

**Final
Environmental Impact Statement/Overseas Environmental Impact Statement
Hawaii-Southern California Training and Testing**

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3.12 PUBLIC HEALTH AND SAFETY

PREFERRED ALTERNATIVE SYNOPSIS

The United States Department of the Navy considered all potential stressors that public health and safety could be exposed to from the Proposed Action. The following conclusions have been reached for the Preferred Alternative (Alternative 1):

- In-Water Energy: Because of the Navy's standard operating procedures, impacts on public health and safety would be unlikely.
- In-Air Energy: Because of the Navy's standard operating procedures, impacts on public health and safety would be unlikely.
- Physical Interactions: Because of the Navy's standard operating procedures, impacts on public health and safety would be unlikely.
- Secondary Stressors (sediments and water quality): Because water and sediment quality impacts would be minimal and temporary and the Navy would not exceed state or federal water quality standards, impacts on public health and safety would be unlikely.

3.12.1 INTRODUCTION

This section provides the analysis of potential impacts on public health and safety within the Hawaii-Southern California Training and Testing (HSTT) Study Area.

The affected environment provides the context for evaluating the effects of the Navy training and testing on public health and safety. Generally, the greatest potential for a proposed activity to impact the public is in nearshore areas because that is where public activities are most concentrated. Proposed training and testing in nearshore areas could be close to dive sites and other recreational areas where the collective health and safety of groups of individuals would be of concern. Most commercial and recreational marine activities (with the exception of commercial shipping) occur close to the shore, usually limited by the capabilities of the vessel or equipment used.

The Navy employs standard operating procedures to provide for the safety of personnel and equipment as well as the success of the training and testing activities. Standard operating procedures designed to prevent public health and safety impacts are discussed in detail in Section 2.3.3 (Standard Operating Procedures). The following subsections generally discuss established safety protocols and standard operating procedures associated with the sea space and airspace environment, as well as specific procedures associated with aviation safety, submarine navigation safety, surface vessel navigation safety, sonar safety, electromagnetic energy safety, and munitions safety.

Methods

The requirements for public health and safety were derived from federal regulations, Department of Defense (DoD) directives, and Navy instructions for training and testing. The directives and instructions provide specifications for mission planning and execution, including criteria for public health and safety considerations.

The alternatives were evaluated based on two factors: the potential for specific training or testing activities to impact public health and safety, and the degree to which those activities could have an impact. The likelihood that members of the public would be near a training or testing activity determined the potential for exposure to the activity. If the potential for exposure existed, the degree of the potential impacts on public health and safety, including increased risk for injury or loss of life, was determined. If the potential for exposure did not exist, it was determined that there would be no impacts on public health and safety.

3.12.2 AFFECTED ENVIRONMENT

3.12.2.1 General Background

The area of interest for assessing potential impacts on public health and safety is the U.S. territorial waters of southern California and Hawaii (seaward of the mean high water line to 12 nautical miles [NM]). Military, commercial, institutional, and recreational activities take place simultaneously in the Study Area and have coexisted safely for decades. These activities coexist safely because established rules and practices lead to safe use of the waterway and airspace. The following paragraphs briefly discuss the rules and practices for recreational, commercial, and military use in sea surface areas and airspace.

3.12.2.1.1 Sea Space

Most of the sea space in the Study Area is accessible for recreational and commercial activities; however, some activities are prohibited or restricted in certain areas (e.g., danger zones and restricted areas).

In accordance with Title 33 Code of Federal Regulations (CFR) part 165 (Regulated Navigation Areas and Limited Access Areas), these restrictions can be permanent or temporary. Nautical charts issued by the National Oceanic and Atmospheric Administration include these federally designated zones and areas. Operators of recreational and commercial vessels have a duty to abide by maritime regulations administered by the U.S. Coast Guard.

In accordance with Title 33 CFR part 72 (Aids to Navigation), the U.S. Coast Guard informs private and commercial vessels about temporary closures via Notices to Mariners. These notices provide information about durations and locations of closures because of activities that are potentially hazardous to surface vessels. Broadcast notices on maritime frequency radio, weekly publications by the appropriate U.S. Coast Guard Navigation Center, and global positioning system navigation charts disseminate these navigational warnings.

3.12.2.1.2 Airspace

Most of the airspace in the Study Area is accessible to general aviation (recreational, private, corporate) and commercial aircraft; however, some areas, like waterways, are temporarily off-limits to civilian and commercial use. The Federal Aviation Administration has established special use airspace, which is airspace of defined dimensions wherein activities must be confined because of their nature or wherein limitations may be imposed upon aircraft operations that are not part of those activities (Federal Aviation Administration Order 7400.2L *Procedures for Handling Airspace Matters, Special Use Airspace* -

The Study Area is shared by military, commercial, institutional, and recreational users. The Navy is committed to ensuring public safety during training and testing activities. To protect public safety, access to certain ocean areas must be temporarily limited during certain training and testing activities.

Part 5, Chapters 21 to 28, effective April 27, 2017). Special use airspace in the Study Area includes the following:

- Restricted airspace: Areas where aircraft are subject to restriction due to the existence of unusual (often invisible) hazards to aircraft (e.g., release of munitions). Some areas are under strict control of the DoD, and some are shared with nonmilitary agencies (Federal Aviation Administration Order 7400.2L, Chapter 23).
- Military Operations Areas: Airspace designated outside of Class A airspace to separate or segregate certain nonhazardous military activities from Instrument Flight Rules traffic and identify for Visual Flight Rules traffic where these activities are conducted (Federal Aviation Administration Order 7400.2L, Chapter 25).
- Warning areas: Areas of defined dimensions, extending from 3 NM outward from the coast of the United States, that serve to warn non-participating aircraft of potential danger (Federal Aviation Administration Order 7400.2L, Chapter 24).

