Environmental Impact Statement/
Overseas Environmental Impact Statement
Hawaii-California Training and Testing
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3.2 Sediments and Water Quality

SEDIMENT AND WATER QUALITY SYNOPSIS

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

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

3.2.1 Introduction

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

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

3.2.2 Affected Environment

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

3.2.2.1 General Background

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

3.2.2.2 Sediments

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

3.2.2.2.1 Sediment Quality in Hawaii Study Area

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

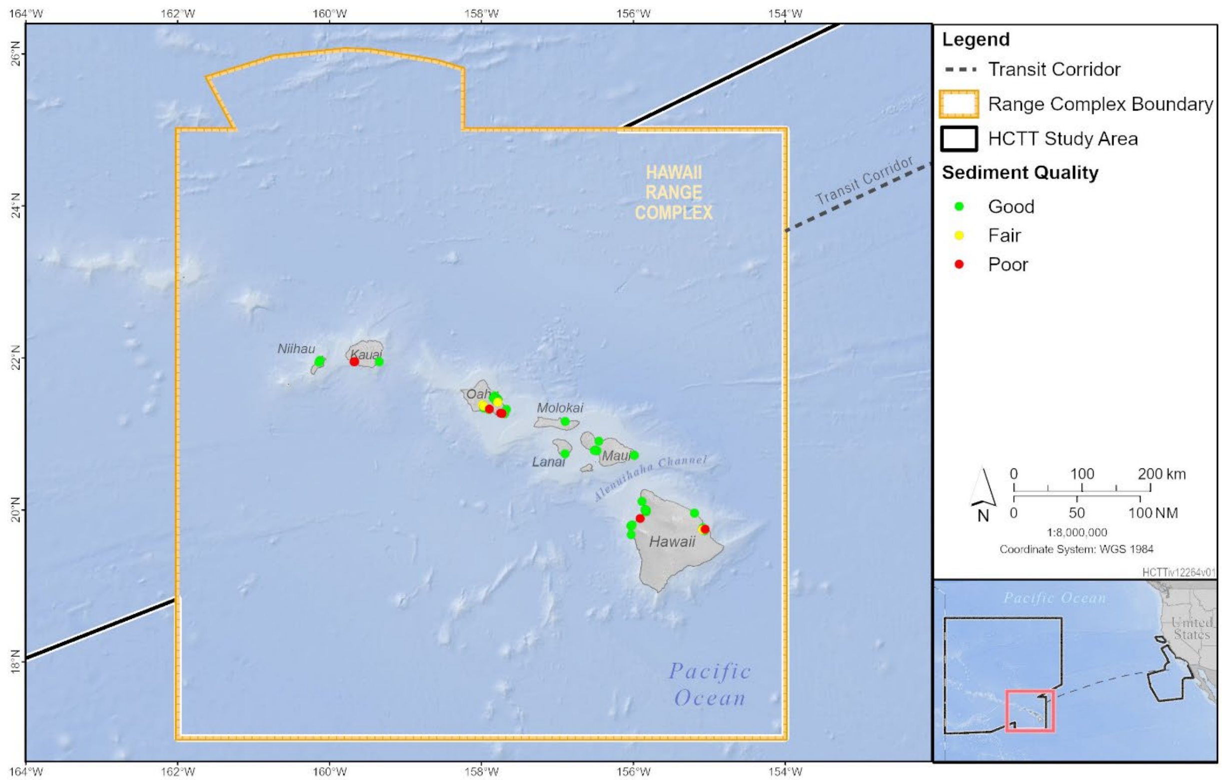

