# Environmental Impact Statement/

# Overseas Environmental Impact Statement

# Hawaii-California Training and Testing

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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). Sea snakes considered in this analysis rarely occur in the Study Area and few, if any, effects are anticipated:

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. 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. 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. 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. 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 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 refer to 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[7] | 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).

[7] Green sea turtle Central North Pacific and East Pacific distinct population segments are expected to primarily occur in pelagic waters of the Study Area; however, other distinct population segments (Central West Pacific and Central South Pacific) likely occur in open ocean waters of the Study Area (National Marine Fisheries Service, 2023, 2024a, 2024b).

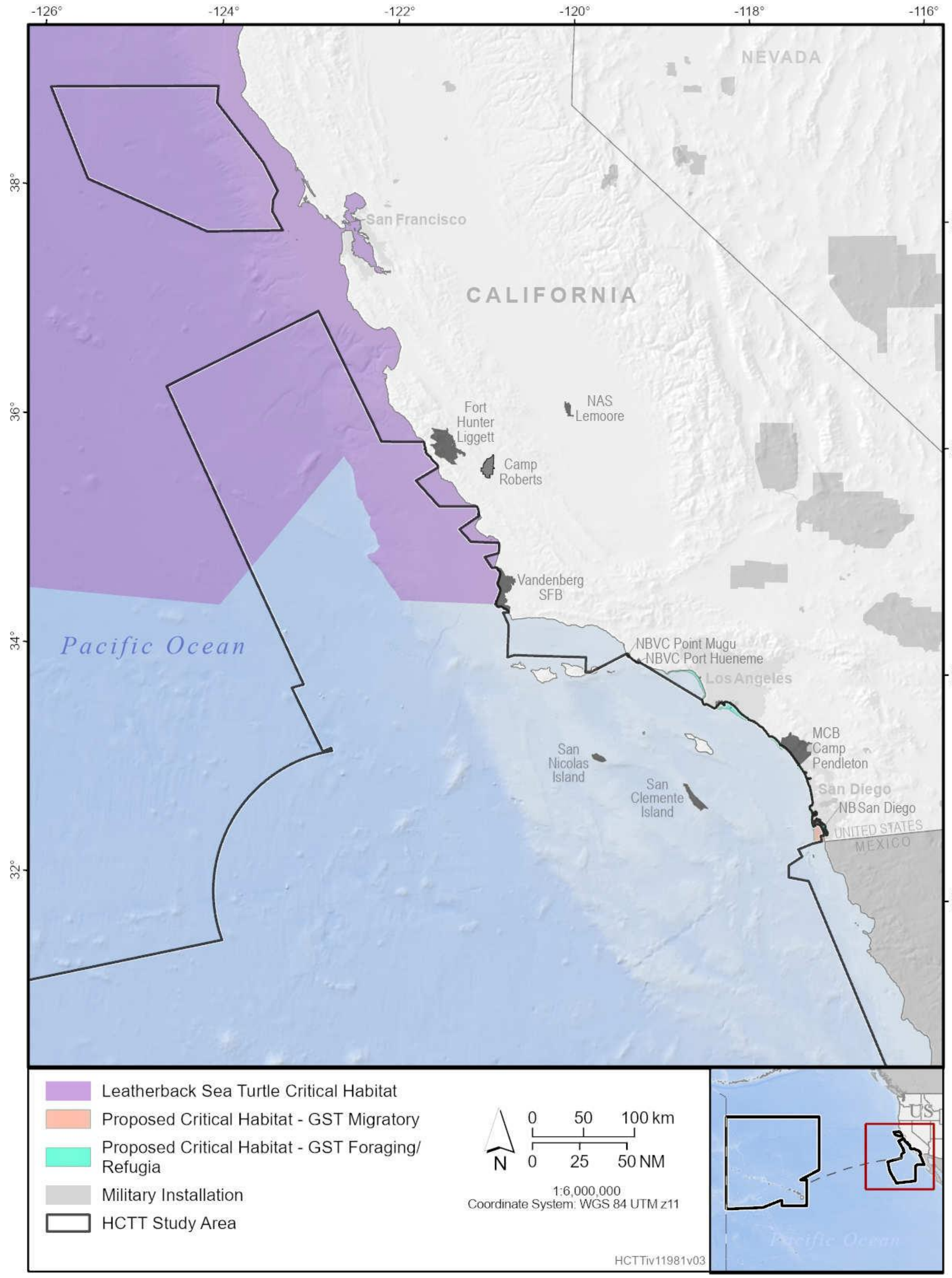



**Figure 3.8-1: Leatherback Sea Turtle Critical Habitat and Proposed Green Sea Turtle Critical Habitat in the HCTT Study Area**