Additionally, Air Traffic Control Assigned Airspace is airspace of defined vertical/lateral limits, implemented by Letter of Agreement between the user and the concerned Air Route Traffic Control Center, and assigned by Air Traffic Control for the purpose of providing air traffic segregation between the specified activity being conducted within the assigned airspace and other instrument flight rules traffic. Air Traffic Control Assigned Airspace should not be established to contain activities for which a specific type of special use airspace should be designated (i.e., should not be used as a substitute for a more appropriate special use airspace designation).

Notices to Airmen are created and transmitted by government agencies and airport operators to alert aircraft pilots of any hazards en route to or at a specific location. Notices to Airmen contain information (not known sufficiently in advance to publicize by other means) concerning the establishment, condition, or change in any component (facility, service, procedure, or hazard in the National Airspace System), the timely knowledge of which is essential to personnel concerned with flight operations. The Federal Aviation Administration issues Notices to Airmen to disseminate information on upcoming or ongoing military exercises with resulting airspace restrictions. Civilian aircraft operators are responsible for being aware of restricted areas in airspace and any Notices to Airmen in effect. Pilots have a duty to abide by aviation rules as administered by the Federal Aviation Administration.

Weather conditions dictate whether an aircraft (general aviation, commercial, or military) can fly under Visual Flight Rules or Instrument Flight Rules. Under Visual Flight Rules, the weather is favorable and the pilot is required to remain clear of clouds by specified distances to ensure separation from other aircraft under the concept of “see and avoid.” Pilots flying under Visual Flight Rules must be able to see outside of the cockpit, control the aircraft’s attitude, navigate, and avoid obstacles and other aircraft based on visual cues. Pilots flying under Visual Flight Rules assume responsibility for their separation from all other aircraft and are generally not assigned routes or altitudes by air traffic control.

During unfavorable weather, pilots must follow Instrument Flight Rules. Factors such as visibility, cloud distance, cloud ceilings, and weather phenomena cause visual conditions to drop below the minimum required to operate by visual flight referencing. Instrument Flight Rules are the regulations and restrictions a pilot must comply with when flying in weather conditions that restrict visibility. Pilots can fly under Instrument Flight Rules in Visual Flight Rules weather conditions; however, pilots cannot fly under Visual Flight Rules in Instrument Flight Rules weather conditions.

3.12.2.2 Safety and Inspection Procedures

In accordance with Navy instructions presented in this chapter, safety and inspection procedures discussed in this section are designed to ensure public health and safety. Through the Naval Safety Center and Fleet Safety Center, the Navy promotes a proactive and comprehensive safety program designed to reduce to the greatest extent possible any potential adverse impacts on public health and safety from training and testing activities.

As previously stated, the greatest potential for training or testing activities to impact the public is in nearshore areas, because public activities are concentrated in those areas. When planning a training or testing activity, the Navy considers proximity of the activity to public areas in choosing a location. Important factors considered include the ability to control access to an area; schedule (time of day, day of week); frequency, duration, and intensity of activities; range safety procedures; operational control of activities or events; and safety history.

The Navy's Fleet Area Control and Surveillance Facilities provide support and training resources for DoD, Department of Homeland Security, and foreign military units by coordinating, scheduling, and monitoring activities in the U.S. Pacific Fleet operating areas and special use airspace. At Navy Ranges, such as the Pacific Missile Range Facility, Range Control is responsible for hazard area surveillance and clearance and the control of all range operational areas. Although operations in special use airspace are scheduled through the Navy Fleet and Area Control and Surveillance Facilities, Range Control coordinates the real-time control of ranges in coordination with the Federal Aviation Administration and other military users, and communicates with the operations conductors and all participants entering and leaving the range areas. The Federal Aviation Administration and the U.S. Coast Guard issue Notices to Airmen and Notices to Mariners, respectively.

During training and testing activities in the Study Area, the Navy ensures that the appropriate safety zone is clear of non-participants before engaging in certain activities, such as firing weapons. Inability to obtain a "clear range" could result in the delay, cancellation, or relocation of an event. This approach ensures public safety during Navy activities that otherwise could harm non-participants. Current Navy practices employ the use of sensors and other devices (e.g., radar and big-eye binoculars) to ensure public health and safety while conducting training and testing activities. The following subsections outline the current requirements and practices for human safety as they pertain to range safety procedures, range inspection procedures, exercise planning, and scheduling and coordinating procedures for the Navy.

Training activities must comply with Fleet Area Control and Surveillance Facility procedures. Fleet Area Control and Surveillance Facilities San Diego and Hawaii have published safety procedures for activities conducted both nearshore and offshore (U.S. Department of the Navy, 2014). These guidelines (and others) apply to range users as follows:

- Navy personnel are responsible for ensuring that impact areas and targets are clear before commencing hazardous activities.
- The use of in-water munitions must be coordinated with submarine operational authorities. The coordination also applies to towed sonar arrays and torpedo countermeasures.
- Aircraft or vessels expending munitions shall not commence firing without the permission of the Range Safety Officer for their specific range area.

- Firing units and targets must remain in their assigned areas, and units must fire in accordance with current safety instructions.
- Aircraft carrying munitions to or from ranges shall avoid populated areas to the maximum extent possible.
- Strict on-scene procedures include the use of ship sensors, visual surveillance of the range from aircraft and range safety boats, and radar and acoustic data to confirm the firing range and target area are clear of civilian vessels, aircraft, or other non-participants.

Comprehensive safety planning instructions exist for specific testing activities, such as laser and electromagnetic energy testing (U.S. Department of Defense, 2009; U.S. Department of the Navy, 2008). These instructions provide guidance on how to identify the hazards, assess the potential risk, analyze risk control measures, implement risk controls, and review safety procedures. They apply to all testing activities including ground, waterborne, and airborne testing activities involving personnel, aircraft, inert minefields, equipment, and airspace. The guidance applies to system program managers, program engineers, test engineers, test directors, and aircrews that are responsible for incorporating safety planning and review when conducting test programs.

