges within annex V special areas. Requirements associated with the APPS are implemented in accordance with the Navy Environmental and Natural Resources Program Manual and related Navy guidance documents governing waste management, pollution prevention, and recycling. At sea, the Navy complies with these regulations and operates in a manner that minimizes or eliminates any adverse effects on the marine environment. See Section 3.2 for the assessment.

Table 6-1: Summary of Environmental Compliance for the Proposed Action (continued)

Laws, Executive Orders, International Standards, and Guidance	Status of Compliance
Antiquities Act (54 U.S.C. sections 320301-320303)	In accordance with Navy procedures, the Proposed Action is consistent with the Act's objectives for protection of archaeological and historical sites and objects, preservation of cultural resources, and the public's access to them. See Section 3.10 for the assessment.
California Coastal National Monument Designation (Presidential Proclamation 7264, January 11, 2000), expanded areas including the Point Arena-Stornetta Public Lands (Presidential Proclamation 9089, March 11, 2014), and the Boundary Enlargement of the California Coastal National Monument (Presidential Proclamation 9563, January 12, 2017)	The California Coastal National Monument is located along the California coastline and comprises more than 20,000 unappropriated or unreserved islands, rocks, exposed reefs, and pinnacles occurring within 12 nautical miles off the coast of California between Mexico and Oregon (over 1,100 miles). Navy activities are proposed to occur in these areas. The Navy and the Bureau of Land Management have agreed on the terms of a Memorandum of Understanding dated November 5, 2007, regarding Navy activities in the vicinity of monument resources. Implementation of the Proposed Action would be consistent with the Memorandum of Understanding and would not affect monument resources.
Coastal Zone Management Act (CZMA) (16 U.S.C. sections 1451–1468)	Federal Consistency Determinations will be provided to California Coastal Commission and the Hawaii Office of Planning in accordance with CZMA Federal Consistency requirements.
Endangered Species Act (ESA) (16 U.S.C. 1531-1544)	Consultation with the National Marine Fisheries Services (NMFS) and United States Fish and Wildlife Service (USFWS) pursuant to Section 7 of the Act is underway. See Sections 3.4, 3.6, 3.7, 3.8, and 3.9 of this EIS/OEIS for the associated effects analyses under NEPA.
Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. sections 1801–1891d)	An Essential Fish Habitat Assessment has been prepared as a separate document. California and Hawaii consultations with National Marine Fisheries Service for affected species and their habitats are underway (as discussed in Section 6.1.3).
Migratory Bird Treaty Act (16 U.S.C. sections 703–712)	Implementation of the Proposed Action is not anticipated to result in significant adverse effects on migratory bird populations; therefore, the Navy does not need to confer with the USFWS. See Section 3.9 for the assessment.
National Historic Preservation Act (54 U.S.C. section 300101 et seq.)	Consultation with the Hawaii and California State Historic Preservation Officers pursuant to Section 106 of this Act is underway. See Section 3.10 for the associated effects analysis under NEPA.
National Marine Sanctuaries Act (16 U.S.C. sections 1431–1445c-1)	Six National Marine Sanctuaries administered by the National Oceanic and Atmospheric Administration Office of National Marine Sanctuaries (ONMS) lie within the Study Area. Two additional proposed (i.e., not yet designated) National Marine Sanctuaries also lie within the Study Area. These are discussed further in Table 6-2. • Military readiness activities proposed to occur in the vicinity of or within the Channel Islands National Marine Sanctuary have the potential to cause injury to sanctuary resources. As such, Consultation under Section 304(d) will occur. • Military readiness activities proposed to occur in the vicinity of and within the Monterey Bay National Marine Sanctuary have the

Table 6-1: Summary of Environmental Compliance for the Proposed Action (continued)

Laws, Executive Orders, International Standards, and Guidance	Status of Compliance
	potential to cause injury to sanctuary resources. As such, Consultation under Section 304(d) will occur. ● Military readiness activities proposed to occur in the vicinity of or within the Greater Farallones National Marine Sanctuary have the potential to cause injury to sanctuary resources. As such, Consultation under Section 304(d) will occur. ● Military readiness activities proposed to occur in the vicinity of or within the Cordell Bank National Marine Sanctuary have the potential to cause injury to sanctuary resources. As such, Consultation under Section 304(d) will occur. ● Military readiness activities proposed to occur in the vicinity of Hawaiian Islands Humpback Whale Sanctuary have the potential to cause injury to sanctuary resources (as defined in 15 CFR 922.182). As such, Consultation under Section 304(d) will occur. ● Military readiness activities proposed to occur in the vicinity of the Chumash Heritage National Marine Sanctuary have the potential to cause injury to sanctuary resources. As such, consultation under Section 304(d) will occur. ● The Navy is coordinating with ONMS to ensure the proposed management documents for the proposed Papahanaumokuakea National Marine Sanctuary consider appropriate exemptions for military activities and that HCTT adequately evaluates the effects of military activities on sanctuary resources for the purpose of determining whether the Navy would consult under Section 304(d) at the appropriate time. ● Draft national marine sanctuary designation documents for the Proposed National Marine Sanctuary in the Pacific Remote Islands are currently being prepared and are expected to have exemptions for DoD activities. Navy is working with ONMS in the designation process of the sanctuary would not cause injury to sanctuary resources and would not require Section 304(d) consultation upon designation.
Resource Conservation and Recovery Act (RCRA) (42 U.S.C. section 6901 et seq.)/Military Munitions Rule	Military munitions used for their intended purpose during training and testing are exempt from the definition of solid waste under RCRA (40 CFR Section 266.202).
Rivers and Harbors Act (33 U.S.C. section 401 et seq.)	Under the Rivers and Harbors Act, a permit is required when construction/placement of structures in or over navigable waters of the United States may occur. The Navy will apply for and obtain applicable permits through U.S. Army Corps of Engineers for those activities where Rivers and Harbors Act permitting is required, such as installation of instrumentation.
Submerged Lands Act (43 U.S.C. sections 1301–1356c)	Navy's activities within and on the submerged lands are authorized in accordance with Section 1314(a) of the Submerged Lands Act, 43 U.S.C. sections 1301, et seq., and U.S. Const. art. I, 8.
Sunken Military Craft Act (Public Law 108–375, 10 U.S.C. section 113 Note and 118 Stat. 2094–2098)	The Sunken Military Craft Act does not apply to actions taken by, or at the direction of, the United States. Additionally, no disturbance to sunken military craft is anticipated. See Section 3.10 for the assessment.

Table 6-1: Summary of Environmental Compliance for the Proposed Action (continued)

Laws, Executive Orders, International Standards, and Guidance	Status of Compliance
Presidential Proclamation – Papahanaumokuakea Marine National Monument; Designated by Proclamation 8031 (June 15, 2006) and amended by Proclamation 8112 (February 28, 2007), and 50 CFR part 404 and Presidential Proclamation 9478 – Papahanaumokuakea Marine National Monument Expansion (August 31, 2016)	The proposed activities would be carried out consistent with applicable laws. In accordance with Presidential Proclamations 8031, 8112, and 9478, and Papahanaumokuakea Marine National Monument regulations (50 CFR part 404), all activities and exercises of the Armed Forces shall be carried out in a manner that avoids, to the extent practicable and consistent with operational requirements, adverse effects on Monument resources and qualities. Papahanaumokuakea Marine National Monument plays a critical role for Native Hawaiians with regards to voyaging and wayfinding and is considered a sacred site (81 FR 60225). No new activities are proposed to occur within the Papahanaumokuakea Marine National Monument. Therefore, as analyzed in Section 3.10, no adverse effects on submerged cultural resources would occur as a result of the Proposed Action. However, the Proposed Action may cause disruptions to cultural voyaging and wayfinding, but these would be considered temporary as both military and cultural voyaging activities are considered transitory and there would be minimal to no overlap. In addition, military activities taking place within the National Monument are limited in number and thus are not anticipated to adversely affect biological resources. While there has been no incident to date, should there be an event that causes destruction of, loss of, or injury to a monument resource, a monument expansion resource, or quality (such as spill or grounding), the DoD must promptly coordinate with the Secretaries of Commerce and Interior to respond to, provide mitigation, and if possible, restore or replace the Monument resource or quality. The proposed Papahanaumokuakea National Marine Sanctuary in the same area is discussed in Table 6-2.
Executive Orders	
Executive Order 11990, *Protection of Wetlands*	Implementation of the Proposed Action would not affect wetlands as defined in Executive Order 11990, as it occurs within coastal and ocean waters; no wetlands exist in the Study Area.
Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*	In accordance with Executive Order 12898, this EIS/OEIS considers whether the Proposed Action would result in disproportionately high or adverse health or environmental effects on minority or low-income populations. Although proposed activities occur in the marine environment, minority and low-income populations who practice subsistence fishing or live in nearshore communities may be affected by the Proposed Action. Refer to Section 3.11 for the assessment of effects.
Executive Order 14096, *Revitalizing Our Nation's Commitment to Environmental Justice for All*	Executive Order 14096 builds upon and strengthens the nation's existing commitments to address environmental justice in Executive Order 12898. In accordance with Executive Order 14096, this EIS/OEIS considers whether the Proposed Action would result in disproportionate or adverse health or environmental effects on communities with environmental justice concerns. Refer to Section 3.11 for the assessment of effects.
Executive Order 12962, *Recreational Fisheries*	In accordance with Navy procedures, the Proposed Action would not affect federal agencies' ability to fulfill certain duties with regard to promoting the health of the public and public access to recreational fishing areas. See Section 3.11 and Section 3.12 for the assessments.

Table 6-1: Summary of Environmental Compliance for the Proposed Action (continued)

Laws, Executive Orders, International Standards, and Guidance	Status of Compliance
Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks*	In accordance with Navy procedures, the Proposed Action would not result in disproportionate environmental health or safety risks to children.
Executive Order 13089, *Coral Reef Protection*	The Navy has prepared this EIS/OEIS in accordance with requirements that federal agencies whose actions affect U.S. coral reef ecosystems shall provide for implementation of measures needed to research, monitor, manage, and restore them, including reducing effects from pollution and sedimentation. See Section 3.4 for the assessment.
Executive Order 13112, *Invasive Species*	In accordance with Navy procedures, the Proposed Action would not increase the number of or introduce new invasive species nor require the Navy to take measures to avoid introduction and spread of those species. Information on invasive species and standard operating procedures used by the Navy related to invasive species is presented in Section 3.0.4. Additionally, Naval vessels are exempt from 33 CFR part 151 subpart D, Ballast Water Management for Control of Nonindigenous Species in Waters of the United States; however, the Navy follows ballast water protocols as required by the Chief of Naval Operations Instructions M-5090.1, *Environmental Readiness Program Manual*. The Navy has a hull-cleaning program that ensures routine ship performance and fleet capability by preventing fouling of anti-corrosive paint coatings. It includes regular scheduled inspections and periodic cleanings (Naval Sea Systems Command, 2022)
Executive Order 13158, *Marine Protected Areas*	The Navy has prepared this EIS/OEIS in accordance with requirements for the protection of existing national system marine protected areas. See Section 6.1.2 for more information.
Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*	In accordance with Navy procedures, the Proposed Action would not have substantial direct effects on one or more Indian tribes, on the relationship between the federal government and Indian tribes, or on the distribution of power and responsibilities between the federal government and Indian tribes. The Navy will continue to coordinate with Indian Tribal Governments in accordance with Executive Order 13175. The Action Proponents are conducting Government to Government consultation as part of the Section 106 consultation process. See Section 6.1.4 for more information.
Executive Order 13840, *Ocean Policy to Advance the Economic, Security, and Environmental Interests of the United States*	The Proposed Action is consistent with the comprehensive national policy for the *Ocean Policy to Advance the Economic, Security, and Environmental Interests of the United States* (which replaced Executive Order 13547, *Stewardship of the Ocean, Our Coasts, and the Great Lakes*).
Executive Order 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*	This executive order revokes Executive Order 13834, *Efficient Federal Operations*, except for Section 6, 7, and 11. The Proposed Action is consistent with this executive order's goals to empower workers and communities, promote and protect public health and the environment, and conserve national treasures and monuments.
Executive Order 14008, *Tackling the Climate Crisis at Home and Abroad*	The Proposed Action is consistent with this executive order's goal of taking a government-wide approach to tackling the climate crisis.