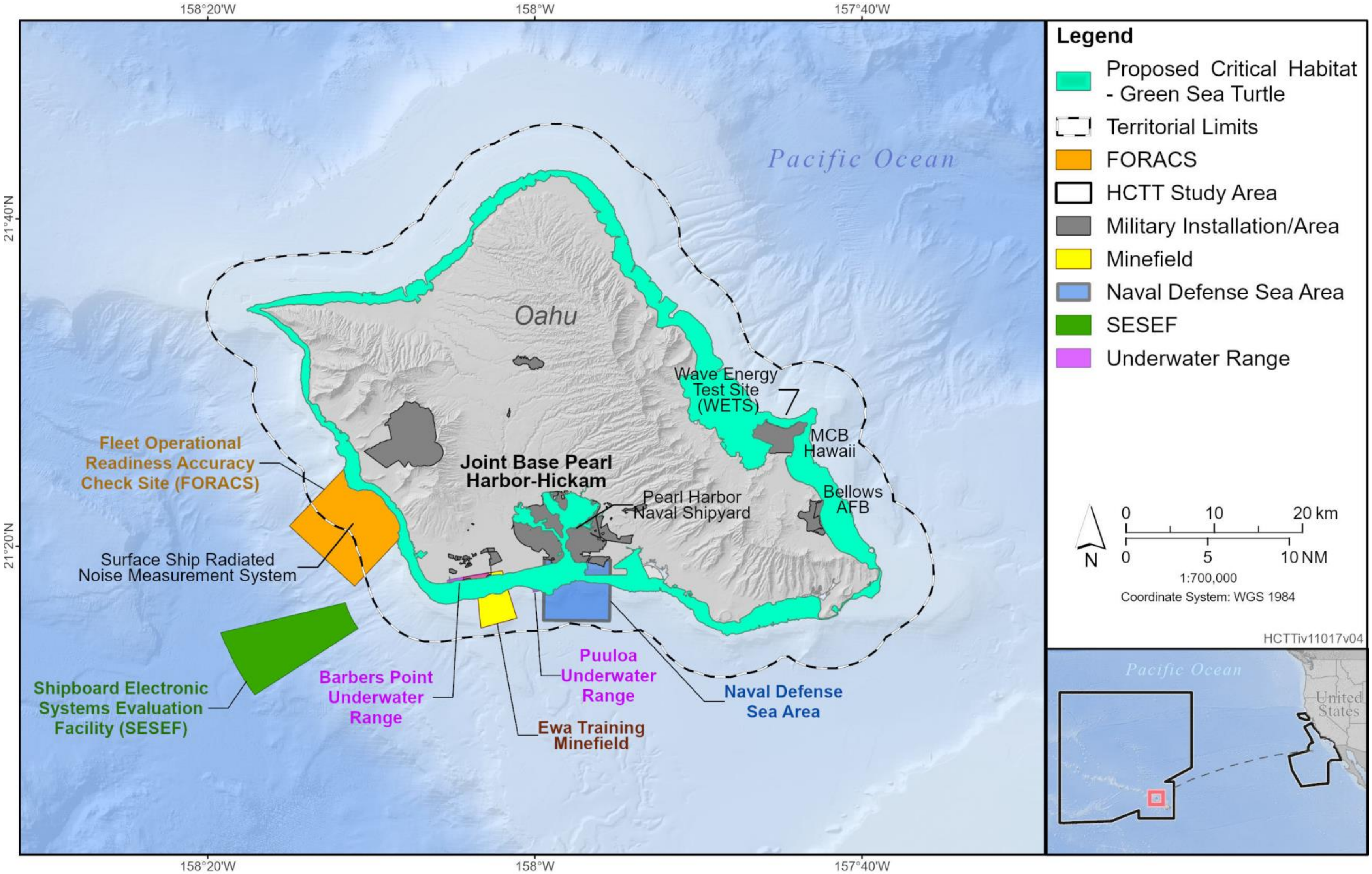



**Figure 3.8-2: Proposed Critical Habitat