Figure 3.2-1: Sediment Quality in the Hawaii Study Area

3.2.2.2.2 Sediment Quality in California Study Area

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

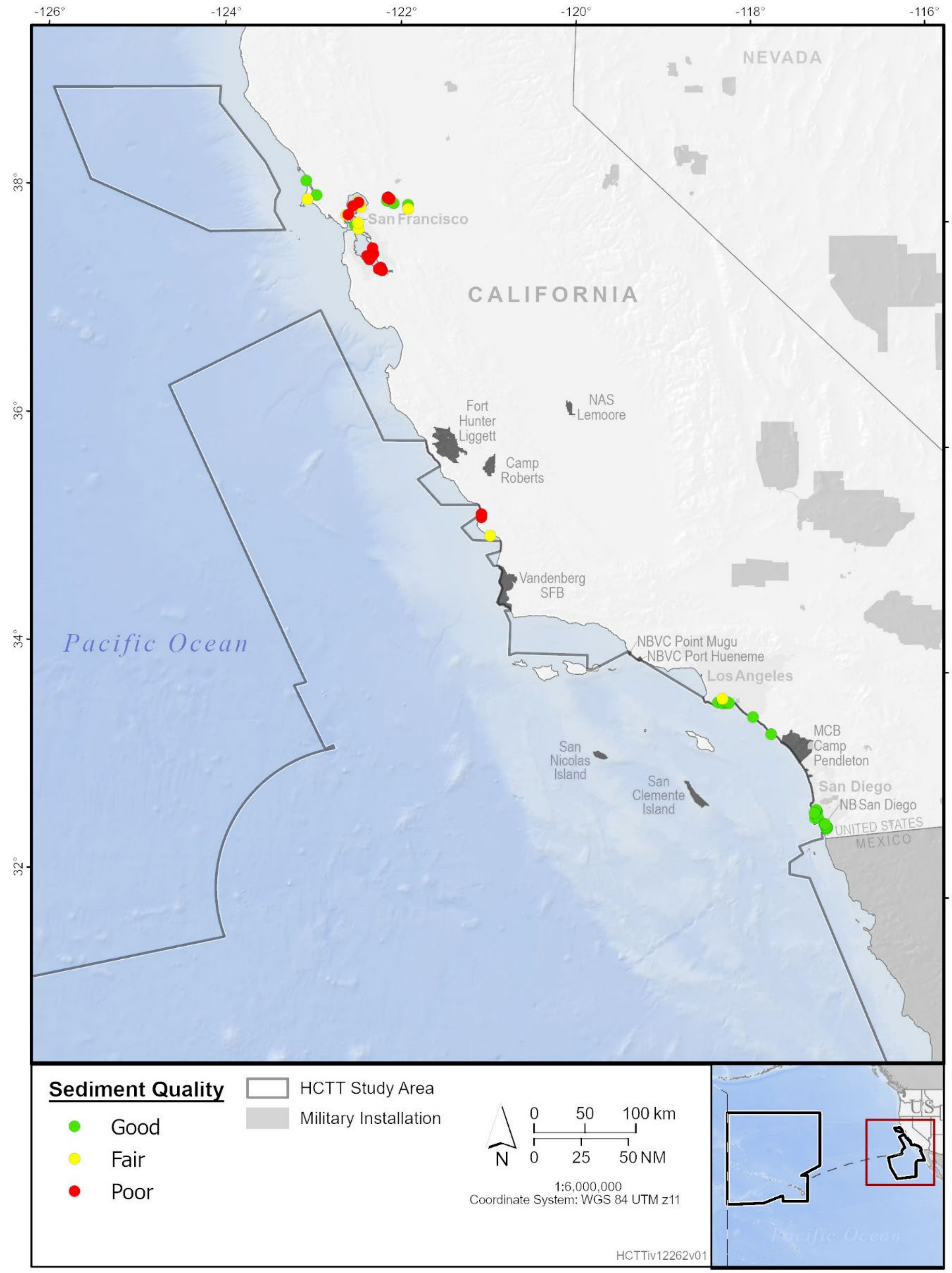

Figure 3.2-2: Sediment Quality in the California Study Area

3.2.2.3 Water Quality

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

3.2.2.3.1 Water Quality in the Hawaii Study Area

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

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

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

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

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

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

3.2.2.3.2 Water Quality in the California Study Area

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

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