Table 6-1: Summary of Environmental Compliance for the Proposed Action (continued)

Laws, Executive Orders, International Standards, and Guidance	Status of Compliance
Executive Order 14057, *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability*	The Navy completed a Navy-wide Climate Action Plan in accordance with this executive order.
International Standards	
International Convention for the Prevention of Pollution from Ships (MARPOL)	The Navy adheres to all applicable requirements within the Convention and domestic enacting laws (like APPS).)

Notes: EIS = Environmental Impact Statement, OEIS = Overseas Environmental Impact Statement, CFR = Code of Federal Regulations, DoD = Department of Defense, FR = Federal Register

6.1.1 Coastal Zone Management Act Compliance

The Proposed Action is consistent with activities that were covered in the 2018 HSTT and 2022 PMSR EIS/OEISs. Per the CZMA of 1972 (16 U.S.C. section 1451, et seq.), federal actions that have an effect on a coastal use or resource are required to be consistent, to the maximum extent practicable, with the enforceable policies of federally approved Coastal Management Plans. As such, the Action Proponents will prepare consistency determinations in accordance with federal consistency determinations to be submitted to the California Coastal Commission and the Hawaii Office of Planning (Appendix J).

6.1.2 Marine Protected Areas

The 2018 HSTT and 2022 PMSR EIS/OEISs discussed marine protected areas that were part of the National System of Marine Protected Areas that overlapped with the Study Area (U.S. Department of the Navy, 2018). Since the publication of the 2018 HSTT and 2022 PMSR EIS/OEISs, the National Marine Protected Areas Center has updated their definitions and classification system for marine protected areas to mirror that of the International Union for Conservation of Nature. More information on marine protected areas, as well as an online mapper, can be found at the National Marine Protected Areas Center website (National Marine Protected Areas Center, 2023).

Marine Protected Areas within the Study Area are included in Table 6-2. All resources of the marine protected areas located within the Study Area have been incorporated into the analyses in Sections 3.1 through 3.8. In accordance with Executive Order 13158, the potential effects of the proposed activities under the Preferred Alternative (Alternative 1) to the national system of protected areas that contain marine waters within the Study Area have been considered, factoring in standard operating procedures (Appendix A) and mitigation (Chapter 5) when applicable to the stressor and resource.

6.1.2.1 State Marine Protected Areas

State governments have established marine protected areas, including state parks and species-specific sanctuaries, for the management of fisheries, nursery grounds, shellfish beds, recreation, tourism, and for other uses. These areas have a diverse array of conservation objectives, from protecting ecological functions, to preserving shipwrecks, to maintaining traditional or cultural interaction with the marine environment. There are 72 state or local marine protected areas within the Study Area that are included in the National System of Marine Protected Areas (Table 6-2 and Figure 6-1 through Figure 6-4).

Special Closures: Areas designated by the California Fish and Game Commission, where access is restricted to protect seabird rookeries or marine mammal haul-out areas. There are three Special Closures within the California Study Area (Table 6-2 and Figure 6-1).

Areas of Special Biological Significance (ASBS): Established by the California State Water Resources Control Board for ocean water quality maintenance and monitoring to protect diverse varieties of aquatic wildlife. There are 15 ASBS within the Study Area, as listed in Table 6-2 and Figure 6-1.

6.1.2.2 Federal Marine Protected Areas

6.1.2.2.1 Federal Conservation Areas and Marine Reserves

The federal government has established marine conservation areas and marine reserves to conserve nature, ecosystems services, and cultural value through effective management and protection. While conservation goals and degree of legal protection varies, all involved levels of fisheries, recreation, and tourism management. There are nine federal conservation areas of marine reserves within the Study Area that are included in the National System of Marine Protected Areas (Table 6-2 and Figure 6-1 through Figure 6-4).

National Estuarine Research Reserves: National Estuarine Research Reserve System sites protect estuarine land and water and provide habitat for wildlife. These sites also provide educational opportunities for students, teachers, and the public; and serve as laboratories for scientists (15 CFR part 921). The National Estuarine Research Reserve Program was established through the Coastal Zone Management Act and is administered in coordination with the National Marine Sanctuary System. Each reserve is managed by a state agency or university with input from local partners on a site-specific basis. There is one National Estuarine Research Reserve System sites within the Study Area (Table 6-2 and Figure 6-3).

6.1.2.2.2 National Monuments

Marine National monuments are designated through Presidential Proclamation under the authority of the Antiquities Act of 1906 (as codified in 54 U.S.C. section 320301). Marine national monuments are often co-managed by state, federal, and local governments as trustees, in order to preserve diverse habitats and ecosystem functions; they can include land and ocean resources. There are three marine national monuments within the Study Area: one in Hawaii (Table 6-2 and Figure 6-4), one in the Pacific Remote Islands (Table 6-2 and Figure 6-4), and one in California (Table 6-2 and Figure 6-4). The Papahanaumokuakea Marine National Monument within the Hawaii Study Area is also a United Nations Educational, Scientific and Cultural Organization World Heritage Sites, as discussed in Section 3.10.

6.1.2.2.2.1 California Coastal National Monument

Established on January 11, 2000, the California Coast National Monument encompasses the entire California coastline and provides unique coastal habitat for marine life that inhabit its nearly 20,000 rocks, islands, and exposed reefs (Figure 6-2). The monument provides nesting habitat for nearly 200,000 breeding seabirds, as well as myriad species of marine mammals, fish, invertebrates, and algae (Bureau of Land Management, 2023). Activities proposed to occur within the National Monument are summarized in Table 6-2.

6.1.2.2.2.2 Pacific Remote Islands National Monument

The Pacific Remote Islands Marine National Monument was established through Presidential Proclamation 8336 on January 6, 2009, and expanded via Proclamation 9173 on September 25, 2014.

Pacific Remote Islands Marine National Monument comprises approximately 495,189 square miles and includes Baker, Howland, and Jarvis Islands; and Johnston, Wake, and Palmyra Atoll; and Kingman Reef (Table 6-2 and Figure 6-4). The northeast portion of the Pacific Remote Islands National Marine Monument, specifically Johnston Atoll, is included in the Hawaii Study Area.

The Pacific Remote Islands Marine National Monument is one of the most pristine tropical marine environments in the world and includes approximately 165 seamounts that are hotspots of marine biodiversity, including fish, corals, shellfish, seabirds, and vegetation not found anywhere else in the world. Many threatened or endangered species thrive in the protected waters of the Monument.

Johnston atoll and its islands (Johnston, Sand, North, and East islands) are the northernmost point of the Line Islands and are the portion of the Pacific Remote Islands Marine National Monument that are within the Study Area. It is an ancient atoll and provides habitat for at least 45 coral species, including 12 species that are only found in the Hawaiian and Line Islands.

The Pacific Remote Islands Marine National Monument is cooperatively managed by the U.S. Department of Commerce (NOAA), the U.S. Department of the Interior (USFWS), and the DoD. NOAA and USFWS are working to develop a management plan for the Monument that will help guide conservation management and address concerns such as climate change.

6.1.2.2.2.3 Papahanaumokuakea Marine National Monument

Details of the Papahanaumokuakea Marine National Monument are discussed in the 2018 HSTT EIS/OEIS, and the dimensions, species, and descriptions of the area have not changed. The Hawaii Study Area encompasses the Papahanaumokuakea Marine National Monument (Table 6-2 and Figure 6-4), and the activities proposed to occur in the monument in the 2018 HSTT EIS/OEIS have not changed and are summarized in Table 6-2. Mitigation measures, as described in Chapter 5, would be implemented and benefit the monument’s resources. Mai Ka Pō Mai (a Native Hawaiian management document for the Monument) will serve as the foundation for the update of the Monument Management Plan. The Management Plan is in the process of being updated, and it is anticipated that the planning process will take 2–3 years.

6.1.2.2.3 National Wildlife Refuges

Details of refuges within the Study Area are included in the 2018 HSTT EIS/OEIS. The boundaries, species present, and regulations have not changed. The National Wildlife Refuge System serves as a national network of lands and waters for the conservation, management, and where appropriate, restoration of fish, wildlife, and plant resources and habitats. National wildlife refuges are managed on a site-specific basis. Activities conducted within a refuge must not impair existing wildlife-dependent recreational uses or reduce the potential of the refuge to provide quality, compatible, wildlife-dependent recreation into the future. The USFWS is directed to continue, consistent with existing laws and interagency agreements, authorized or permitted refuge uses necessary to facilitate military preparedness; however, new agreements permitting military preparedness activities on refuges are discouraged (U.S. Fish and Wildlife Service, 2006). There are four national wildlife refuge areas within the Study Area (Table 6-2 and Figure 6-1, and Figure 6-3).

6.1.2.2.4 National Marine Sanctuaries

Under the Marine Protection, Research, and Sanctuaries Act of 1972 (also known as the National Marine Sanctuaries Act), NOAA establishes a national marine sanctuary for marine areas with special conservation, recreational, ecological, historical, cultural, archaeological, scientific, educational, or aesthetic qualities. The National Marine Sanctuaries Act and federal regulations prohibit destroying, causing the loss of, or injuring any sanctuary resource managed under the law or regulations for that sanctuary (16 U.S.C. section 1436; 15 CFR part 922). National Marine Sanctuaries are managed on a site-specific basis, and each sanctuary has site-specific regulatory prohibitions. Each sanctuary also has site-specific regulatory exemptions from the prohibitions for certain military activities.

Additionally, 16 U.S.C. 1434(d) of the National Marine Sanctuaries Act requires federal agencies to consult with the Office of National Marine Sanctuaries (ONMS) whenever their proposed actions are likely to destroy, cause the loss of, or injure a sanctuary resource. Within the Study Area, there are eight National Marine Sanctuaries included in the List of National System Marine Protected Areas, six of which are designated, two of which are in the designation process. The National Marine Sanctuaries within the Study Area are mapped in Figure 6-2 and Figure 6-4. Where appropriate, a Sanctuary Resources Statement has been prepared describing potential injury to sanctuary resources, which has been submitted to the ONMS to initiate National Marine Sanctuaries Act 16 U.S.C. 1434(d) consultation. Potential mitigation measures that would afford additional protection to sanctuary resources are described in Chapter 5. Additionally, the Central California Large Whale Mitigation Area, a proposed mitigation area, would limit annual sonar use to no more than 300 hours of hull-mounted mid-frequency active sonar in a few of the sanctuaries in the California Study Area. The Central California Large Whale Mitigation Area overlaps significantly with Cordell Bank, Greater Farallones, Monterey Bay and the Chumash Heritage National Marine Sanctuaries. See Table 6-2 for a listing and details concerning the National Marine Sanctuaries within the HCTT Study Area.

6.1.2.2.5 National Parks

The National Park Service administers all national parks, national seashores, and some of the national recreation areas and national monuments to conserve the scenery and the natural and historic objects and wildlife contained within. Park managers control all park usage to ensure that park resources and values are preserved for the future. Unacceptable effects are those that fall short of impairment but are still not acceptable within a particular park’s environment, as determined by the professional judgment of the park manager in accordance with *National Park Service Management Policies 2006* (National Park Service, 2006). Military services may request the use of park areas for noncombat exercises. Permits are approved at the discretion of the park superintendent. There are three National Parks within the Study Area that are included in the National System of Marine Protected Areas (Table 6-2 and Figure 6-2 and Figure 6-4). While the Navy owns infrastructure facilities that support testing and training within Channel Islands National Park, the Navy does not conduct any testing or training activities in the waters of the park (defined as waters within 1 NM of island shorelines).