3.12.2.2.1 Aviation Safety

The Navy procedures regarding planning and management of special use airspace are provided in the Chief of Naval Operations Instruction 3770.2L, *Airspace Procedures and Planning Manual* (U.S. Department of the Navy, 2007). Scheduling and planning procedures for air operations on range complexes are issued through the Navy's Fleet Area Control and Surveillance Facilities San Diego and Hawaii (U.S. Department of the Navy, 2014).

Testing activities have their own procedures that require that safety be considered in any testing event. For example, the Navy's Operational Test Director's Manual prescribes policies and procedures for the planning, conducting, and reporting of Operational Test and Evaluation of new and improved naval weapons and warfare support systems (U.S. Department of the Navy, 2016a).

Aircrews involved in training or testing exercises must be aware that non-participating aircraft and ships are not precluded from entering the area and may not comply with Notices to Airmen or Notices to Mariners. Aircrews are required to maintain a continuous lookout for non-participating aircraft while operating in warning areas under Visual Flight Rules. In general, aircraft carrying munitions are not allowed to fly over public or commercial boats or ships.

3.12.2.2.2 Submarine Navigation Safety

Submarine crews use various methods to avoid collisions while they are surfaced, including visual and radar scanning, acoustic depth finders, and state-of-the-art satellite navigational systems. During submerged transit, submarines use all available ocean navigation tools, including inertial navigation charts that calculate position based on the submerged movements of the submarine. Submarines use these systems to avoid surface vessels as well as all other hazards to navigation.

3.12.2.2.3 Surface Vessel Navigation Safety

The Navy practices the fundamentals of safe navigation. As specified in Section 2.3.3 (Standard Operating Procedures), ships operated by or for the Navy have personnel assigned to stand watch at all times, day and night, when underway. Watch personnel undertake extensive training in accordance with the *Navy Lookout Training Handbook* or civilian equivalent, including on-the-job instruction and a formal

Personal Qualification Standard program (or equivalent program for supporting contractors or civilians), to certify that they have demonstrated all necessary skills (such as detection and reporting of floating or partially submerged objects). While on watch, personnel employ visual search techniques, including the use of binoculars and scanning techniques in accordance with the *Navy Lookout Training Handbook* or civilian equivalent. After sunset and prior to sunrise, watch personnel employ night visual search techniques, which could include the use of night vision devices. Watch personnel are primarily posted for safety of navigation, range clearance, and man-overboard precautions. For some specific testing activities, such as unmanned surface vehicle testing, a support boat would be used in the vicinity of the testing and operation to ensure safe navigation. Before firing or launching a weapon or radiating a non-eye-safe laser, Navy surface vessels are required to determine that all safety criteria have been satisfied. When applicable, the surface vessel would use aircraft and other boats to aid in navigation.

3.12.2.2.4 Sonar Safety

Surface vessels and submarines may use active sonar in the pierside locations listed in Chapter 2 (Description of Proposed Action and Alternatives) and during transit to training or testing exercise locations. To ensure safe and effective sonar use, the Navy applies the same safety procedures for pierside sonar use as described in Section 3.12.2.2 (Safety and Inspection Procedures).

The U.S. Navy Diving Manual, Appendix 1A, *Safe Diving Distances from Transmitting Sonar*, is the Navy's governing document for protecting divers during active sonar use (U.S. Department of the Navy, 2016b). The manual provides procedures for calculating safe distances from active sonar. These procedures are derived from experimental and theoretical research conducted at the Naval Submarine Medical Research Laboratory and the Navy Experimental Diving Unit. Safety distances vary based on conditions that include diver dress, type of sonar, and duration of time in the water. These safety distances would also be applicable to recreational swimmers and divers. Some safety procedures include measurements to be taken during testing activities to identify an exclusion area for non-participating swimmers and divers.

3.12.2.2.5 Electromagnetic Energy Safety

This section discusses electromagnetic energy transmitted through the air as a result of proposed activities. All frequencies (or wavelengths) of electromagnetic energy are referred to as the *electromagnetic spectrum* and include electromagnetic energy and radio frequency radiation. Communications and electronic devices such as radar, electronic warfare devices, navigational aids, two-way radios, cell phones, and other radio transmitters produce electromagnetic radiation. While such equipment emits electromagnetic energy, some of these systems are the same as, or similar to, civilian navigational aids and radars at local airports and television weather stations. Radio waves and microwaves emitted by transmitting antennas are another form of electromagnetic energy, collectively referred to as radio frequency radiation. Radio frequency energy includes frequencies ranging from 0 to 3,000 gigahertz. Exposure to radio frequency energy of sufficient intensity at frequencies between 3 kilohertz and 300 gigahertz can adversely affect people, munitions, and fuel.

To avoid excessive exposures to electromagnetic energy, military aircraft are operated in accordance with standard operating procedures that establish minimum separation distances between electromagnetic energy emitters and people, munitions, and fuels (U.S. Department of Defense, 2009). Thresholds for determining hazardous levels of electromagnetic energy to humans, munitions, and fuel have been determined for electromagnetic energy sources based on frequency and power output, and practices are in place to protect the public from electromagnetic radiation hazards (U.S. Department of

Defense, 2002, 2009). These procedures include setting the heights and angles of electromagnetic energy transmissions to avoid direct exposure, posting warning signs, establishing safe operating levels, activating warning lights when radar systems are operational, and not operating some platforms that emit electromagnetic energy within 15 NM of shore. Safety planning instructions provide clearance procedures for non-participants in operational areas before conducting training and testing activities that involve in-water electromagnetic energy (e.g., mine warfare) (U.S. Department of Defense, 2009; U.S. Department of the Navy, 2008).