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

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

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

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

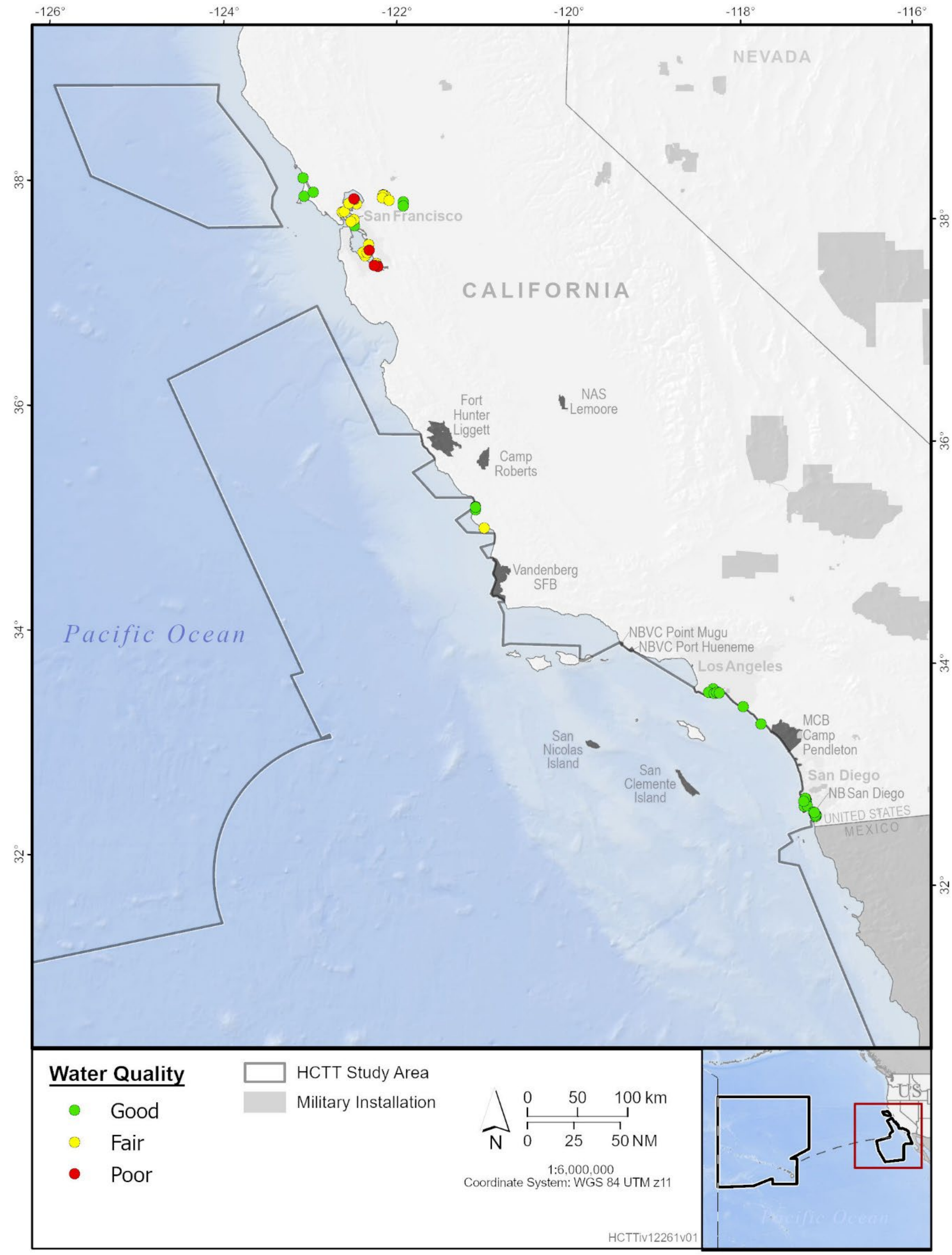

Figure 3.2-3: Water Quality in the California Study Area

3.2.2.3.3 Marine Debris and Water Quality

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

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

3.2.2.3.4 Climate Change and Water Quality

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

3.2.2.3.5 Regulatory Environment

State Standards and Guidelines

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

3.2.3 Environmental Consequences

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

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

For sediments and water quality, stressors include:

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

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

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

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

3.2.3.1 Explosives and Explosives Byproducts

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

Table 3.2-1: Explosives and Explosive Byproducts Information Summary

Explosives and Explosives Byproducts Information Summary

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

3.2.3.1.1 Effects from Explosives and Explosives Byproducts

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

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

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

3.2.3.2 Metals

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

Table 3.2-2: Metals Information Summary

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

3.2.3.2.1 Effects from Metals

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

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

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

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

3.2.3.3 Chemicals other than Explosives

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

Table 3.2-3: Chemicals Other Than Explosives Information Summary

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

Chemical Other than Explosives Information Summary
• Constituents commonly found in the energetics, propellant, and pyrotechnic elements of munitions may also leach from solid components of munitions and release into seawater. • Propellants used by rockets and missiles are typically completely consumed prior to impact of the water surface even if the munition fails to detonate upon impact. • Perchlorates, which make up a large percentage of rocket and missile propellants, are water soluble and any residuals that are not consumed dissolve and are dispersed in surface waters. • Aluminum powder is used as a fuel additive and ranges from 5% to 22% by weight of solid propellant. • Other explosives (e.g., octahydro-1,3,5,7 -tetranitro-1,3,5,7-tetrazocine and hexahydro-1,3,5-trinitro-1,3,5-triazine) may be added, although they usually comprise less than 30% by weight of the propellant. • Otto Fuel II is used as a liquid propellant in torpedoes; it is consumed underwater, and any combustion products would enter the marine environment. All non-explosive torpedoes are recovered after conclusion of activity, which would reduce the amount of residual Otto Fuel II entering the marine environment. • Otto Fuel II combustion byproducts include NO_x, CO, CO_2, N, and methane, (Arai & Chino, 2012). These byproducts occur naturally in the marine environment and are considered non-toxic. Ammonia and hydrogen cyanide, which are also byproducts of Otto Fuel II combustion, can be toxic to marine organisms. • Decommissioned vessels used as targets for SINKEX have been cleaned or remediated for fuel and PCBs in accordance with U.S. Environmental Protection Agency (USEPA) guidelines. • Target vessels used during SINKEX are a potential source of PCBs that may be present. However, the USEPA considers the contaminant levels released during SINKEX to be within the standards of the Marine Protection, Research, and Sanctuaries Act (U.S. Environmental Protection Agency, 2014). • The DoD uses relatively harmless compounds as chemical simulants for chemical and biological warfare agents for the purposes of testing equipment intended to detect their presence. Given the criteria for choosing simulants for use in activities, it is reasonable to conclude that simulants would have no effect on sediment and water quality in the Study Area. Therefore, simulants are not analyzed further in this section.

3.2.3.3.1 Effects from Chemicals Other Than Explosives

Training and Testing. The distribution of munitions that use chemicals other than explosives is not uniform throughout the Study Area. Approximately 67 percent of these munitions are rockets (expending the byproducts of propellant combustion) used in the California Study Area. Missiles make up another 4 percent of these munitions. Effects associated with chemicals other than explosives under Alternative 1 and 2 would not differ greatly from what was analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs for reasons summarized in Table 3.2-3. As such, for properly functioning munitions, chemical, physical changes in sediments or water quality would not be detectable.