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
State Marine Protected Areas					
Abalone Cove State Marine Conservation Area	#1, Figure 6-1	California	Ecosystem; rocky reef, surf grass, kelp forest, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Abalone Cove State Marine Conservation Area.
Ahihi-Kinau Natural Area Reserve	#2, Figure 6-3	Hawaii	Ecosystem; recent lava flow, unique coral reef assemblages, anchialine ponds	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Ahihi-Kinau Natural Area Reserve.
Anacapa Island State Marine Conservation Area	#3, Figure 6-1	California	Ecosystem; kelp forest, sandy and rocky seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Anacapa Island State Marine Reserve	#5, Figure 6-1	California	Ecosystem; kelp forest, sandy and rocky seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Arrow Point to Lion Head Point (Catalina Island) State Marine Conservation Area	#6, Figure 6-1	California	Ecosystem; kelp forest, sandy and rocky seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Arrow Point to Lion Head Point (Catalina Island) State Marine Conservation Area.
Begg Rock (San Nicolas Island Quad) State Marine Reserve	#7, Figure 6-1	California	Ecosystem; rocky reef	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Big Creek State Marine Conservation Area	#8, Figure 6-1	California	Ecosystem; kelp forest, rock pinnacle reef, submarine canyon	Activities will avoid harm to natural and cultural resources protected by the MPA	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Big Creek State Marine Conservation Area. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.
Big Creek State Marine Reserve	#9, Figure 6-1	California	Ecosystem; kelp forest, rock pinnacle reef, submarine canyon	Activities will avoid harm to natural and cultural resources protected by the MPA	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Big Creek State Marine Reserve. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.
Blue Cavern (Catalina Island) Offshore State Marine Conservation Area	#10, Figure 6-1	California	Ecosystem; kelp forests, rocky reef, sandy seafloor, underwater caves	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Blue Cavern (Catalina Island) Offshore State Marine Conservation Area.
Blue Cavern (Catalina Island) Onshore State Marine Conservation Area	#11, Figure 6-1	California	Ecosystem; kelp forests, rocky reef, sandy seafloor, underwater caves	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Blue Cavern (Catalina Island) Onshore State Marine Conservation Area.
Cabrillo State Marine Reserve	#12, Figure 6-1	California	Ecosystem; kelp forest, rocky reef, sandy seafloor, intertidal habitat	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Cabrillo State Marine Reserve.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Cambria State Marine Conservation Area	#13, Figure 6-1	California	Ecosystem; kelp forest, estuaries, marshes, rock reef	Activities will avoid harm to natural and cultural resources protected by the MPA	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Cambria State Marin Conservation Area. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.
Carrington Point (Santa Rosa Island) State Marine Reserve	#14, Figure 6-1	California	Ecosystem; kelp forest, surf grass beds, offshore sandy seafloors	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Casino Point (Catalina Island) State Marine Conservation Area	#15, Figure 6-1	California	Ecosystem; rocky intertidal habitat, rocky reef, kelp forest	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Casino Point (Catalina Island) State Marine Conservation Area.
Cat Harbor (Catalina Island) State Marine Conservation Area	#16, Figure 6-1	California	Ecosystem; tidal flats	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Cat Harbor (Catalina Island) State Marine Conservation Area.
Crystal Cove State Marine Conservation Area	#17, Figure 6-1	California	Ecosystem: kelp forest, rocky reef, surf grass, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Crystal Cove State Marine Conservation Area.
Dana Point State Marine Conservation Area	#18, Figure 6-1	California	Ecosystem; kelp forest, surf grass, rocky reef	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Dana Point State Marine Conservation Area.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Farnsworth Bank ASBS State Water Quality Protection Area	#19, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy does not discharge waste in or near this area. Sonar-related activities and other training and testing activities are not likely to harm the area's protected natural resources. A detailed analysis of Water Quality effects in the Study Area is included in Section 3.2. Therefore, no significant effects are expected within the Farnsworth Bank ASBS State Water Quality Protection Area.
Farnsworth Offshore (Catalina Island) State Marine Conservation Area	#20, Figure 6-1	California	Ecosystem; rocky reef, rocky intertidal, kelp forest, surf grass, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA	Sonar-related activities and other training and testing activities are not likely to harm the area's protected natural resources. No explosives are used in this marine protected area. Therefore, no significant effects are expected within the Farnsworth Offshore (Catalina Island) State Marine Conservation Area.
Farnsworth Onshore (Catalina Island) State Marine Conservation Area	#21, Figure 6-1	California	Ecosystem; rocky reef, rocky intertidal, kelp forest, surf grass, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Farnsworth Onshore (Catalina Island) State Marine Conservation Area.
Footprint State Marine Reserve	#22, Figure 6-1	California	Ecosystem; deep coldwater habitat	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Gull Island (Santa Cruz Island) State Marine Reserve	#24, Figure 6-1	California	Ecosystem; rocky reef, pinnacle, kelp forest, sandy seafloor, submarine canyon	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Hanauma Bay MLCD	#26, Figure 6-3	Hawaii	Ecosystem; fringing coral reef, sand bottom	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Hanauma Bay MLCD.
Harris Point (San Miguel Island) State Marine Reserve	#27, Figure 6-1	California	Ecosystem; rocky reef, rocky pinnacle, kelp forest, surf grass, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Irvine Coast ASBS	#29, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy does not discharge waste in or near this area. A detailed analysis of water quality effects in the Study Area is included in Section 3.2. Therefore, no effects are expected within the Irvine Coast ASBS State Water Quality Protection Area.
Judith Rock (San Miguel Island) State Marine Reserve	#30, Figure 6-1	California	Ecosystem; kelp forest, surf grass, rocky reef	Activities will avoid harm to natural and cultural resources protected by the MPA	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Julia Pfeiffer Burns ASBS	#31, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Julia Pfeiffer Burns ASBS. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Kahoolawe Island Reserve	#32, Figure 6-3	Hawaii	Ecosystem: coral reef, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy conducts no activities on or near Kahoolawe Island. Submarines conduct underwater mine detection activities several nautical miles west of Kahoolawe. However, submarine underwater mine detection activities are not likely to harm the area's protected natural resources. No explosives are used in this marine protected area. Therefore, no significant effects are expected within the Kahoolawe Island Reserve.
Kealakekua Bay MLCD	#33, Figure 6-3	Hawaii	Ecosystem; fringing coral reef, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Kealakekua Bay MLCD.
Kure Atoll Wildlife Sanctuary	#90, Figure 6-4	Hawaii	Ecosystem; fringing coral reef, cultural resources, pelagic ocean	Prohibitions on activities within the Kure Atoll Wildlife Sanctuary are the same as those that apply to the Papahanaumokuakea Marine National Monument and World Heritage Site (50 CFR part 404). Activities of the Armed Forces are not subject to those prohibited acts. The regulations state that "all activities and exercises of the Armed Forces shall be carried out in a manner that avoids, to the extent practicable and consistent with operational requirements, adverse effects on Monument	Limited activities under the Proposed Action would be conducted within or in the vicinity of Kure Atoll Wildlife Sanctuary. The Navy conducts activities in a manner that avoids, to the extent practicable and consistent with operational requirements, effects on Refuge resources and qualities. Therefore, no significant effects are expected within the Kure Atoll Wildlife Sanctuary.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				resources and qualities." Additionally, these regulations require that "in the event of threatened or actual destruction of, loss of, or injury to a Monument resource or quality resulting from an incident, including but not limited to spills and groundings, caused by a component of the DoD or the United States Coast Guard, the cognizant component shall promptly coordinate with the Secretaries for the purpose of taking appropriate actions to respond to and mitigate the harm and, if possible, restore or replace the Monument resource or quality". Activities will avoid harm to natural and cultural resources protected by the MPA.	