for the Green Sea Turtle Surrounding Oahu**

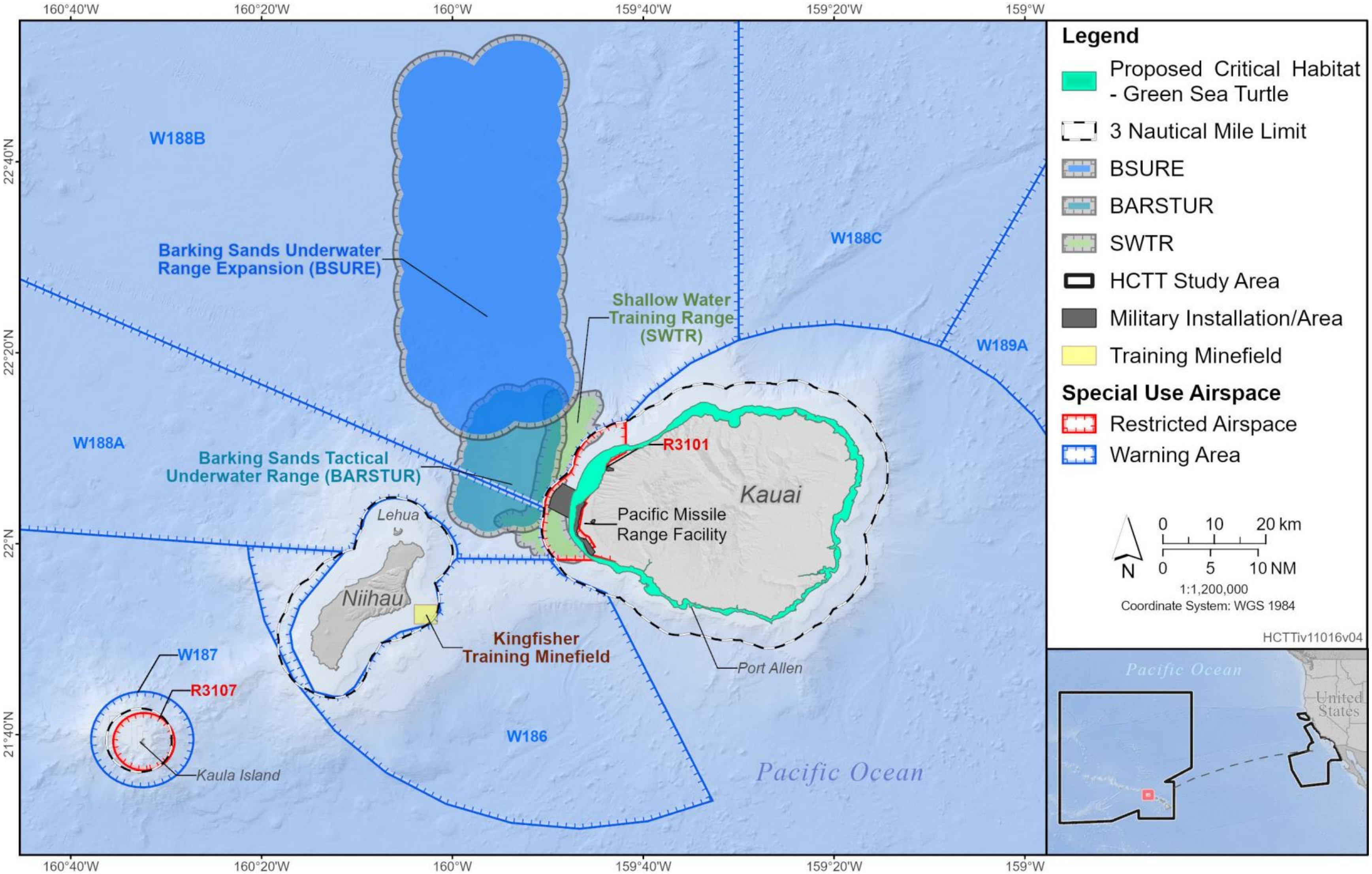