3.12.2.2.6 Laser Safety

Lasers produce a coherent beam of light energy. The Navy uses lasers for precision range finding, as target designation/illumination devices for engagement with laser-guided weapons, and for mine detection and mine countermeasures, as well as for non-lethal deterrent. Testing activities include high-energy laser weapons tests to evaluate the specifications, integration, and performance of a vessel- or aircraft-mounted, high-energy laser. The high-energy laser would be used as a weapon to disable small surface vessels. The Office of the Chief of Naval Operations Instruction 5100.27B/Marine Corps Order 5104.1C, *Navy Laser Hazards Control Program*, prescribes Navy and Marine Corps policy and guidance in the identification and control of laser hazards. The Navy observes strict precautions and has written instructions in place for laser users to ensure that non-participants are not exposed to intense light energy. Laser safety procedures for aircraft require an initial pass over the target before laser activation to ensure that target areas are clear. During actual laser use, aircraft run-in headings are also restricted to avoid unintentional contact with personnel or non-participants. Personnel participating in laser training activities are required to complete a laser safety course (U.S. Department of the Navy, 2008).

3.12.2.2.7 Explosive Munitions Detonation Safety

Pressure waves from in-water detonations can pose a physical hazard in surrounding waters. Before conducting an in-water explosive training or testing activity, Navy personnel establish an appropriately sized exclusion zone to avoid exposing non-participants to the harmful intensities of pressure waves. The U.S. Navy Diving Manual, Section 2.7.3, *Underwater Explosions*, provides procedures for determining safe distances from in-water explosions (U.S. Department of the Navy, 2016b). In accordance with training and testing procedures for safety planning related to detonations (see Section 3.12.2.2.8, Weapons Firing and Munitions Expenditure Safety), the Navy uses the following detonation procedures:

- Navy personnel are responsible for ensuring that impact areas and targets are clear before commencing hazardous activities.
- The use of in-water munitions must be coordinated with submarine operational authorities.
- Aircraft or vessels expending munitions shall not commence firing without permission of the Range Safety Officer or Test Safety Officer for their specific range area.
- Firing units and targets must remain in their assigned areas, and units must fire in accordance with current safety instructions.
- Detonation activities would be conducted during daylight hours.

3.12.2.2.8 Weapons Firing and Munitions Expenditure Safety

Navy explosives safety policy is based on the requirements of DoD 6055.9M-STD, *Ammunition and Explosives Safety Standards*. This DoD standard establishes uniform safety requirements applicable to ammunition and explosives and to associated and unrelated personnel and property exposed to the potentially damaging effects of an accident involving ammunition and explosives during, among other things, usage during training, testing, transportation, handling, storage, maintenance, and disposal (U.S. Department of Defense, 2012).

Safety is a primary consideration for all training and testing activities. The range must be able to safely contain the hazard area of the weapons and equipment employed. The hazard area is based on the size and net explosive weight of the weapon, and it includes a safety buffer around the target to account for items going off-range or malfunctioning. The size of the buffer zone is determined by the type of activity. For activities with a large hazard area, special sea and air surveillance measures are implemented to make sure the area is clear before the activities commence. Before aircraft can drop munitions, they are required to make a preliminary pass over the intended target area to ensure that it is clear of boats, divers, or other non-participants. Aircraft carrying munitions are not allowed to fly over surface vessels.

Training and testing activities are delayed, moved, or cancelled if there is a question about the safety of the public. Target areas must be clear of non-participants before conducting training and testing. When using munitions with flight termination systems (which terminate the flight of airborne missiles or launch vehicles when they veer from their targeted path), the Navy is required to follow standard operating procedures to ensure public health and safety. In those cases where a weapons system does not have a flight termination system, the size of the target area that needs to be clear of non-participants is based on the flight distance of the weapon plus an additional distance beyond the system's performance capability.

3.12.3 ENVIRONMENTAL CONSEQUENCES

This section evaluates how and to what degree the activities described in Chapter 2 (Description of Proposed Action and Alternatives) would potentially impact public health and safety. Table 2.6-1 (Proposed Training Activities) through Table 2.6-5 (Space and Naval Warfare Systems Command Proposed Testing Activities) present the proposed training and testing activity locations for each alternative (including the annual number of events). Each public health and safety stressor is introduced, and analyzed by alternative for both training and testing activities. Tables B-1 and B-2 in Appendix B (Activity Stressor Matrices) show the warfare areas and associated stressors that were considered for analysis of public health and safety. The stressors vary in intensity, frequency, duration, and location within the Study Area. The stressors applicable to public health and safety are the following:

- **In-water energy** (sonar and in-water explosions)
- **In-air energy** (radar and lasers)
- **Physical interactions** (aircraft, vessels, in-water devices/targets, munitions, seafloor devices)
- **Secondary stressors** (impacts to water quality from explosives and explosion byproducts, metals, chemicals other than explosives, and other materials)

As discussed in Chapter 2 (Description of Proposed Action and Alternatives), the majority of the training and testing activities that would be conducted under Alternatives 1 and 2 are the same or similar as those currently being conducted or have been conducted in the past.

The potential for impacts on public health and safety were evaluated assuming the implementation of the Navy's standard operating procedures, as discussed in Section 2.3.3 (Standard Operating Procedures). Training and testing activities in the Study Area are conducted in accordance with guidance provided in Fleet Area Control and Surveillance Facility Instructions (U.S. Department of the Navy, 2014) (if activities are conducted in Fleet Area Control and Surveillance Facility areas) or Test and Safety Planning Instructions. These instructions provide standard operating procedures for all normal range events. They also provide range users with information that is necessary to operate safely and avoid affecting nonmilitary activities such as shipping, recreational boating, diving, and commercial or recreational fishing. Ranges are managed in accordance with standard operating procedures that ensure public health and safety.

3.12.3.1 In-Water Energy

In-water energy can come from acoustic sources or electromagnetic devices. Active sonar, in-water explosions, air guns, and vessel movements produce in-water acoustic energy. Sound travels from air to water during aircraft overflights. Electromagnetic energy can enter the water from mine warfare training devices and unmanned underwater vehicles. The potential for the public to be exposed to these stressors would be limited to individuals, such as recreational swimmers or scuba divers who are underwater and within unsafe proximity of a training or testing event.