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
La Jolla ASBS State Water Quality Protection Area	#34, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy conducts training and testing in all warfare areas, including mine warfare training activities and underwater communications testing activities just offshore (within 3 NM) of this water quality protection area. The Navy does not discharge any waste in or near this area. A detailed analysis of water quality effects in the Study Area is included in Section 3.2. No explosives are used in this marine protected area. Mine warfare training activities, underwater communications testing activities, and other training and testing activities are not likely to harm the area's protected natural resources. Therefore, no significant effects are expected within the La Jolla ASBS State Water Quality Protection Area.
Laguna Beach State Marine Conservation Area	#35, Figure 6-1	California	Ecosystem; rocky intertidal, rocky reef, kelp forest, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Laguna Beach State Marine Conservation Area.
Laguna Beach State Marine Reserve	#36, Figure 6-1	California	Ecosystem; rocky intertidal, rocky reef, kelp forest, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Laguna Beach State Marine Reserve.
Laguna Point to Latigo Point ASBS State Water Quality Protection Area	#37, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy does not discharge waste in or near this area. Other testing or training activities are not likely to harm the area's protected natural resources. A detailed analysis of water quality effects in the Study Area is included in Section 3.2. Therefore, no significant effects are expected within this area.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Lapakahi MLCD	#38, Figure 6-3	Hawaii	Ecosystem; lava fingers, fringing coral reef	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Lapakahi MLCD.
Long Point (Catalina Island) State Marine Reserve	#39, Figure 6-1	California	Ecosystem; kelp forest, rocky reef, surf grass, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Long Point (Catalina Island) State Marine Reserve.
Lover's Cove (Catalina Island) State Marine Conservation Area	#40, Figure 6-1	California	Ecosystem; rocky intertidal, rocky reef, kelp forest	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Lover's Cove (Catalina Island) State Marine Conservation Area.
Manele-Hulopoe MLCD	#41, Figure 6-3	Hawaii	Ecosystem; fringing coral reef, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Manele-Hulopoe MLCD.
Matlahuayl State Marine Reserve	#42, Figure 6-1	California	Ecosystem; kelp forest, rocky intertidal, rocky reef, sur grass, sea caves, submarine canyon	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed training or testing activities are expected to occur in the area. Therefore, no effects are expected within the Matlahuayl State Marine Reserve.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Molokini Shoal MLCD	#43, Figure 6-3	Hawaii	Ecosystem; fringing coral reef, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy conducts sonar in the waters near Molokini Shoal MLCD. No explosives are used in this marine protected area. The Navy avoids affecting Conservation District resources and qualities to the maximum extent practicable. Mitigation measures are employed whenever sonar activities occur, as applicable. The Navy may conduct diver insertion or extraction on or near Molokini. However, diver insertion or extraction is not likely to affect the area's protected natural resources. Therefore, no significant effects are expected to the Molokini Shoal MLCD.
Morro Bay State Marine Reserve	#44, Figure 6-1	California	Ecosystem; tidal flats, coast marsh, eelgrass bed	Activities will avoid harm to natural and cultural resources protected by the MPA.	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Morro Bay State Marine Reserve. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.
Northwest Santa Catalina Island ASBS State Water Quality Protection Area	#45, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy does not discharge waste in or near this area. A detailed analysis of water quality effects in the Study Area is included in Section 3.2. No explosives are used in this marine protected area. Sonar-related activities and other training and testing activities are not likely to harm the area's protected natural resources. Therefore, no significant effects are expected within the Northwest Santa Catalina Island ASBS State Water Quality Protection Area.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Northwestern Hawaiian Islands Marine Refuge	#89, Figure 6-4	Hawaii	Ecosystem	Activities will avoid harm to natural and cultural resources protected by the MPA.	Limited activities under the Proposed Action would be conducted within or in the vicinity of Northwestern Hawaiian Islands Marine Refuge. The Navy conducts activities in a manner that avoids, to the extent practicable and consistent with operational requirements, effects on Refuge resources and qualities. Therefore, no significant effects are expected within the Northwestern Hawaiian Islands Marine Refuge.
Old Kona Airport MLCD	#46, Figure 6-3	Hawaii	Ecosystem; lava fingers, fringing coral reef	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Old Kona Airport MLCD.
Painted Cave (Santa Cruz Island) State Marine Conservation Area	#47, Figure 6-1	California	Ecosystem; nearshore, rocky reef, sandy seafloor, sea cave	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Piedras Blancas State Marine Conservation Area	#48, Figure 6-1	California	Ecosystem; rocky reef, surf grass, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Piedras Blancas State Marine Conservation Area. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Piedras Blancas State Marine Reserve	#49, Figure 6-1	California	Ecosystem; rocky reef, surf grass, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Piedras Blancas State Marine Reserve. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.
Point Buchon State Marine Conservation Area	#50, Figure 6-1	California	Ecosystem; intertidal, rocky reef, kelp forest, sandy seafloor, offshore pinnacles	Activities will avoid harm to natural and cultural resources protected by the MPA.	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Point Buchon State Marine Conservation Area. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.
Point Buchon State Marine Reserve	#51, Figure 6-1	California	Ecosystem; intertidal, rocky reef, kelp forest, sandy seafloor, offshore pinnacles	Activities will avoid harm to natural and cultural resources protected by the MPA.	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Point Buchon State Marine Reserve. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.
Point Conception State Marine Reserve	#52, Figure 6-1	California	Ecosystem; kelp forest, surf grass, rocky reefs, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Point Sur State Marine Conservation Area	#53, Figure 6-1	California	Ecosystem; kelp forest, rocky reef, submarine canyon	Activities will avoid harm to natural and cultural resources protected by the MPA.	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Point Sur State Marine Conservation Area. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.
Point Sur State Marine Reserve	#54, Figure 6-1	California	Ecosystem; kelp forest, rocky intertidal, rocky reef, submarine canyon	Activities will avoid harm to natural and cultural resources protected by the MPA.	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Point Sur State Marine Reserve. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.
Point Vicente State Marine Conservation Area	#55, Figure 6-1	California	Ecosystem; kelp forest, rocky reef, soft seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed training or testing activities are expected to occur in the area. Therefore, no effects are expected within the Point Vicente State Marine Conservation Area.
Pupukea MLCD	#56, Figure 6-3	Hawaii	Ecosystem; rocky reef, submarine caves, estuary,	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Pupukea MLCD.
Richardson Rock (San Miguel Island) State Marine Reserve	#57, Figure 6-1	California	Ecosystem; pinnacles, rocky reef	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Robert E. Badham ASBS	#59, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy does not discharge waste in or near this area. A detailed analysis of water quality effects in the Study Area is included in Section 3.2. Therefore, no effects are expected within the Robert E. Badham ASBS State Water Quality Protection Area.
Salmon Creek Coast ASBS	#60, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Salmon Creek Coast ASBS. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.
San Clemente Island ASBS State Water Quality Protection Area	#61, Figure 6-1	California	Water Quality	Military training and testing activities are exempt from the established waste discharge prohibitions within the ASBS. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy conducts training and testing in all warfare areas, including amphibious, anti-surface warfare, anti-submarine warfare, electronic warfare, mine warfare, and expeditionary warfare activities in this area. The military could discharge waste in or near this area in accordance with the exemption provided for military training and testing activities. A detailed analysis of water quality effects in the Study Area is included in Section 3.2. Training and testing activities are not likely to harm the area's protected natural resources because any discharges will be conducted in accordance with ASBS regulations and military exemption policies. Therefore, no significant effects are expected within the San Clemente Island ASBS State Water Quality Protection Area.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
San Diego-Scripps ASBS State Water Quality Protection Area	#62, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy conducts training and testing in all warfare areas, including mine warfare training activities and underwater communications testing activities just offshore (within 3 NM) of this water quality protection area. However, no explosives are used in this marine protected area. The Navy does not discharge any waste in or near this area. A detailed analysis of water quality effects in the Study Area is included in Section 3.2. Mine warfare training activities, underwater communications testing activities, and other training and testing activities are not likely to harm the area's protected natural resources. Therefore, no significant effects are expected within the San Diego-Scripps ASBS State Water Quality Protection Area.
San Diego-Scripps Coastal State Marine Conservation Area	#63, Figure 6-1	California	Ecosystem; rocky reef, sandy seafloor, submarine canyon	It is unlawful to injure, damage, take, or possess any living, geological, or cultural marine resource for recreational and/or commercial purposes, unless following the specified exceptions (California Department of Fish and Wildlife, 2016).	Mitigation measures are employed whenever sonar activities occur, as applicable; therefore, sonar-related activities and other training and testing activities are not likely to harm the area's protected natural resources in this marine protected area. Therefore, no significant effects are expected within the San Diego-Scripps Coastal State Marine Conservation Area.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
San Miguel, Santa Rosa, and Santa Cruz Islands ASBS State Water Quality Protection Area	#64, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy does not discharge waste in or near this area. Other testing or training activities are not likely to harm the area's protected natural resources. A detailed analysis of water quality effects in the Study Area is included in Section 3.2. Therefore, no significant effects are expected within this area.
San Nicolas Island and Begg Rock ASBS State Water Quality Protection Area	#65, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy does not discharge waste in or near this area. No explosives are used in this marine protected area. A detailed analysis of water quality effects in the Study Area is included in Section 3.2. Therefore, no significant effects are expected within the San Nicolas Island and Begg Rock ASBS State Water Quality Protection Area.
Santa Barbara and Anacapa Islands ASBS State Water Quality Protection Area	#66, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy does not discharge waste in or near this area. Other testing or training activities are not likely to harm the area's protected natural resources. A detailed analysis of water quality effects in the Study Area is included in Section 3.2. Therefore, no significant effects are expected within the Santa Barbara and Anacapa Islands ASBS State Water Quality Protection Area.
Santa Barbara Island State Marine Reserve	#67, Figure 6-1	California	Ecosystem; sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	Mitigation measures are employed whenever sonar activities occur, as applicable; therefore, sonar-related activities and other training and testing activities are not likely to harm the area's protected natural resources. No explosives are used in this marine protected area. Therefore, no significant effects are expected within the Santa Barbara Island State Marine Reserve.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Skunk Point (Santa Rose Island) State Marine Reserve	#69, Figure 6-1	California	Ecosystem; kelp forest, sandy seafloor, surf grass, eelgrass, lagoon	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
South La Jolla State Marine Conservation Area	#70, Figure 6-1	California	Ecosystem; kelp forest, rocky reef, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	Transits may occur in this area. No proposed training and testing activities are expected to occur in the area. Therefore, no significant effects are expected within the South La Jolla State Marine Conservation Area.
South La Jolla State Marine Reserve	#71, Figure 6-1	California	Ecosystem; kelp forest, rocky reef, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	Transits may occur in this area. No proposed training and testing activities are expected to occur in the area. Therefore, no significant effects are expected within the South La Jolla State Marine Reserve.
South Point (Santa Rosa Island) State Marine Reserve	#72, Figure 6-1	California	Ecosystem; kelp forest, rocky reef, surf grass, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Southeast Santa Catalina Island ASBS State Water Quality Protection Area	#74. Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy does not discharge waste in or near this area. A detailed analysis of water quality effects in the Study Area is included in Section 3.2. Sonar-related activities and other training and testing activities are not likely to harm the area's protected natural resources. No explosives are used in this marine protected area. Therefore, no significant effects are expected within the Southeast Santa Catalina Island ASBS State Water Quality Protection Area.
Swami's State Marine Conservation Area	#75, Figure 6-1	California	Ecosystem; kelp forest, rocky reef, surf grass, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Swami's State Marine Conservation Area.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Vandenberg State Marine Reserve	#76, Figure 6-1	California	Ecosystem; kelp forest, rocky reef, tidal flats, estuary, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of Vandenberg State Marine Conservation Area. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.
Waikiki MLCD	#77, Figure 6-3	Hawaii	Ecosystem; reef flat, fringing coral reef,	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the Waikiki MLCD.
Western Santa Catalina Island ASBS State Water Quality Protection Area	#79, Figure 6-1	California	Water Quality	Waste discharges are prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy does not discharge waste in or near this area. A detailed analysis of water quality effects in the Study Area is included in Section 3.2. Therefore, no effects are expected within the Western Santa Catalina Island ASBS State Water Quality Protection Area.
White Rock State Marine Conservation Area	#80, Figure 6-1	California	Ecosystem; kelp forests, rocky intertidal, rocky reef, sandy seafloor, pinnacles	Activities will avoid harm to natural and cultural resources protected by the MPA.	Amphibious landing activities would be conducted on soft habitat areas within the vicinity of White Rock State Marine Conservation Area. Effects on hard bottom habitats (reefs) would be avoided; soft bottom in the nearshore environment where amphibious landing activities would occur is sand, which would return to normal after disturbance concludes. Further details can be found in Section 3.5.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
State Special Closures					
Anacapa Island Special Closure (A)	#82, Figure 6-1	California	Ecosystem	No net or trap may be used in waters less than 20 feet deep off Anacapa Island. A brown pelican fledging area is designated on the north side of West Anacapa Island. This area is restricted to everyone except California Department of Fish and Wildlife employees or National Park Service employees.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Anacapa Island Special Closure (B)	#83, Figure 6-1	California	Ecosystem	No net or trap may be used in waters less than 20 feet deep off Anacapa Island. A brown pelican fledging area is designated on the north side of West Anacapa Island. This area is restricted to everyone except California Department of Fish and Wildlife employees or National Park Service employees.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
San Miguel Island Special Closure (A-1)	#84, Figure 6-1	California	Ecosystem	Boating is allowed except west of a line drawn between Judith Rock and Castle Rock where boats are prohibited closer than 300 yards from shore. Boats operated by commercial sea urchin divers may enter the	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				restricted waters with a minimum amount of noise and not exceeding speeds of five miles per hour. Landing is allowed on San Miguel Island only at the designated landing beach in Cuyler Harbor.	
Federal Marine Protected Areas					
Federal Conservation Area and Marine Reserves					
Anacapa Island Federal Marine Conservation Area	#4, Figure 6-1	California	Ecosystem; kelp forest, sandy and rocky seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Anacapa Island Federal Marine Reserve	#6, Figure 6-1	California	Ecosystem; kelp forest, sandy and rocky seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Footprint (Anacapa Channel) Federal Marine Reserve	#23, Figure 6-1	California	Ecosystem; deep coldwater habitat	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Gull Island (Santa Cruz Island) Federal Marine Reserve	#25, Figure 6-1	California	Ecosystem; rocky reef, pinnacle, kelp forest, sandy seafloor, submarine canyon	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Harris Point (San Miguel Island) Federal Marine Reserve	#28, Figure 6-1	California	Ecosystem; rocky reef, rocky pinnacle, kelp forest, surf grass, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
He'eia National Estuarine Research Reserve	#81, Figure 6-3	Hawaii	Ecosystem; coral reef, sandy seafloor, estuary	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within the He'eia National Estuarine Research Reserve.
Richardson Rock (San Miguel Island) Federal Marine Reserve	#58, Figure 6-1	California	Ecosystem; pinnacles, rocky reef	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
Santa Barbara Island Federal Marine Reserve	#68, Figure 6-1	California	Ecosystem; sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
South Point (Santa Rosa Island) Federal Marine Reserve	#73, Figure 6-1	California	Ecosystem; kelp forest, rocky reef, surf grass, sandy seafloor	Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities are expected to occur in the area. Therefore, no effects are expected within this area.
National Monuments					
California Coastal National Monument	#1, Figure 6-2	California	Ecosystem	Presidential proclamations 7264 and 9089 (terrestrial extension) do not include any prohibitions or regulations concerning DoD activities. Both proclamations note that the establishment and subsequent boundary enlargement were subject to existing rights. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Navy and USMC conduct activities throughout the central and southern portions of Monument (which spans the entire coastline of California), including but not limited to amphibious landings at various locations. However, activities under the Proposed Action would not occur on the rocks the comprise the Monument. Additionally, the Navy and the Bureau of Land Management have agreed on the terms of a Memorandum of Understanding dated November 5, 2007, regarding Navy activities in the vicinity of monument resources. Implementation of the Proposed Action would be consistent with the Memorandum of Understanding and would not affect