**Figure 3.8-3: Proposed Critical Habitat for the Green Sea Turtle Surrounding Kauai**

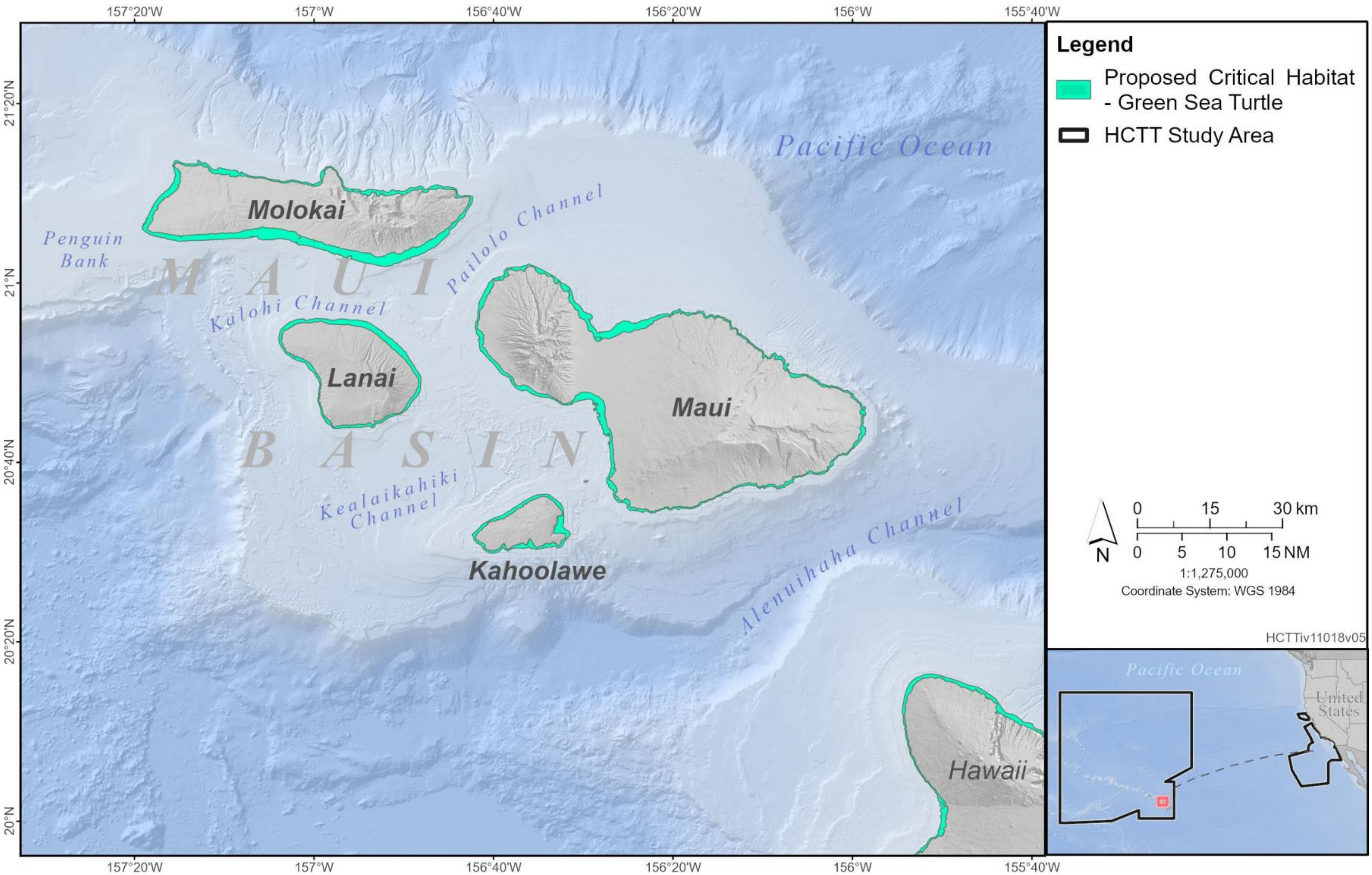
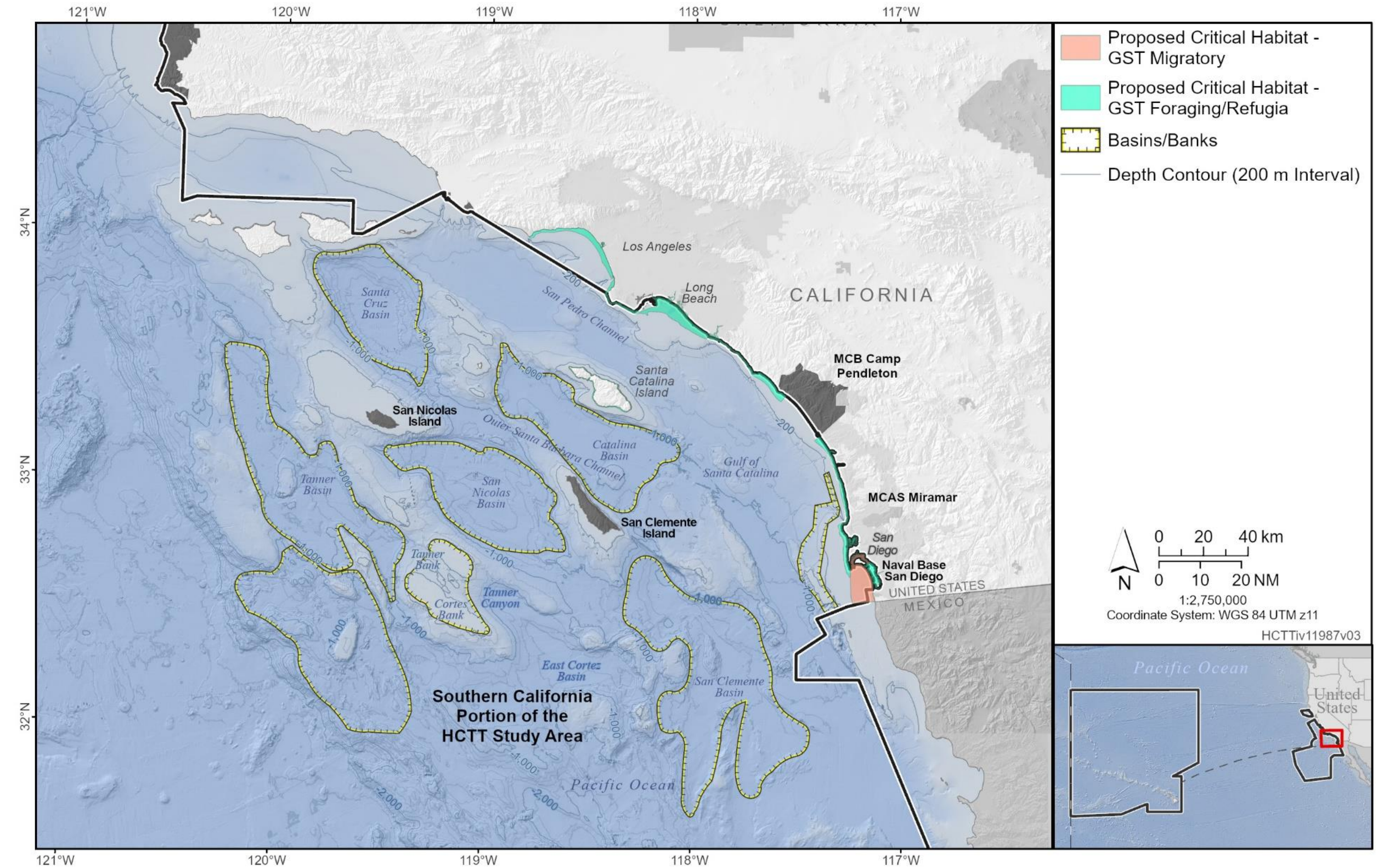