In-water acoustic energy is generated from many of the proposed activities; however, not all would be considered in detail in this environmental impact statement/overseas environmental impact statement (EIS/OEIS) in terms of their impact on public health and safety because the public safety risks from some activities are deemed to be negligible. The public might intermittently hear noise from ships if they are in the general vicinity of a training or testing event, but there would be no impact on public health and safety because of the infrequency and short duration of events. In addition, underwater air guns are used during some pierside integrated swimmer defense training and testing activities, but public health and safety would not be put at risk because access to pierside locations by non-participants is controlled. Active sonar and in-water explosions are the only sources of in-water acoustic energy evaluated for potential impacts on public health and safety.

The proposed activities that would result in in-water acoustic energy include activities such as amphibious warfare, surface warfare, anti-submarine warfare, mine warfare, surface warfare testing, sonar maintenance, pierside sonar testing, and unmanned underwater vehicle testing. A limited amount of active sonar would be used during transit between range complexes and training and testing locations.

The effect of active sonar on humans varies with the frequency of sonar involved. Of the four types of sonar (very high-, high-, mid-, and low-frequency), mid-frequency and low-frequency sonar have the greatest potential to impact humans due to the range of human hearing capabilities.

In-water explosives cause a physical shock front that compresses the explosive material, and the pressure wave then passes into the surrounding water. Generally, the pressure wave would be the primary cause of injury. The effects of an in-water explosion depend on several factors, including the size, type, and depth of the explosive charge and where it is in the water column.

Electromagnetic energy is associated with systems such as the Organic Airborne and Surface Influence Sweep System that emit an electromagnetic field to simulate the presence of a ship. Electromagnetic energy can also be used in a defensive mode to cause nearby mines to explode. Unmanned underwater vehicles, some unmanned surface vehicles, and towed devices use electromagnetic energy, either for navigation or as a means to be targeted.

Electromagnetic energy dissipates quickly with distance from the source. Scientific literature does not conclude that there are adverse health effects from most levels of electromagnetic energy, which is why no federal standards have been set for occupational exposures to this type of energy. DoD Instruction 3222.03 provides guidance regarding management and implementation of the electromagnetic environmental effects program, including hazards of electromagnetic radiation to personnel (U.S. Department of Defense, 2015).

As previously stated, the potential for the public to be exposed to these stressors would be limited to individuals who are underwater and within unsafe proximity to an event. Scuba diving is a popular recreational activity that is typically concentrated around known dive attractions, such as reefs and shipwrecks. The Professional Association of Diving Instructors (one of several scuba diving instruction organizations) suggests that certified open-water divers limit their dives to 60 feet (ft.). More experienced divers are generally limited to 100 ft.; in general, no recreational diver should exceed 130 ft. of depth (Professional Association of Diving Instructors, 2011). These depths typically limit this activity's distance from shore.

Navy operations overlapping with recreational swimmers or divers would be unlikely. Recreational swimmers and divers are not precluded from operating in public boat lanes or adjoining areas near Navy pier-side locations (which include shipyards); however, Navy operators are diligent in identifying recreational swimmers and divers to ensure that these would be avoided. Additionally, recreational divers would not be expected near Navy ships at sea. The locations of popular offshore diving spots are well-documented, and dive boats (typically well-marked) and diver-down flags would be visible from the ships conducting the training and testing. The U.S. Navy Diving Manual (U.S. Department of the Navy, 2016b) contains methodologies to determine appropriate safety distances associated with sonar use near Navy divers. These safety distances would also be used as safety buffers to protect public health and safety. If any unauthorized personnel are detected within the sonar activity safety buffer, the activity would be temporarily halted until the area is again cleared.

3.12.3.1.1 Impacts from In-Water Energy Under Alternative 1

Impacts from In-Water Energy Under Alternative 1 for Training Activities

Under Alternative 1, the Navy would conduct active sonar training activities such as anti-submarine warfare, mine warfare, and sonar maintenance at the Hawaii Range Complex, the Southern California (SOCAL) Range Complex, and other HSTT areas. Activities involving in-water explosions, such as surface warfare and mine warfare, would be conducted at established ranges and training locations. The Navy would conduct these activities throughout the Study Area.

As previously discussed, the Navy implements operating procedures designed to protect public health and safety. These procedures include:

- ensuring that training areas are clear before commencing hazardous activities,
- conducting all activities in accordance with established safety instructions,

- conducting in-water detonations only at established and approved locations,
- posting Navy Lookouts at all times during an exercise to ensure non-participants do not enter the area, and
- coordinating with the Coast Guard to issue Notices to Mariners notifying the public about durations and locations of potentially hazardous activities.

Consequently, the potential for training activities using in-water energy to impact public health and safety under Alternative 1 would be unlikely.

Impacts from In-Water Energy Under Alternative 1 for Testing Activities

Under Alternative 1, the Navy would conduct active sonar testing activities such as anti-submarine warfare, mine warfare, pierside sonar testing, unmanned underwater vehicle testing, and sonar maintenance in the HSTT Study Area. Pierside testing of active sonar would occur in Pearl Harbor and San Diego.

The Navy would conduct testing activities involving in-water detonations, such as surface warfare, anti-submarine warfare, mine warfare, and surface combatant sea trials at current locations, which include specific training areas in the Hawaii Range Complex and the SOCAL Range Complex.

As discussed in Impacts from In-Water Energy Under Alternative 1 for Training Activities, the Navy implements operating procedures designed to protect public health and safety. Under this alternative, these procedures would be implemented. Consequently, the potential for testing activities using in-water energy to impact public health and safety under Alternative 1 would be unlikely.

3.12.3.1.2 Impacts from In-Water Energy Under Alternative 2

Impacts from In-Water Energy Under Alternative 2 for Training Activities

Alternative 2 reflects an increase in sonar training over that presented in Alternative 1. Training locations would remain the same as those of Alternative 1. Alternative 2 assumes a maximum of three Composite Training Unit Exercises per year. The Navy would implement standard operating and safety procedures, as previously discussed. Therefore, potential for impacts on public health and safety beyond those identified for Alternative 1 would be unlikely.