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
					monument resources.
Pacific Remote Islands National Marine Monument	#2, Figure 6-4	U.S. Territory	Ecosystem	Presidential Proclamation 8336 includes exemptions for DoD activities, including the protected of training, readiness, and global mobility of the U.S. Armed Forces. It also stipulates that no regulation implementing this proclamation shall limit or otherwise affect the Armed Forces discretion to use, maintain, improve, or control properties under the administrative control of a Military Department or otherwise limit the availability of such property for military mission purposes, including, but not limited to, defensive areas and airspace reservations.	The Navy conducts no activities in or near the proposed Pacific Remote Islands National Marine Monument. Ships may transit in the vicinity of the sanctuary and within Pacific Remote Islands Marine National Monument. Ships transiting in the vicinity are not expected to affect monument resources. While there has been no incident to date, should there be a threatened or actual event that may cause destruction of, loss of, or injury to a Monument resource or quality (such as spill or grounding), the DoD and Navy would coordinate with the Secretaries of Commerce and Interior to respond to, and provide mitigation or restoration of the effects of any such harm. No significant adverse effect is likely.
Papahanaumokuakea Marine National Monument and World Heritage Site	#3, Figure 6-4	Hawaii	Ecosystem	The Monument's two Proclamations identify prohibitions on activities within the Monument. Proclamation 8031 provides that "all activities and exercises of the Armed Forces shall be carried out in a manner that avoids, to the extent practicable and consistent with operational	Vessels and aircraft used in the conduct of military training and testing would be operated in a manner consistent with the requirements of Presidential Proclamations 8031 and 9478, so far as is practicable. As analyzed in Section 3.10, no adverse effects on cultural resources would occur as a result of the Proposed Action; additionally, adverse effects on biological resources are not anticipated. While there has been no incident to date, should there be a threatened or

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				requirements, adverse effects on Monument resources and qualities." Similarly, Proclamation 9478, which expanded the Monument, requires that the "U.S. Armed Forces ensure that its vessels and aircraft act in a manner consistent, so far as is practicable with the Proclamation by the adoption of appropriate measures not impairing operations or operation capabilities." Additionally, both Proclamations state that "in the event of threatened or actual destruction of, loss of, or injury to a Monument resource or quality resulting from an incident, including but not limited to spills and groundings, caused by a component of the DoD or the United States Coast Guard, the cognizant component shall promptly coordinate with the Secretaries for the purpose of taking appropriate actions to respond to and mitigate the harm and, if possible, restore or replace the Monument resource or	actual event that may cause destruction of, loss of, or injury to a Monument resource or quality (such as spill or grounding), the DoD and Navy would coordinate with the Secretaries of Commerce and Interior to respond to, provide mitigation or restoration of the effects of any such harm. No significant adverse effect is likely.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				quality". Activities will avoid harm to natural and cultural resources protected by the MPA.	
National Wildlife Refuges					
Johnston Island National Wildlife Refuge	#2, Figure 6-4	U.S. Territory	Ecosystem; fringing coral reef, pelagic ocean	This refuge is captured within the Pacific Remote Islands Marine National Monument. The proclamation for that Monument indicates that prohibition of certain activities does not apply to activities and exercises of the Armed Forces. Any activities carried out within the area will be conducted in a manner consistent "so far as is reasonable and practical" with the prohibitions. If a DoD activity causes any destruction, loss, or injury to a resource within the refuge, then the DoD will coordinate with the Secretary of the Interior or Commerce, to take appropriate actions to respond, mitigate, restore, or replace the affected areas. Activities will avoid harm to natural and cultural	The Navy conducts no activities in or near the Johnston Island National Wildlife Refuge. Ships may transit in the vicinity of the refuge and within Pacific Remote Islands Marine National Monument. Ships transiting in the vicinity are not expected to significantly affect the area's protected natural resources. Therefore, no significant effects as a result of the Proposed Action are expected to the Johnston Island National Wildlife Refuge.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				resources protected by the MPA.	
Midway Atoll National Wildlife Refuge and	#86, Figure 6-4	Hawaii	Ecosystem; fringing coral reef, cultural resources, pelagic ocean	Prohibitions on activities within the Midway Atoll National Wildlife Refuge and Kure Atoll Wildlife Sanctuary are the same as those that apply for the Papahanaumokuakea Marine National Monument and World Heritage Site (50 CFR part 404). Activities of the Armed Forces are not subject to those prohibited acts. The regulations state that "all activities and exercises of the Armed Forces shall be carried out in a manner that avoids, to the extent practicable and consistent with operational requirements, adverse effects on Monument resources and qualities." Additionally, these regulations require that "in the event of threatened or actual destruction of, loss of, or injury to a Monument resource or quality resulting from an incident, including but not limited to spills and groundings, caused by a component of the DoD or the	Limited activities under the Proposed Action would be conducted within or in the vicinity of Midway Atoll National Wildlife Refuge and Kure Atoll Wildlife Sanctuary. The Navy conducts activities in a manner that avoids, to the extent practicable and consistent with operational requirements, effects on Refuge resources and qualities. Therefore, no significant effects are expected within the Midway Atoll National Wildlife Refuge and Kure Atoll Wildlife Sanctuary.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				United States Coast Guard, the cognizant component shall promptly coordinate with the Secretaries for the purpose of taking appropriate actions to respond to and mitigate the harm and, if possible, restore or replace the Monument resource or quality". Activities will avoid harm to natural and cultural resources protected by the MPA.	
San Diego Bay National Wildlife Refuge	#87, Figure 6-1	California	Endangered Species Management	It is unlawful to injure, damage, take, or possess any living, geological, or cultural marine resource for recreational or commercial purposes. Swimming, operating personal watercraft (e.g., jet ski), and water skiing are not allowed on the refuge (U.S. Fish and Wildlife Service, 2014). Activities will avoid harm to natural and cultural resources protected by the MPA.	No activities are proposed within the San Diego Bay National Wildlife Refuge. Activities in the San Diego Bay outside of the National Wildlife Refuge would not injure, damage, take, or possess any living, geological, or cultural marine resource in the Refuge. Therefore, no effects are expected within the San Diego Bay National Wildlife Refuge.
Seal Beach National Wildlife Refuge	#88, Figure 6-1	California	Endangered Species Management	The Seal Beach National Wildlife Refuge is an approximately 920-acre salt marsh and upland habitat located entirely within the	No activities are proposed within the Seal Beach National Wildlife Refuge. Therefore, no effects are expected within the Seal Beach National Wildlife Refuge.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				boundaries of Naval Weapons Station Seal Beach. The refuge is jointly managed by the Department of the Navy and the Fish and Wildlife Service pursuant to plans which are mutually acceptable to the Secretary of the Interior and the Secretary of the Navy. The focus of the refuge is on the protection of endangered bird species, primarily the California least tern and the light-footed Ridgeway rail. Activities will avoid harm to natural and cultural resources protected by the MPA.	
National Marine Sanctuaries					
Channel Islands National Marine Sanctuary	#4, Figure 6-2	California	Ecosystem	Military activities pre-existing the Sanctuary effective date of Sanctuary regulations (September 1980) and those specifically listed in the Channel Islands National Marine Sanctuary Final MP/Final EIS are exempt from the prohibitions identified in 15 CFR 922.72. Other activities that are modified, new, or not considered pre-existing may	Proposed military activities in the Channel Islands National Marine Sanctuary include training exercises, military testing, and evaluation projects for aircraft, ship, and missile programs, and air, surface, and subsurface Navy testing and training. They are consistent with those activities described in the Sanctuary's regulations and in Section 3.5.9 (Department of Defense Activities, preexisting activities) of the 2009 *Final Channel Islands National Marine Sanctuary Management Plan/Final EIS.* While Navy activities are carried out in a manner that

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				be exempted by the Director after consultation between the Director and the DoD. Activities will avoid harm to natural and cultural resources protected by the MPA.	avoids any adverse effects on Sanctuary resources or qualities to the maximum extent practicable, military readiness activities proposed to occur in the vicinity of Channel Islands National Marine Sanctuary have the potential to affect or cause injury to sanctuary resources. As such, consultation under Section 304(d) will occur for Channel Islands National Marine Sanctuary.
Cordell Bank National Marine Sanctuary	#5, Figure 6-2	California	Ecosystem	Cordell Bank National Marine Sanctuary regulations (15 CFR part 922, subpart K) provide that identified prohibitions do not apply to military activities currently carried out for the purpose of national defense by the DoD as of September 1980 (effective date of the regulations). Specific military activities are not specified in the 2014 Cordell Banks National Marine Sanctuary MP. However, new activities may be exempt from the prohibitions by the Director after a consultation between the DoD and NOAA. Activities will avoid harm to natural and cultural resources protected by the MPA.	As an ecosystem-based sanctuary, a key habitat of Cordell Bank National Marine Sanctuary's main feature is the Cordell Bank, which is a 26-square-mile rocky feature rising abruptly out of the soft sediment of the continental shelf 22 miles off the coast of Point Reyes. The diverse marine habitat is supported by the California Current, which flows southward along the coast of the bank, and the annual upwelling of nutrient-dense waters off the continental shelf (National Oceanic and Atmospheric Administration, 2023c). As a result, the sanctuary boasts a biologically diverse marine community that includes upwards of 18 mammal species, 180 species of fish, 70 species of birds, and thousands of invertebrate species that compete for space on the upper-reef habitat of the bank. The sanctuary also includes the continental slope, which accounts for 190 square miles of the sanctuary, and submarine canyons that extend over 5,200 feet deep that provide essential habitat for deep-water corals, sponges, and various fish (National

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
					Marine Sanctuary Foundation, 2023). Activities proposed in the Cordell Bank National Marine Sanctuary include flight operations. Cordell Bank National Marine Sanctuary regulations (15 CFR part 922, subpart K), all activities being carried out by the DoD within the sanctuary on the effective date of designation or expansion of the Sanctuary necessary for national defense are allowed under military exemption. Proposed activities fall under this exemption as they have been previously conducted within the NOCAL Range Complex. While Navy activities are carried out in a manner that avoids any adverse effects on Sanctuary resources or qualities to the maximum extent practicable, military readiness activities proposed to occur in the vicinity of Cordell Bank National Marine Sanctuary have the potential to affect or cause injury to sanctuary resources. As such, consultation under Section 304(d) will occur for Cordell Bank National Marine Sanctuary.
Greater Farallones National Marine Sanctuary	#6, Figure 6-2	California	Ecosystem	Greater Farallones National Marine Sanctuary regulations (15 CFR part 922, subpart H) provide that identified prohibitions do not apply to military activities currently carried out by the DoD as of September 1980 (effective date of the regulations). Specific military activities are not specified in the 2014	As an ecosystem-based sanctuary, key habitats of the Greater Farallones include sandy beaches, surfgrass, rocky shore, kelp forests, rocky reef, shallow sandy and rocky seafloor, deep seafloor, and pelagic habitat. The diversity of habitats onshore and offshore contributes to the high species diversity in the sanctuary, which supports 36 marine mammal species, over 390 species of fish, 330 species of invertebrates (including mollusks, echinoderms, cnidarians, arthropods,

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				Greater Farallones National Marine Sanctuary MP. However, new activities may be exempt from the prohibitions by the Director after a consultation between the DoD and NOAA. Activities will avoid harm to natural and cultural resources protected by the MPA.	poriferans and polychaetes), over 200 species of algae, more than 250,000 seabirds from 160 species, and one of the most robust white shark populations on the planet. Within the sanctuary, the Farallon Islands host the largest breeding colony of seabirds in the Continental United States and also serves as a stop along the Pacific Flyway for species migrating from southern wintering ground to northern breeding sites (Greater Farallones Association, 2023). It is estimated that 300 shipwrecks are within the sanctuary area. Activities proposed in the Greater Farallones National Marine Sanctuary include flight operations. Per 15 CFR part 922, subpart H, all activities currently carried out by the DoD within the sanctuary are allowed under military exemption. Proposed activities fall under this exemption as they have been previously conducted within the NOCAL Range. While Navy activities are carried out in a manner that avoids any adverse effects on sanctuary resources or qualities to the maximum extent practicable, military readiness activities proposed to occur in the vicinity of Greater Farallones National Marine Sanctuary have the potential to affect or cause injury to sanctuary resources. As such, Consultation under Section 304(d) will occur for Greater Farallones National Marine Sanctuary.
Monterey Bay National	#8, Figure 6-2	California	Ecosystem	Prohibited or otherwise	Military activities in Monterey Bay National