Figure 3.8-4: Proposed Critical Habitat for the Green Sea Turtle Surrounding Maui




*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 made only for activities that may have reasonably foreseeable adverse effects on the human environment based on the significance factors in Table 3.0-2. Acoustic, 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 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.

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, 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:<br>1. Set vessel anchors within an anchor swing circle radius that overlaps shallow-water coral reefs (except in designated anchorages)<br>2. Place other seafloor devices too close to shallow-water coral reefs<br>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.

**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.<br>• 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.<br>• 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.<br>• Sonar and other transducers would have limited potential for masking.<br>• 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.<br>• 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. |
| 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. |
| 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.<br>• 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.<br>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.<br>• 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.<br>• 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.<br>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). |

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.

#### 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. Appendix D discusses how, 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.

### 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

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.

#### 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 explosives quantities (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 (e.g., barotrauma, 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 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.

**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

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.

#### 3.8.3.3 Energy Stressors

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. There are no reasonably foreseeable adverse effects from energy stressors on sea turtles or sea snakes, and therefore further analysis is not warranted. Background information on energy stressors is provided in Appendix F.

**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. |

### Table 3.8-11: Energy Stressors Information Summary (continued)

| Substressor | Background Information Summary |
|---|---|
| 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:<br>• 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.<br>• 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.<br>• 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 (m) of water despite deeper water being available (Hazel et al., 2009; Hazel et al., 2007).<br>• 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.<br>• 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).<br>• 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. |

## Table 3.8-12: Physical Disturbance and Strike Stressors Information Summary (continued)

| Substressor | Background Information Summary |
|---|---|
| Vessels and in-water devices (continued) | In-water devices:<br>• In-water devices are generally smaller (several inches to 111 feet) than most Navy vessels.<br>• Devices that could pose a collision risk to reptiles are those operated at high speeds and are unmanned.<br>• 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.<br>• 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.<br>• 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).<br>• 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).<br>• 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:<br>• 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.<br>• 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.<br>• 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.<br>• 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. |

**Table 3.8-12: Physical Disturbance and Strike Stressors Information Summary (continued)**

| Substressor | Background Information Summary |
|---|---|
| Military expended materials (continued) | • Propelled fragments produced by an exploding bomb are large and decelerate rapidly, posing little risk to reptiles.<br>• 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 for the following reasons:<br>• Benthic-foraging sea turtles (e.g., olive ridley, green, loggerhead, or hawksbill turtles), encountering a seafloor device but would likely avoid it.<br>• 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 3.0-16 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 NOCAL 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 A, 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 (refer to 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). The entrance at Pearl Harbor may present a special strike hazard for sea turtles (Kelly, 2020), vessel speed limits and lookout requirements reduce the likelihood of a strike. 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). Refer to 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:<br>• 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.<br>• 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.<br>• 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.<br>• 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. |

**Table 3.8-13: Entanglement Stressors Information Summary (continued)**

| Substressor | Information Summary |
| --- | --- |
| 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:<br>• Most decelerators/parachutes are small, and their distribution in the Study Area would be sparse.<br>• 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.<br>• 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. |
| 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 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.<br>• 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:<br>• 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.<br>• Most reptiles do not forage on the seafloor and would not encounter the cables after installation.<br>• 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.<br>• 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.<br>• 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 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:<br>• 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.<br>• 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.<br>• Ingestion of non-explosive practice munitions is not expected to occur in the water column because the munitions sink quickly. |

**Table 3.8-14: Ingestion Stressors Background Information Summary (continued)**

| Substressor | Background Information Summary |
|---|---|
| Military expended materials – munitions (continued) | • 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.<br>• 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. |
| 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:<br>• 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.<br>• 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.<br>• 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.<br>• 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.<br>• 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.<br>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 3.5. 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.<br>• 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:<br>• 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.<br>• 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.<br>• 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). |

**Table 3.8-15: Secondary Stressor Information Summary (continued)**

| Indirect Links | Substressors | Information Summary |
|---|---|---|
| Habitats | 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 (e.g., polycyclic aromatic hydrocarbons and persistent organic pollutants).<br>• 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.<br>• 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.<br>• Most propellants are consumed during normal operations, and the failure rate of munitions using propellants and other combustible materials is low.<br>• Most byproducts occur naturally in seawater and are readily degraded by biotic and abiotic processes. All chemicals are quickly diluted by water movement.<br>• 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.<br>• 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.<br>• 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.<br>• 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.<br>• Effects on sea turtle prey (e.g., invertebrates) would likely be limited to exposure in the sediment within a few inches of the object.<br>• 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). |

### 3.8.4 Combined Effects of All Stressors

#### 3.8.4.1 Combined Effects of All Stressors Under Alternative 1

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 marine 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.

Although potential adverse effects on certain sea turtles and sea snakes 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 sea turtles and sea snakes resulting from military readiness activities are consistent with a determination of less than significant adverse effects on marine reptiles, including ESA-listed sea turtles and designated critical habitat.

#### 3.8.4.2 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, because the types of military readiness activities and associated stressors are the same. However, since the level of activity under Alternative 1 would fluctuate from year to year, and the level of activity under Alternative 2 would be consistent and at the maximum level every year, the combined effects from all stressors would be expected to be marginally greater under Alternative 2 over a seven-year period. Nevertheless, for the reasons described in the effects analysis for Alternative 1, 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.

### 3.8.5 Endangered Species Act Determinations

Based on the potential co-occurrence of ESA-listed sea turtles and military readiness activities under Alternative 1, the proposed activities may affect the green sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle, and olive ridley sea turtle.

Military readiness activities may affect designated critical habitat in the Study Area for leatherback sea turtle and proposed green sea turtle critical habitat because some activities are likely to occur in those critical habitats and have the potential to temporarily affect one or more of the essential features defining those habitats. A description of each species' designated critical habitat, including the essential features defining the critical habitat, is provided in Appendix C. Additional information on stressors potentially affecting critical habitat is provided in Appendix F.

Pursuant to the ESA, NMFS has been consulted on potential effects on ESA-listed sea turtles from military readiness activities, as required by section 7(a)(2) of the ESA. The results of that consultation can be found in the NMFS Biological Opinion, which will be added to the project website when finalized.

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