The Navy would conduct activities involving in-water explosions, such as surface warfare, mine warfare, and civilian port defense, at current locations. In this case also, the Navy would implement standard operating and safety procedures. Therefore, potential for impacts on public health and safety beyond those identified for Alternative 1 would be unlikely.

Impacts from In-Water Energy Under Alternative 2 for Testing Activities

Under Alternative 2, the Navy would conduct active sonar testing activities (both at-sea and pierside) in the same areas and at the same levels identified under Alternative 1. The Navy would implement standard operating and safety procedures. Therefore, an increased potential for impacts on public health and safety beyond those identified for Alternative 1 would be unlikely.

The Navy would conduct testing activities involving in-water explosions, such as air warfare, surface warfare, anti-submarine warfare, mine warfare, surface combatant sea trials, littoral combat ship testing, ship shock trials, combat ship qualifications, at-sea explosive testing, and sonobuoy lot acceptance testing in the same areas identified under Alternative 1. Alternative 2 would increase the number of some testing activities involving in-water explosions. The Navy would implement standard

operating and safety procedures. Therefore, an increased potential for impacts on public health and safety beyond those identified for Alternative 1 would be unlikely.

3.12.3.1.3 Impacts from In-Water Energy Under the No Action Alternative

Impacts from In-Water Energy Under the No Action Alternative for Training and Testing Activities

Under the No Action Alternative, the Navy would not conduct the proposed training and testing activities in the HSTT Study Area. Various in-water energy stressors (e.g., acoustic and electromagnetic) would not be introduced into the marine environment. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities. However, with regard to diminished military readiness, the No Action Alternative would have adverse impacts on public health and safety.

3.12.3.2 In-Air Energy

In-air energy stressors include sources of electromagnetic energy and lasers. The sources of electromagnetic energy include radar and electronic warfare systems. These systems operate similarly to other navigational aids and radars at civilian airports and television weather stations throughout the United States. Electronic warfare systems emit electromagnetic energy similar to that from cell phones, handheld radios, commercial radio stations, and television stations. The Navy follows documented safety procedures to protect Navy personnel and the public from electromagnetic energy hazards. These procedures include setting the heights and angles of electromagnetic energy transmissions to avoid direct human exposure, posting warning signs, establishing safe operating levels, and activating warning lights when radar systems are operational.

High-energy lasers are used as weapons to disable surface targets. The Navy would operate high-energy laser equipment in accordance with procedures defined in the Office of the Chief of Naval Operations Instruction 5100.23G, *Navy Safety and Occupational Health Program Manual* (U.S. Department of the Navy, 2011). These high-energy light sources can cause eye injuries and burns. A comprehensive safety program exists for the use of lasers. Current Navy safety procedures protect individuals from the hazard of injuries caused by laser energy. Laser safety requirements for aircraft and vessels mandate verification that target areas are clear before commencement of an exercise. In the case of aircraft, during actual laser use, the aircraft run-in headings (i.e., the direction at which the aircraft's nose approaches the target) are restricted to preclude inadvertent lasing of areas where the public may be present.

Training and testing activities involving electromagnetic energy include electronic warfare activities that use airborne and surface electronic jamming devices to defeat tracking and communications systems. Training activities involving low-energy lasers include surface warfare and mine warfare; there are no training activities that use high-energy lasers.

3.12.3.2.1 Impacts from In-Air Energy Under Alternative 1

Impacts from In-Air Energy Under Alternative 1 for Training Activities

Under Alternative 1, the Navy would conduct electronic warfare training activities involving electromagnetic energy sources at current levels and locations, including the Hawaii OPAREA and the SOCAL Range Complex's Electronic Warfare Range. The Navy would conduct laser targeting activities and mine detection activities using lasers at current levels and locations, including the Hawaii Range

Complex's Warning Area 188 and the SOCAL Range Complex's Anti-Submarine Warfare Range and San Clemente Island Shore Bombardment Range.

It is unlikely that the public would be exposed to electromagnetic energy sources or lasers from training activities under Alternative 1, because the Navy would not conduct these activities in proximity to the public. Additionally, the Navy would employ strict safety procedures for the use of lasers and other electromagnetic energy sources, as discussed in Sections 3.12.2.2.5 (Electromagnetic Energy Safety) and Section 3.12.2.2.6 (Laser Safety). Consequently, the potential for training activities to impact public health and safety under Alternative 1 would be unlikely.

Impacts from In-Air Energy Under Alternative 1 for Testing Activities

Under Alternative 1, the Navy would conduct electronic warfare testing activities involving electromagnetic energy sources and low-energy lasers at locations identified under Alternative 1. High-energy laser weapons testing activities (the only testing activities using high-energy lasers) would occur only within designated areas of the Hawaii Range Complex and the SOCAL Range Complex.

The Navy would not conduct these testing activities in proximity to the public. Additionally, the Navy would employ strict safety procedures for the use of lasers and other electromagnetic energy sources, as discussed in Sections 3.12.2.2.5 (Electromagnetic Energy Safety) and Section 3.12.2.2.6 (Laser Safety). Consequently, the potential for testing activities to impact public health and safety would be unlikely.

3.12.3.2.2 Impacts from In-Air Energy Under Alternative 2

Impacts from In-Air Energy Under Alternative 2 for Training Activities

Alternative 2 would involve the same locations and number of training activities described under Alternative 1 for electromagnetic energy and lasers. The Navy would implement standard operating and safety procedures. Therefore, an increased potential for impacts on public health and safety beyond those identified for Alternative 1 would be unlikely.

Impacts from In-Air Energy Under Alternative 2 for Testing Activities

Alternative 2 would involve the same locations and number of testing activities described under Alternative 1 for electromagnetic energy and lasers. The Navy would implement standard operating and safety procedures. Therefore, an increased potential for impacts on public health and safety beyond those identified for Alternative 1 would be unlikely for testing activities.