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Marine Sanctuary				regulated activities are identified in 15 CFR part 922.132. The following activities are prohibited: exploring for or developing oil, gas, or minerals; discharging hazardous material; moving, removing, or injuring any historical resources; drilling and dredging; and taking or disturbing any marine mammal, sea turtle, or bird. Military activities defined in the 1992 Monterey Bay National Marine Sanctuary Final MP/EIS are exempt from the sanctuary's regulations. New activities may be exempted by the Director after consultation between the Director and the DoD. Activities will avoid harm to natural and cultural resources protected by the MPA.	Marine Sanctuary are identified in the 1992 Monterey Bay National Marine Sanctuary Final MP/EIS. While Navy activities are carried out in a manner that avoids any adverse effects on Sanctuary resources or qualities to the maximum extent practicable, military readiness activities proposed to occur in the vicinity of Monterey Bay National Marine Sanctuary have the potential to affect or cause injury to sanctuary resources. As such, consultation under Section 304(d) will occur for Monterey Bay National Marine Sanctuary.
Hawaiian Islands Humpback Whale National Marine Sanctuary	#7, Figure 6-4	Hawaii	Species and habitat	Federal regulations prohibit approaching humpback whales within 100 yards (90 meters) when in the water except as authorized under the Marine Mammal Protection Act, as amended	Proposed military activities in the Hawaiian Islands Humpback Whale National Marine Sanctuary include air, surface, and subsurface activities; weapons activities; use of explosives; mine warfare activities; and unmanned underwater vehicles and unmanned aerial systems activities. All fall

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				by the Endangered Species Act; and 1,000 feet (300 meters) when operating an aircraft except when in a designated flight corridor for takeoff or landing from an airport or runway or as authorized under the Marine Mammal Protection Act, as amended by the Endangered Species Act. Other prohibited activities are listed in 15 CFR 922.184. Activities will avoid harm to natural and cultural resources protected by the MPA.	into classes of activities covered in the 1997 Final EIS/MP for the Sanctuary. These activities are also the same classes of activities previously analyzed in the Navy's 2013 and 2018 HSTT EIS/OEIS and for which the ONMS found no consultation was required in a letter dated August 16, 2013. While Navy activities are carried out in a manner that avoids any adverse effects on sanctuary resources or qualities to the maximum extent practicable, military readiness activities proposed to occur in the vicinity of Hawaiian Islands Humpback Whale National Marine Sanctuary have the potential to affect or cause injury to sanctuary resources. As such, consultation under Section 304(d) will occur for Hawaiian Islands Humpback Whale National Marine Sanctuary.
Chumash Heritage National Marine Sanctuary (CHNMS)	#10, Figure 6-2	California	Ecosystem	The prohibitions in paragraphs (a)(2) through (a)(10) in Table 3-1 (found in Section 3.2.2 of the Final Chumash Heritage National Marine Sanctuary Final Environmental Impact Statement EIS [Volume 1]) do not apply to existing activities carried out or approved by the DoD, that were conducted prior to the effective date of this designation, as specifically identified in Section 4.9 or	The CHNMS provides a conservation and comprehensive ecosystem-based management to address threats to the nationally significant biological, cultural, and historical resources of the sanctuary. The purpose of the CHNMS is to conserve and manage its special ecological qualities, shaped by significant offshore geologic features (e.g., Santa Lucia Bank, Rodriguez Seamount, and Arguello Canyon). Seasonal upwelling supports the area's high biological productivity, promoting dense aggregations of marine life. The existing biogeographic transition zone, where temperate waters from the north meet the subtropics, creates

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				Appendix I of the final EIS for CHNMS. New activities may be exempted from the prohibitions (referenced above) by the Director after consultation between the Director and the DoD. All DoD activities must be carried out in a manner that avoids to the maximum extent practicable any adverse impacts on Sanctuary resources and qualities.	an area of nationally significant biodiversity in sea birds, marine mammals, invertebrates, and fishes. The area is also composed of extensive kelp forests, seagrass beds, and wetlands that serve as nurseries for numerous commercial fish species and as important habitat for many threatened and endangered species, such as humpback whales, blue whales, the southern sea otter, black abalone, snowy plovers, and leatherback sea turtles. In coordination with ONMS, military activities in the Chumash Heritage National Marine Sanctuary have been identified in the designation documents, to include training and testing, warfare practice exercises, weapons testing including ballistic missile tests, and other operations. Military readiness activities proposed to occur in the vicinity of the CHNMS have the potential to cause injury to sanctuary resources. As such, consultation under Section 304(d) will occur.
PROPOSED National Marine Sanctuary in the Pacific Remote Islands	#14, Figure 6-4	Hawaii	Ecosystem	On March 24, 2023, President Biden issued a memorandum directing the Secretary of Commerce to consider initiating the designation process for a National Marine Sanctuary in the Pacific Remote Islands region. NOAA's ONMS issued a Notice of Intent on April	The Proposed National Marine Sanctuary in the Pacific Remote Islands would cover one of the most pristine tropical marine environments in the world and includes over 165 seamounts that are hotspots of marine biodiversity, including fish, corals, shellfish, seabirds, and vegetation not found anywhere else in the world. Many threatened or endangered species thrive in the protected

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				17, 2023, to conduct scoping and prepare an EIS for the the Proposed National Marine Sanctuary in the Pacific Remote Islands, initiating the designation process. The proposed sanctuary will encompass the existing Pacific Remote Islands Marine National Monument and extend protection of the marine and seabed resources to the full extent of the U.S. EEZ, covering a total of about 770,000 square miles (Table 6-2 and Figure 6-4). This area includes Baker, Howland, and Jarvis Islands; and Johnston, Wake, and Palmyra Atoll; and Kingman Reef. The northeast portion of the Pacific Remote Islands National Marine Monument, specifically Johnston Atoll, is included in the Hawaii Study Area. Proposed sanctuary designation documents and proposed sanctuary regulations are currently being drafted.	waters of the proposed sanctuary. The designation of the proposed sanctuary would allow for the augmentation of current regulations associated with the Pacific Remote Islands Marine National Monument, providing additional regulatory and non-regulatory protective measures, and extending the conservation area past the Monument's current boundaries. Additionally, the Pacific Remote Island region is historically and culturally significant for many indigenous sea-faring people in the Pacific, including native Hawaiian, Samoan, CHamoru, Carolinian, and others. The proposed sanctuary would honor the ancestral and historical connection sea-faring peoples have to the Pacific Remote Islands and surrounding waters that were used for voyaging, settling new lands, and trading commerce and cultures. The Navy can conduct training and testing activities in or near the proposed National Marine Sanctuary in the Pacific Remote Islands. However, those activities are generally within transit corridors commonly associated with the Navy's Marianas Island Training and Testing study area between Hawaii and Guam. The Navy is working with ONMS in the development of the sanctuary, and should consultation under Section 304(d) become necessary will do so through future

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
					analysis related to the Mariana Islands Training and Testing study area.
PROPOSED Papahanaumokuakea National Marine Sanctuary	#9, Figure 6-4	Hawaii	Ecosystem	NOAA's ONMS initiated the process to designate the marine portions of the Papahānaumokuākea Marine National Monument as a national marine sanctuary in November 2021. The preferred alternative for the proposed Sanctuary has a similar footprint (with exclusion of the land areas) as the Papahānaumokuākea Marine National Monument, which, at 582,578 square miles, is the largest contiguous fully-protected conservation area in the United States (Figure 6-4) (National Oceanic and Atmospheric Administration, 2023a). Designation as a national marine sanctuary would add conservation benefits and further safeguard the marine resources in the area. Proposed sanctuary designation documents and proposed sanctuary regulations are currently	The Papahanaumokuakea National Marine Monument and proposed National Marine Sanctuary is home to many diverse species, 25 percent of which are endemic to Hawaii and occur nowhere else in the world. The sanctuary would include 3.5 million acres of coral reef (70 percent of the total coral reef area in the United States), which is the only apex-predator dominated reef ecosystem left in the world. Over 90 percent of the proposed sanctuary area is at depths greater than 3,000 feet, providing habitat to unique deep-water ecosystems. Additionally, the islands and shoals within the marine monument are home to nearly 14 million seabirds of 22 different species. The proposed sanctuary also contains significant post-Western contact cultural resources, encompassing approximately 60 shipwrecks and 61 aircraft sites associated with historic events, such as commercial whaling practices and the World War II Battle of Midway. The Navy's proposed action includes activities conducted east of Nihoa Island and inside the eastern edge of the proposed Papahanaumokuakea Marine National Sanctuary boundaries. The Navy conducts activities in a manner that avoids, to the extent practicable and consistent with operational requirements, effects on Refuge resources and qualities. Vessels and aircraft

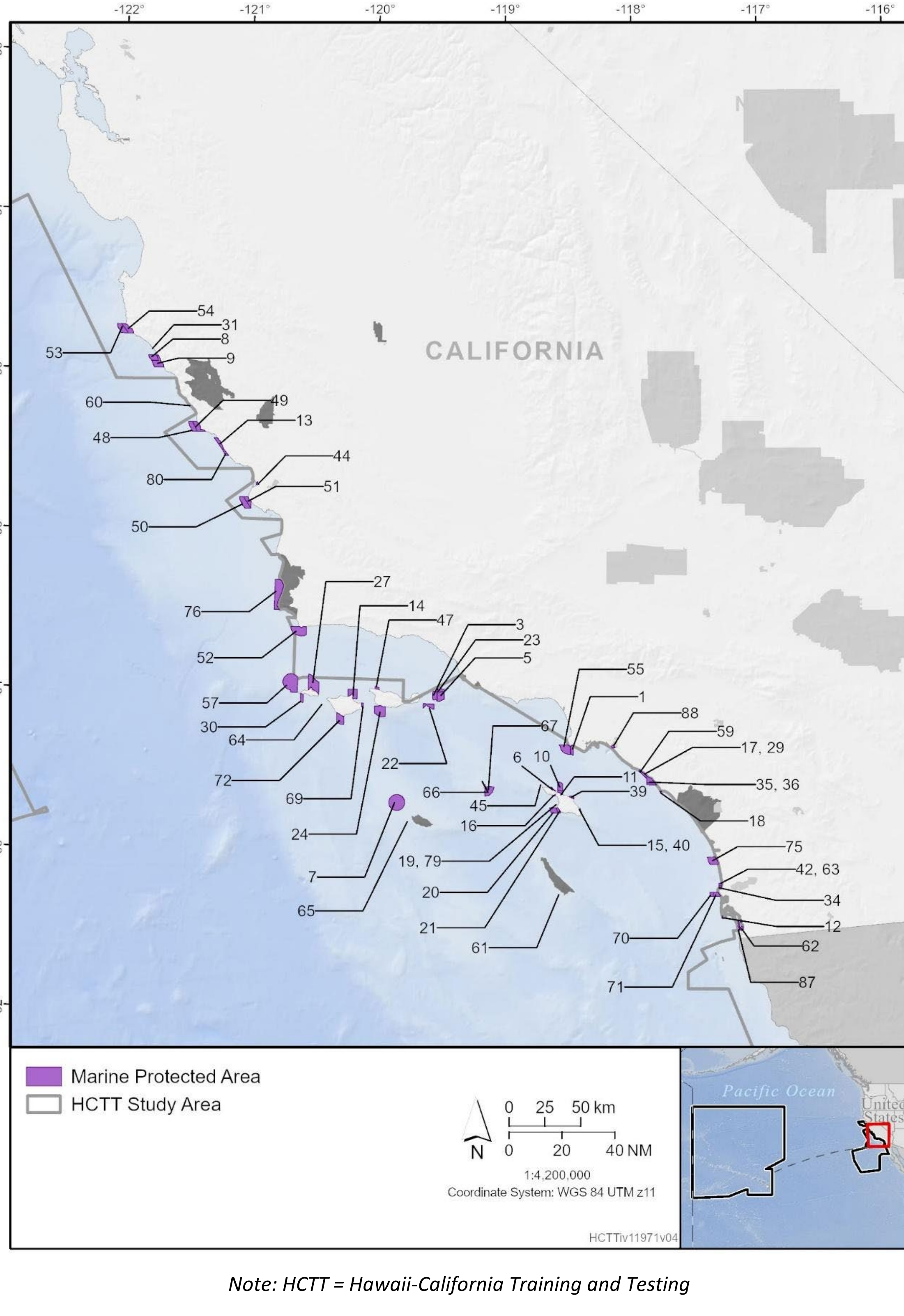
Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
				being drafted. Activities will avoid harm to natural and cultural resources protected by the MPA.	used in the conduct of military training and testing would be operated in a manner consistent with the requirements of Presidential Proclamations 8031 and 9478 and draft sanctuary management documents, as practicable. The Navy is coordinating with ONMS to ensure the proposed management documents for the proposed Papahanaumokuakea National Marine Sanctuary consider appropriate exemptions for military activities and that HCTT adequately evaluates the effects of military activities on sanctuary resources (natural and cultural) for the purpose of determining whether the Navy would consult under Section 304(d) at the appropriate time.
National Parks					
Channel Islands National Park	#11, Figure 6-2	California	Ecosystem	Vessel operations in excess of 5 mph or creating a wake in areas so designated or within 100 feet of a diver's marker, downed skier, or swimmer are prohibited; and operation of a vessel in excess of designated size, length, or width restrictions within restricted areas is prohibited. Activities will avoid harm to natural and cultural resources protected by the MPA.	The Channel Islands National Park contains the land area of the islands and extends to 1 NM offshore from each island. No activities would be conducted in this marine protected area. Therefore, no effects are expected on natural resources that are protected within the Channel Islands National Park.