Modernization and Sustainment of Ranges. As described in Appendix A, Section A.3.2.4, SOAR modernization activities in the California Study Area include releasing corrosion inhibitor solution from existing conduits. A Vapor Phase Corrosion Inhibitor (VpCl) solution is used in the conduits at a dilution up to 1.5 percent VpCl (98.5 percent potable water). The solution is in a concentrated liquid form and would be mixed with potable water to achieve the desired percent solution. To replace corrosion inhibitor solutions, divers would open the valve on the underwater termination point of each conduit. New corrosion inhibitor solution would be mixed onshore in a large tank and then pumped into the conduits at the cable vaults. The valve at the underwater termination point would be closed once the solution is pumped into the conduit. For three conduits with the solution, approximately 6,160 gallons of solution could be released up to three times in a seven-year permit cycle. For each event, it is estimated this work can be completed in approximately one week during daytime hours. Solutions are effective for approximately 24 months.

The corrosion inhibitor products selected for the Proposed Action are routinely used for this type of application in offshore areas because of their environmentally benign properties. Manufacturer hydrotests of the product as depicted in Holden et al. (2010) have yielded low toxicity levels and waters containing the product remain safe for many species, allowing the product to be discharged according to local specifications.

Conclusion. Activities that include the use of chemicals other than explosives would not have reasonably foreseeable adverse effects on sediments and water quality for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs. These reasons include the following: (1) the size of the area in which expended materials would be distributed is large; (2) most propellant combustion byproducts are benign, while those of concern would be diluted to below detectable levels within a short time; (3) most propellants are consumed during normal operations; (4) most byproducts of Otto Fuel II combustion are naturally occurring chemicals, and most torpedoes are recovered after use, such that any fuel that is not consumed would be recovered along with the torpedo, limiting any direct exposure of sediments and water to Otto Fuel II; (5) the failure rate of munitions using propellants and other combustible materials is low; and (6) most of the constituents of concern are biodegradable by various marine organisms or by physical and chemical processes common in marine ecosystems.

3.2.3.4 Other Materials

Information related to other materials as potential stressors to sediments and water quality is summarized in Table 3.2-4. Additional background information remains unchanged from the 2018 HSTT and 2022 PMSR EIS/OEISs and is provided in Appendix F, Section F.2.4.

Table 3.2-4: Other Materials Information Summary

Other Materials Information Summary
• Military readiness activities would release a variety of other materials to the marine environment. • These materials potentially could include marine markers and flares, chaff, towed and stationary targets, and miscellaneous components of non-explosives sonobuoys (i.e., passive and acoustic sonobuoys), which contain metals and other materials including plastics, and small decelerator/parachutes. • These materials and components are either made mainly of non-reactive or slowly reactive materials, such as glass, carbon fibers, and plastics, or break down or decompose into non-toxic byproducts (e.g., rubber, steel, iron, and concrete). • Most of these other materials would settle to the seafloor where they would (1) be exposed to seawater, (2) be lodged in or covered by seafloor sediments, (3) be encrusted by oxidation products such as rust, (4) be dissolved slowly, or covered by marine organisms, and (5) potentially fill holes used as refuge for marine life • Plastic components of the other materials may float or descend to the bottom, depending upon their buoyancy, or break into smaller microplastic particles. • Combustion of red phosphorus produces phosphorus oxides, which have a low toxicity to aquatic organisms. • Aluminum and iron canisters are expected to be covered by sediment over time, encrusted by chemical corrosion, or covered by marine organisms. • Flares are usually consumed during flight. Combustion products from flares include magnesium oxide, sodium carbonate, CO^2, and water. The bulk of the materials used in flares and marine markers are metals and other chemical compounds that occur naturally in the marine environment and would be dispersed at low concentrations in the water column or would sink to the seafloor (Appendix F, Section F.2.4)