3.12.3.2.3 Impacts from In-Air Energy Under the No Action Alternative

Impacts from In-Air Energy Under the No Action Alternative for Training and Testing Activities

Under the No Action Alternative, the Navy would not conduct the proposed training and testing activities in the HSTT Study Area. In-air energy stressors (e.g., laser and electromagnetic) would not be introduced into the marine environment. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities. However, with regard to diminished military readiness, the No Action Alternative would have adverse impacts on public health and safety.

3.12.3.3 Physical Interactions

This section evaluates potential impacts associated with the interaction of Navy aircraft, vessels, and equipment with general public. Public health and safety could be impacted by physical collisions

between Navy assets and the public. As described in Section 3.0.3.3.4 (Physical Disturbance and Strike Stressors), Navy aircraft, vessels, targets, munitions, towed devices, seafloor devices, and other training and testing expended materials could be directly, physically encountered by recreational, commercial, institutional, and governmental aircraft, vessels, and individuals such as swimmers, divers, and anglers.

Like private aircraft, Navy aircraft are required to observe and avoid other aircraft. In addition, the Federal Aviation Administration issues Notices to Airmen advising private and commercial pilots about scheduled Navy training and testing activities. Finally, Navy personnel are required to verify that the range is clear of non-participants before initiating any activity that could be potentially hazardous to the public. Together, these procedures would minimize the potential for adverse interactions between Navy and non-participant aircraft. Application of standard operating procedures would minimize the potential for interaction between private or commercial aircraft with Navy training or testing activities employing aircraft, munitions, and aerial targets.

Private and commercial vessels traversing the Study Area during training or testing activities may interact with Navy vessels, munitions, and surface targets. Naval Vessel Protection Zones established by U.S. Coast Guard regulations (33 CFR section part 165 subpart G) require other (non-Navy) vessels to slow down to a minimum speed within 500 yards of a Navy vessel greater than 100 ft. long; they are prohibited from approaching within 100 yards of a Navy vessel greater than 100 ft. long. Both Navy and public vessels operate under maritime navigational rules requiring them to observe and avoid other vessels. In addition, Notices to Mariners advise vessel operators about when and where Navy training and testing activities are scheduled. Finally, Navy personnel are required to verify that the range is clear of non-participants before initiating any potentially hazardous activity. Together, these procedures minimize the potential for adverse interactions between Navy and non-participant vessels.

Recreational diving within the Study Area takes place primarily at known diving sites such as shipwrecks and reefs. The locations of these popular dive sites are well-documented, dive boats are typically well-marked, and diver-down flags are visible from a distance. As a result, dive sites would be easily avoided by ships conducting training or testing activities. Interactions between training and testing activities and recreational divers, thus, would not be expected. Similar knowledge and avoidance of popular fishing areas would minimize interactions between training and testing activities and recreational fishing.

Commercial and recreational fishing activities could encounter military expended materials that could entangle fishing gear and pose a safety risk. The Navy recovers many surface targets after they are used to avoid them becoming a collision risk or entanglement risk. Unrecoverable pieces of military expended materials are typically small (such as sonobuoys), constructed of soft materials (such as target cardboard boxes or tethered target balloons), or intended to sink to the bottom after their useful function is completed, so they would not pose a collision or entanglement risk to civilian vessels or equipment. Thus, these targets do not pose a safety risk to individuals using the area for recreation because the public would not likely be exposed to these items before they sank to the seafloor.

The footprint of military expended materials in the Study Area is discussed in Habitats, Section 3.5.3.4.3 (Impacts from Military Expended Materials). Figure 3.5-17 and Figure 3.5-18 illustrate the very small percentage of marine substrate (much less than 1 percent of the total area of documented soft bottom or hard bottom in their respective training or testing areas). Given the small footprint of military expended materials estimated here, it is unlikely the public would encounter military expended materials during recreational or commercial fishing activities.

Section 3.2 (Sediments and Water Quality) discusses the low failure rate of munitions, which indicates that most munitions operate as intended. While fishing activities may encounter undetonated munitions, it would be unlikely because of the deep waters and the low density of munitions within the large size of the Study Area. Depending on the circumstances (i.e., emergency or imminent threat), Navy Explosive Ordnance Disposal support or other resources could be asked to respond and safely dispose of any munitions.

Additionally, the public may encounter military expended materials, such as pieces of plastics or fabric that wash up on the seashore. Most of this material does not pose a potential for safety impacts; however, other items, such as flares may pose potential safety impacts. Flares, such as the ones dropped into the ocean by military planes to use as markers, contain chemicals designed to burn at high intensity, allowing them to be visible from long distances. The chemicals (e.g., phosphorous) in unexpended or partially-burned flares can reignite when exposed to air or water, resulting in severe burns if handled. The presence of any flares should be reported to appropriate agencies, such as the police or U.S. Coast Guard, who would then contact experienced ordnance disposal personnel for their proper disposal.

The analysis focuses on the potential for a direct physical interaction with aircraft, vessels, targets, or other expended materials. A vessel or aircraft transiting through the water or air (as would be involved in the vast majority of proposed activities) inherently involves the risk of collision with other vessels or aircraft. But this risk is greatly diminished by a shared set of international navigational rules for vessels and aircraft. The greatest potential for a physical interaction would be along the coast and near populated areas, because that is where public activities are concentrated.

3.12.3.3.1 Impacts from Physical Interactions Under Alternative 1

Impacts from Physical Interactions Under Alternative 1 for Training Activities

Under Alternative 1, the Navy would conduct training activities at current locations. The potential for a direct physical interaction between the public and aircraft, vessels, targets, or expended materials would not change from current conditions. The Navy implements strict operating procedures that protect public health and safety. These operating procedures include ensuring clearance of the area before commencing training activities.

As discussed in Section 3.12.3.3 (Physical Interactions), there would be no impact on public health and safety from physical interactions with training activities, based on the Navy's implementation of strict operating procedures that protect public health and safety. These operating procedures include ensuring clearance of the area before commencing training activities involving physical interactions. Because of the Navy's safety procedures, the potential for training activities to impact public health and safety under Alternative 1 would be unlikely.