Table 6-2: Marine Protected Areas Within the Hawaii-California Training and Testing Study Area (continued)

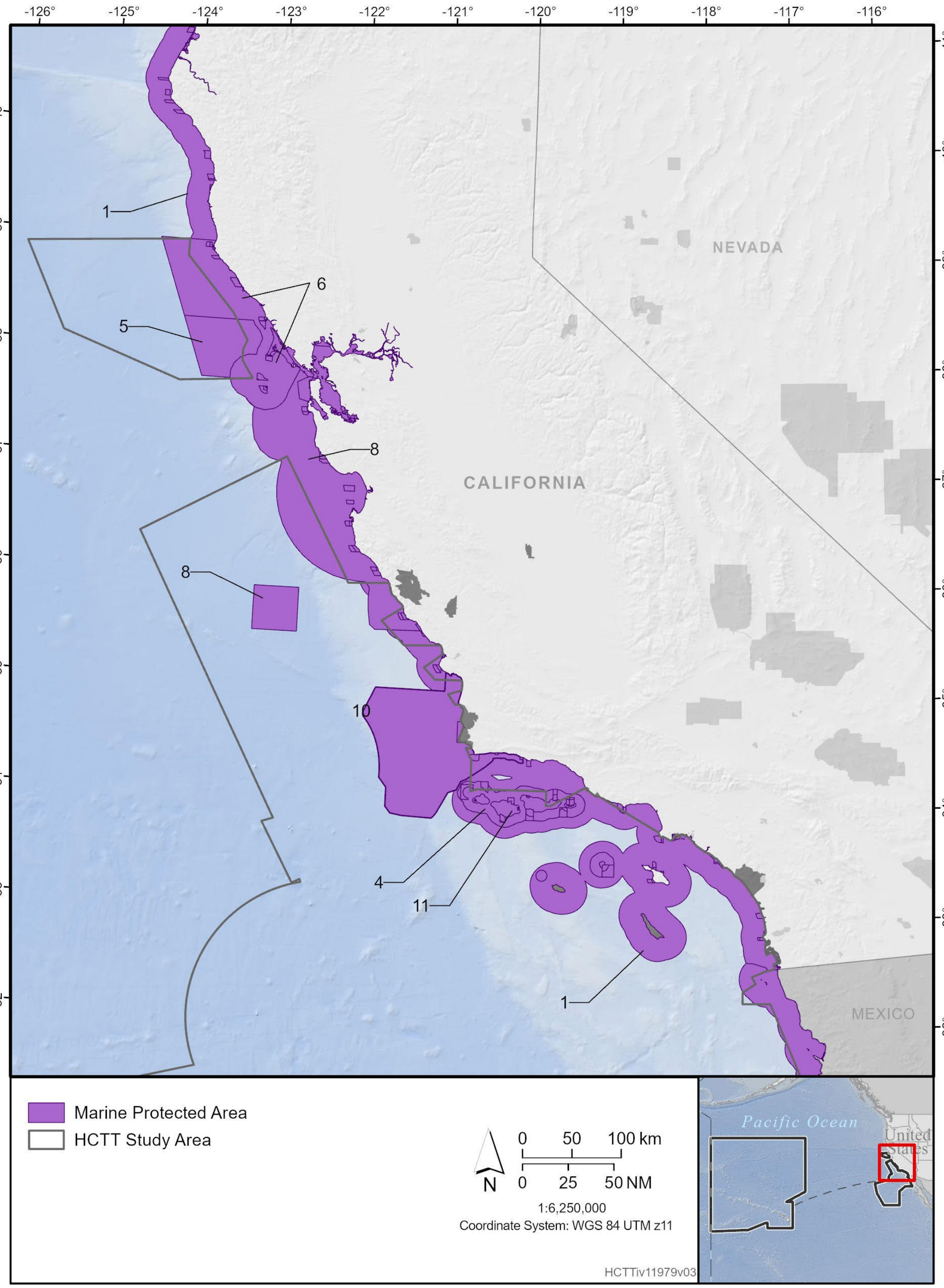
Marine Protected Area	Figure Reference Number	Location within the Study Area	Protection Focus	Summary of Relevant Regulations	Navy Proposed Activities Under the Proposed Action and Marine Protected Area Considerations
Kalaupapa National Historical Park	#12, Figure 6-4	Hawaii	Ecosystem	Prohibitions in the park include restrictions on commercial and recreational fishing. Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities overlap with the park. Therefore, no effects are expected within the Kalaupapa National Historical Park.
Kaloko-Honokohau National Historical Park	#13, Figure 6-4	Hawaii	Ecosystem	Unpermitted uses of lay nets and aquarium collections are prohibited in the Park. Activities will avoid harm to natural and cultural resources protected by the MPA.	No proposed activities overlap with the park. Therefore, no effects are expected within the Kaloko-Honokohau National Historical Park.

Notes: ASBS = Areas of Special Biological Significance, NM = nautical mile(s), MLCD = Marine Life Conservation District, USMC = United States Marine Corps, CFR = Code of Federal Regulations, MP = Management Plan, EIS = Environmental Impact Statement, NOAA = National Oceanic and Atmospheric Administration, DoD = Department of Defense, NOCAL = Northern California (Range Complex), HCTT = Hawaii-California Training and Testing, HSTT = Hawaii-Southern California Training and Testing, EIS/OEIS = Environmental Impact Statement/Overseas Environmental Impact Statement, MPA = Marine Protected Area, ONMS = Office of National Marine Sanctuaries



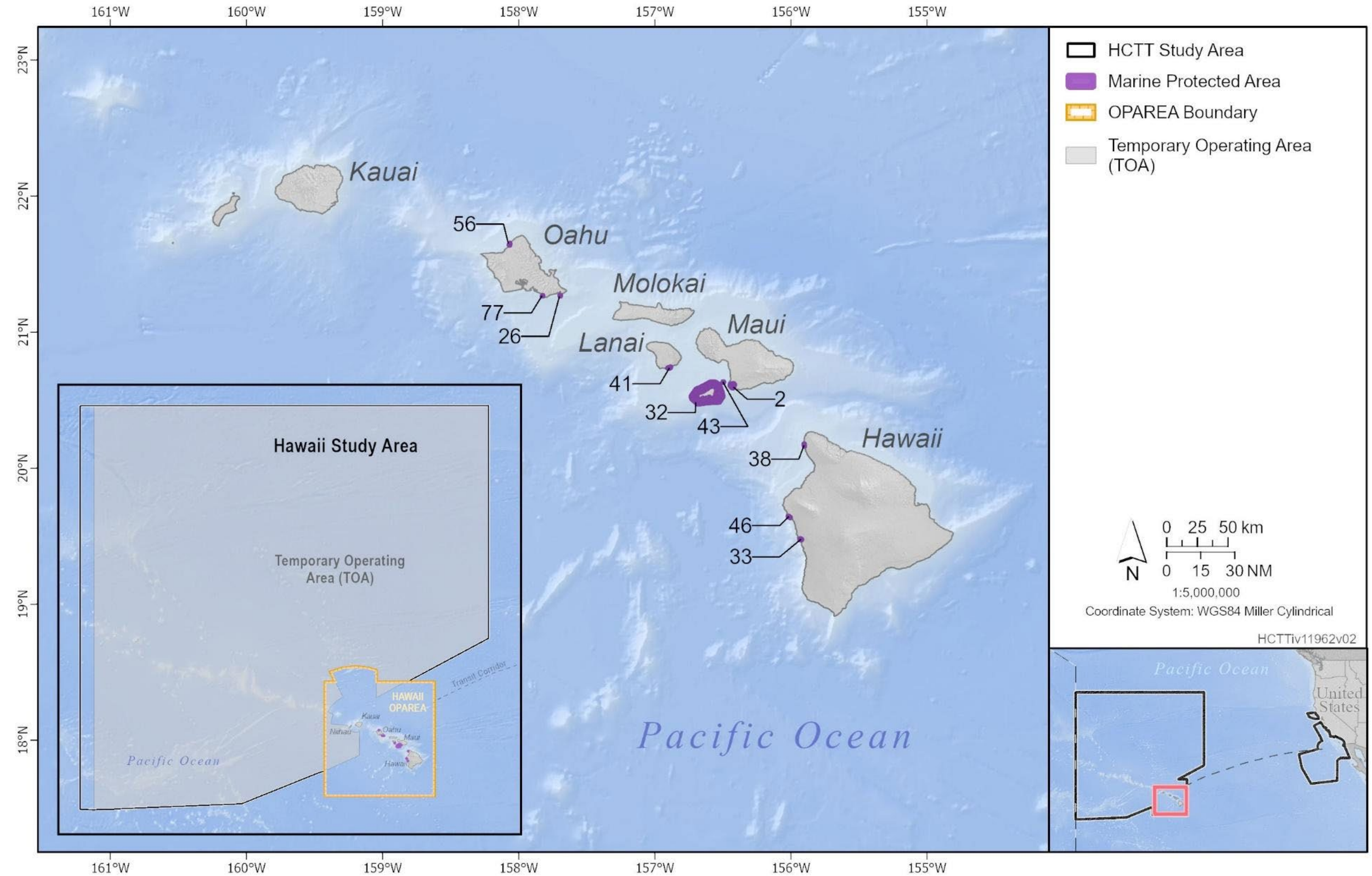
Note: HCTT = Hawaii-California Training and Testing

Figure 6-1: Location of State and Federal Marine Protected Areas Within the California Study Area