Other Materials Information Summary
• Chaff consists of small, thin glass fibers coated in aluminum that are light enough to remain in the air anywhere from 10 minutes to 10 hours (Farrell & Siciliano, 2004). • Once released, chaff fibers disperse, and the extent of dispersion depends on the altitude and location where it is released, prevailing winds, and meteorological conditions (Spargo, 2007; Spargo et al., 1999). • Chaff is generally resistant to chemical weathering and likely remains in the environment for long periods. The fibers are quickly dispersed by waves and currents. • Chemicals leached from the chaff would be diluted by surrounding seawater, reducing the potential for chemical concentrations to reach levels that can affect sediment quality. • Sonobuoys typically contain both metal and nonmetal components and use lithium batteries. • During battery operation of the sonobuoy, the lithium reaction proceeds nearly to completion prior to battery termination, and only a small number of reactants remain when the battery life ends. These residual materials gradually dissolve or are diluted by currents. • After battery life expires (which takes no more than 8 hours), the sonobuoy scuttles itself and sinks to the bottom. • Some munitions and other military expended material used for military readiness activities contain small amounts of plastic, such as that associated with chaff cartridge end caps and flare pads and pistons. The plastic residuals are not recovered after the munitions are expended.

3.2.3.4.1 Effects from Other Materials

Training and Testing. The distribution of other materials used in training and testing activities would not be uniform throughout the Study Area. Approximately 30 percent of these other expended items would be used annually in the Hawaii Study Area and 70 percent in the California Study Area. For details on the numbers and types of MEM used in the Study Area, refer to Appendix I and Chapter 2. Similar other materials analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs will be entering the study areas under Alternative 1 and 2. Although locations and quantities differ somewhat, the overall effects would be similar to the analysis conducted for reasons summarized in Table 3.2-3.

Modernization and Sustainment of Ranges. Implementation of range sustainment and modernization activities would result in other materials (e.g., fiber optic cables, instruments) that may temporarily suspend soft sediments and increase turbidity levels. However, the levels are not expected to be measurable as the substrate is dominated by hard bottom in these areas, and soft suspended sediments would not be greatly disturbed (Section 3.5). These materials are used regularly and maintained, and would not be expected to degrade over a reasonably foreseeable time.

Conclusion. Activities that include the use of other materials would not have reasonably foreseeable adverse effects on sediments and water quality for reasons previously analyzed in the 2018 HSTT and 2022 PMSR EIS/OEISs. These reasons include the following: (1) materials released via breakdown in the ocean would be diluted by currents or sequestered in adjacent sediment; (2) elevated concentrations of materials in sediments, if present, would be limited to the immediate areas around the materials; (3) other materials expended are distributed across a large area outside of state waters, reducing the potential for activities to contribute to existing impairments in nearshore and estuarine water bodies.

3.2.4 Summary of Potential Effects on Sediments and Water Quality

The chemical, physical, or biological changes in sediments and water quality would be minimal and only detectable in the immediate vicinity of munitions. Even in areas where multiple munitions and expended materials are located in close proximity (e.g., munitions disposal sites) chemical degradation products from each source or item are largely isolated from each other. The low failure rate of explosive munitions reduces the likelihood of exposure to explosives materials that remain in intact munitions. Measurable concentrations of contaminants and other chemicals in the marine environment from munitions disposal sites have been shown to be below screening levels or similar to nearby reference areas where munitions are not present. Many components of MEM are inert or corrode slowly over years. Metals that could affect benthic habitat at higher concentrations comprise only a small portion of the alloys used in expended materials, and corrosion of metals in munitions casings and other expended materials is a slow process that allows for dilution. The chemical products from hydrolysis are predominantly naturally occurring chemicals. Elevated concentrations of metals and other chemical constituents in sediments would be limited to small zones adjacent to the munitions or other expended materials and would still most likely remain below screening levels even after years residing on the seafloor. It is also possible that stressors associated with military readiness activities will combine with stressors from non-military activities, particularly in nearshore areas and bays, such as Pearl Harbor, Kaneohe Bay, and San Diego Bay, to exacerbate already affected sediments and water quality. This is qualitatively discussed in Chapter 4.

Although potential effects on sediments and water quality from military readiness activities may occur, they are not expected to be long term or measurable, and therefore adverse effects are not reasonably foreseeable.

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