Impacts from Physical Interactions Under Alternative 1 for Testing Activities

Because the potential for a physical interaction is not activity or location specific, the analysis for the training activities above applies to testing activities under Alternative 1. As concluded above, because of the Navy's safety procedures, the potential for testing activities to impact public health and safety under Alternative 1 would be unlikely.

3.12.3.3.2 Impacts from Physical Interactions Under Alternative 2

Impacts from Physical Interactions Under Alternative 2 for Training Activities

Under Alternative 2, the Navy would increase the number of at-sea training activities over that presented in Alternative 1. While Alternative 2 would adjust locations and number of some training activities, the Navy would implement standard operating and safety procedures, as discussed in Section 3.12.3.3 (Physical Interactions). Therefore, the potential for impacts on public health and safety would remain unlikely.

Impacts from Physical Interactions Under Alternative 2 for Testing Activities

Under Alternative 2, the Navy would increase some types of testing activities. Because the potential for a physical interaction is not activity-specific or location-specific, the analysis for the training activities above applies to testing activities under Alternative 2. As concluded above, because of the Navy's safety procedures, the potential for testing activities to impact public health and safety under Alternative 2 would remain unlikely.

3.12.3.3.3 Impacts from Physical Interactions Under the No Action Alternative

Impacts from Physical Interactions Under the No Action Alternative for Training and Testing Activities

Under the No Action Alternative, the Navy would not conduct the proposed training and testing activities in the HSTT Study Area. Physical interaction stressors (e.g., collision with a vessel, interaction with a military expended material) would not be introduced into the marine environment. Therefore, baseline conditions of the existing environment would remain either unchanged or would improve slightly after cessation of ongoing training and testing activities. However, with regard to diminished military readiness, the No Action Alternative would have adverse impacts on public health and safety.

3.12.3.4 Secondary (Sediments and Water Quality)

Secondary stressors are defined as those stressors that could pose indirect impacts on public health and safety through degradation in water quality or changes to sediment. These stressors include the use of explosives, explosive chemical byproducts, and other materials/debris potentially generated (marine markers, flares, chaff, targets, and miscellaneous components of other materials).

3.12.3.4.1 Impacts from Sediments and Water Quality Under Alternative 1

Impacts from Sediments and Water Quality Under Alternative 1 for Training Activities

Section 3.2 (Sediments and Water Quality) considers the impacts on marine sediments and water quality from these stressors. The analysis in Section 3.2 (Sediments and Water Quality) determined that any impacts to water quality would be temporary and minimal. No state or federal standards or guidelines would be violated. Consequently, training under Alternative 1 would result in no indirect impacts on public health and safety associated with sediments and water quality.

Impacts from Sediments and Water Quality Under Alternative 1 for Testing Activities

The analysis in Section 3.2 (Sediments and Water Quality) determined that any impacts to water quality would be temporary and minimal. No state or federal standards or guidelines would be violated. Consequently, testing under Alternative 1 would result in no indirect impacts on public health and safety associated with sediments and water quality.

3.12.3.4.2 Impacts from Sediments and Water Quality Under Alternative 2

Impacts from Sediments and Water Quality Under Alternative 2 for Training Activities

The analysis in Section 3.2 (Sediments and Water Quality) determined that any impacts to water quality would be temporary and minimal. No state or federal standards or guidelines would be violated. Consequently, training under Alternative 2 would result in no indirect impacts on public health and safety associated with sediments and water quality.

Impacts from Sediments and Water Quality Under Alternative 2 for Testing Activities

The analysis in Section 3.2 (Sediments and Water Quality) determined that any impacts to water quality would be temporary and minimal. No state or federal standards or guidelines would be violated. Consequently, testing under Alternative 2 would result in no indirect impacts on public health and safety associated with sediments and water quality.

3.12.3.4.3 Impacts from Sediments and Water Quality Under the No Action Alternative

Impacts from Sediments and Water Quality Under the No Action Alternative for Training and Testing Activities

Under the No Action Alternative, the Navy would not conduct the proposed training and testing activities in the HSTT Study Area. Secondary stressors (e.g., chemicals affecting water or sediment quality) would not be introduced into the marine environment. Therefore, baseline conditions of the existing environment would either remain unchanged or would improve slightly after cessation of ongoing training and testing activities. However, with regard to diminished military readiness, the No Action Alternative would have adverse impacts on public health and safety.

3.12.4 SUMMARY OF POTENTIAL IMPACTS ON PUBLIC HEALTH AND SAFETY

3.12.4.1 Combined Impacts of All Stressors Under Alternative 1

Activities described in this EIS/OEIS that have potential to impact public health and safety include those that release in-water energy or in-air energy or those that result in physical interactions, as well as those that have indirect impacts from changes to sediments and water quality. As described throughout this section, the Navy promotes a proactive and comprehensive safety program designed to reduce to the greatest extent possible any potential impacts on public health and safety from training and testing activities. Elements of this program include implementing strict navigation rules, coordinating and disseminating information on potentially hazardous activities, and the use of remote sensing technologies (e.g., radar, sonar) or trained Navy Lookouts to ensure that training and testing areas are clear of non-participants. Navy safety considerations are appropriate to the location and type of activity being conducted, no matter what number of activities are occurring concurrently; consequently, no elevated impacts from the combined effect of all stressors are expected.

3.12.4.2 Combined Impacts of All Stressors Under Alternative 2

As with Alternative 1, no elevated impacts under Alternative 2 are expected from the combined effect of all stressors. Navy safety considerations are appropriate to the location and type of activity being conducted, irrespective of the number of activities concurrently conducted.

3.12.4.3 Combined Impacts of All Stressors Under the No Action Alternative

Although Navy at-sea training and testing activities within the Study Area would cease under the No Action Alternative, with respect to combined impacts of stressors, there would be no appreciable

change in potential impacts on public health and safety, as these activities (currently or as proposed) would be unlikely to affect public health and safety. However, diminished military readiness under the No Action Alternative would adversely affect public health and safety.

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