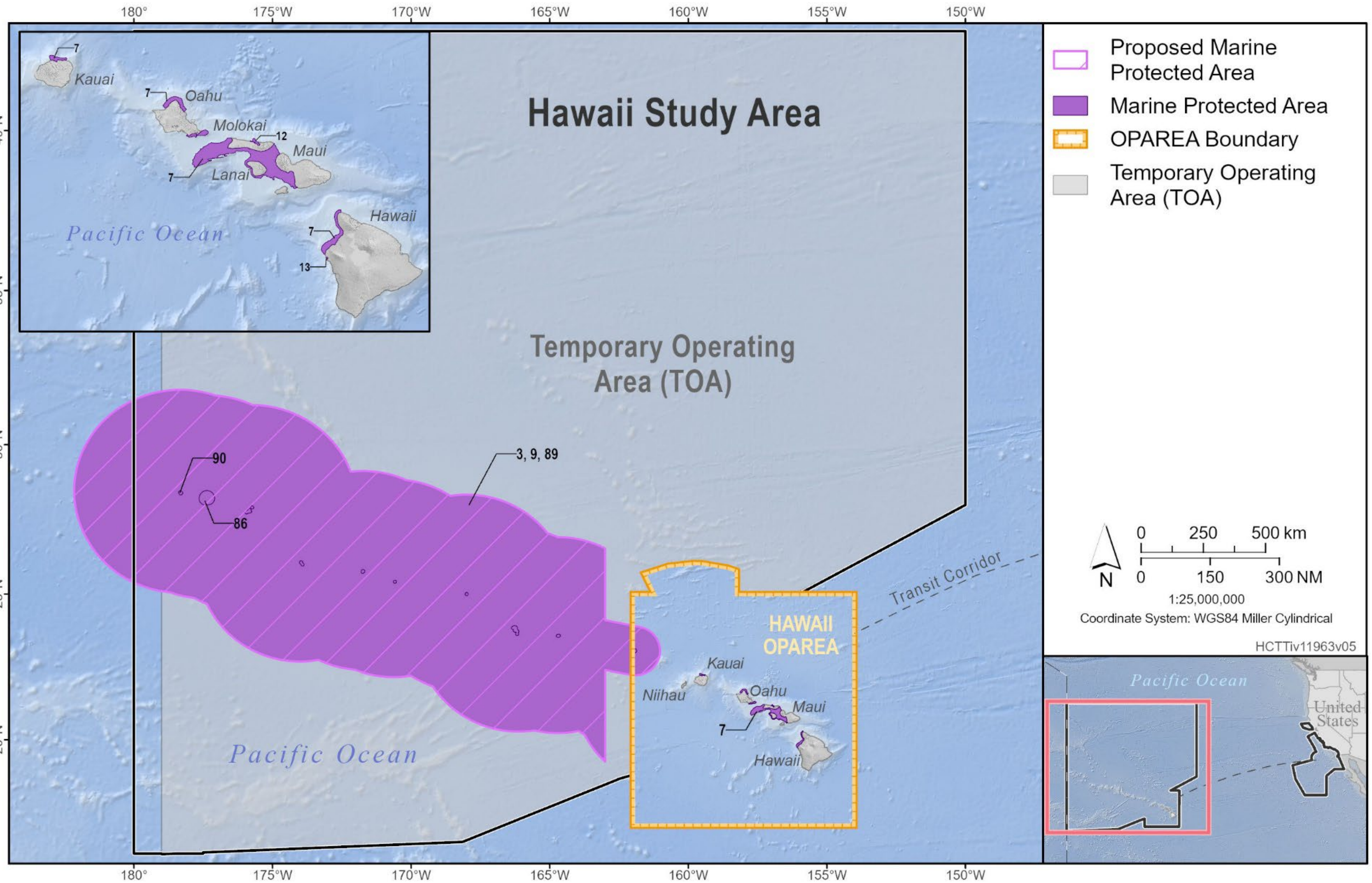
Note: HCTT: Hawaii-California Training and Testing

Figure 6-2: Location of National Marine Sanctuaries, National Parks, and National Monuments Within the California Study Area



Notes: HCTT: Hawaii-California Training and Testing, OPAREA = Operating Area

Figure 6-3: Location of State and Federal Marine Protected Areas Within the Hawaii Study Area



Notes: HCTT: Hawaii-California Training and Testing, OPAREA = Operating Area

Figure 6-4: Location of National Marine Sanctuaries, National Parks, and National Monuments Within the Hawaii Study Area

6.1.3 Magnuson-Stevens Fishery Conservation and Management Act

The Proposed Action has the potential to affect Essential Fish Habitat and managed species within the Study Area. Action Proponents would continue to implement agreed upon mitigation and conservation measures from previous consultations to avoid and minimize effects on these resources. For example, data from benthic habitat mapping surveys conducted as a result of previous consultations are being used by the Navy to avoid effects on sensitive habitats (e.g., seagrass, shallow coral reefs, precious coral beds, live hardbottom) to the extent practicable during activities that have the potential to affect sensitive habitat. The Navy will continue to include maps based on the best available georeferenced data for these sensitive areas in the Navy's Protective Measures Assessment Protocol to ensure these areas are considered in the planning of training and testing and avoided as necessary. The Navy will submit Essential Fish Habitat Assessments and consult with NMFS.

6.1.4 Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*

EO 13175 (November 06, 2000), directs federal agencies to coordinate and consult with Native American tribal governments whose interests might be directly and substantially affected by activities on federally administered lands. Consistent with that EO, DoD Instruction 4710.02, and Department of the Navy Instruction 11010.14B, federally recognized tribes that are historically affiliated with the geographic region of the Study Area were invited to consult on all proposed undertakings with the potential to affect properties of cultural, historical, or religious significance to the tribes.

In October 1998 and as amended in 1999, the DoD promulgated its Native American and Alaska Native policy, emphasizing the importance of respecting and consulting with Tribal governments on a government-to-government basis (U.S. Department of Defense, 2018). The policy requires an assessment, through consultation, of the effects of proposed DoD actions that may have the potential to significantly affect traditional resources (including traditional subsistence resources such as shellfish), Tribal rights (such as fisheries), and American Indian lands before decisions are made by DoD personnel.

The tribal coordination process is distinct from NEPA consultation or the interagency coordination process and requires separate notification to all relevant tribes. The timelines for tribal consultation are also distinct from those of other consultations.

Government to Government Consultation: It is Navy policy to establish permanent government-to-government working relationships with tribal governments built upon respect, trust, and openness. Under these policies, the Navy is required to consider tribal comments and concerns prior to making a final decision on a proposed action. However, reaching formal agreement with a tribe or obtaining tribal approval prior to a final decision is not required.

On December 12, 2023, the Navy provided the public, potential stakeholders, and tribes with a Notice of Intent to prepare an EIS/OEIS for HCTT at the beginning of the 60-day scoping period. The scoping period allows for the public, stakeholders, and tribes to provide comments on the scope of the analysis, including potential environmental issues and viable alternatives to be considered during the development of the Draft EIS/OEIS.

The Navy sent letters to federally recognized tribes in California as a formal invitation to consider initiating government-to-government consultation and consultations are ongoing.

6.2 Relationship Between Short-Term Use of the Environment and Maintenance and Enhancement of Long-Term Productivity

In accordance with Council on Environmental Quality regulations, this EIS/OEIS analyzes the relationship between the short-term effects on the environment and the effects those effects may have on the maintenance and enhancement of the long-term productivity of the affected environment (40 CFR section 1502.16(a)(3)). This analysis has not changed since the analysis conducted in the 2018 HSTT and 2022 PMSR EIS/OEISs. See Section 6.2 of the 2018 HSTT and 2022 PMSR EIS/OEISs for more information. Per 40 CFR 1502.16, applicable considerations for the analysis not addressed elsewhere are discussed in the following sections.

The Proposed Action could result in both short- and long-term environmental effects. However, these are not expected to result in any effects that would reduce environmental productivity, permanently narrow the range of beneficial uses of the environment, or pose long-term risks to health, safety, or general welfare of the public.

6.3 Irreversible or Irretrievable Commitment of Resources

NEPA requires that environmental analysis include identification of "any irreversible and irretrievable commitments of Federal resources which would be involved in the proposed agency action should it be implemented" (40 CFR 1502.16(4)). This analysis has not changed since it was conducted in the 2018 HSTT EIS/OEIS and activities have been ongoing and continuous since then. See Section 6.3 of the 2018 HSTT and 2022 PMSR EIS/OEISs for more information (U.S. Department of the Navy, 2018, 2022b).

For the Proposed Action, most resource commitments would be neither irreversible nor irretrievable. Most effects would be short term and temporary, or long lasting but within historical or desired conditions. Because there would be no building or facility construction, the consumption of material typically associated with such construction (e.g., concrete, metal, sand, fuel) would not occur. Energy typically associated with construction activities would not be expended and irretrievably lost.

6.4 Energy Requirements and Efficiency Initiatives

NEPA requires that environmental analysis include identification of "energy requirements and conservation potential of various alternatives and mitigation measures" (40 CFR 1502.16(7)). The federal government is the largest single energy consumer in the United States. In fiscal year 2017, the DoD consumed approximately 76 percent of the total energy used by the federal government (Congressional Research Service, 2019). In fiscal year 2020, the DoD used approximately 77.6 million barrels of liquid fuel for operational energy to power ships, aircraft, combat vehicles, and contingency bases. The Navy and Marine Corps consume approximately 36 percent of the total DoD share (28.3 million barrels in fiscal year 2020) (U.S. Department of Defense, 2021). In 2023, the DoD published a new Operational Energy Strategy to update the 2016 strategy and transform the way energy is consumed in military operations; the strategy sets the overall direction for operational energy security (U.S. Department of Defense, 2023). The 2023 strategy shifts focus toward four lines of effort and focus areas: (1) Energy Demand Reduction; (2) Energy Substitution and Diversification; (3)Supply Chain Resilience; and (4) Enterprise-Wide Energy Visibility (U.S. Department of Defense, 2023).

Military readiness activities within the Study Area would result in an increase in energy demand over the No Action Alternative. The increased energy demand would arise from an increase in fuel consumption, mainly from aircraft and vessels participating in training and testing. Aircraft fuel consumption is estimated to remain fairly consistent across both Action Alternatives, with an increase of 5.20 percent from Alternative 1 to Alternative 2. Vessel fuel consumption is estimated to increase by approximately 19.43 percent per year under Alternative 2, compared to Alternative 1. Conservative assumptions were made in developing the estimates, and therefore the actual amount of fuel consumed during training and testing events may be less than estimated. The alternatives could result in a net cumulative reduction in the global energy (fuel) supply.

Energy requirements would be subject to any established energy efficiency practices. The use of energy sources has been minimized wherever possible without compromising safety, training, or testing activities. No additional efficiency measures related to direct energy consumption by the proposed activities are identified. In accordance with the Operational Energy Strategy, the DoD's energy vision is to prioritize energy demand reduction and seek to adopt more efficient and clean energy technologies that reduce logistics requirements in contested environments (U.S. Department of Defense, 2023).

The Navy is committed to improving energy security and environmental stewardship by reducing its reliance on fossil fuels. The Navy is actively developing and participating in energy, environmental, and climate change initiatives, such as the Incentivized Energy Conservation Program and the NAVSEA's Fleet Readiness, Research and Development Program, that will help conserve the world's resources for future generations. The U.S. Department of the Navy Climate Action 2030 report (U.S. Department of the Navy, 2022a) identifies actions the Navy and USMC are taking to implement Executive Order 13990 and Executive Order 14008. The two performance goals set in the report are (1) Build Climate Resilience – Ensure that our forces, systems, and facilities can continue to operate effectively and achieve the mission in the face of changing climate conditions, and worsening climate impacts; and (2) Reduce Climate Threat – The Department must reduce its greenhouse gas emissions and draw greenhouse gases out of the atmosphere, stabilize ecosystems, and achieve, as an enterprise, the nation's commitment to net-zero emissions by 2050 (U.S. Department of the Navy, 2022a).

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